Managerial Aspects of Donated Timberland for Foundations

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This bulletin addresses the managerial aspects of donated timberland. Basic forestry terminology, timber measurement and volume, timber value, timber sales and contracts, and timber harvesting are discussed. Foundation administrators and board members will find this discussion serves as a useful primer for first evaluating a potential donation of forestland or timber. A complementary bulletin, SREF-FM-016, addresses the financial issues posed by donated timberland.

Introduction

Over half of the forestland in the United States is in private hands. Just over 10 million individual and family owners control about 60% of this private forestland. These owners are families, individuals, trusts, estates, family partnerships, and other nonincorporated groups of individuals. Ownership of family forests changes on a regular and rapid basis; sometimes from generation to generation and sometimes to outside of the family.

These ownership transfers can result in family dilemmas. Often forestland has been in a rural-based or agricultural family for generations and the family gradually loses it rural roots or desires

to monetize the assets, rather than manage a family property. Or, siblings might each desire smaller, equal parcels. Some families actively pursue options that preserve the family property and keep it intact. Forestland and timber are increasingly being donated to foundations as older donors look for tax-advantaged means to gradually transfer natural resource-based assets to new owners who offer long-term protection to the natural values of the properties.

Land donations to foundations are common, but timber and timberland can pose special managerial and acquisition problems. The timber resource can increase the complexity of a land transaction and make a donation difficult to value. Periodic harvesting generates revenue patterns that impact the attractiveness of the property. Potentially timber investments can produce negative cash flows for lengthy periods of time. These sustainability and valuation issues can be difficult to address and require foundation managers to understand the fundamentals of forestry.

Forestry Basics and Productivity

A forest can be defined as an ecosystem consisting of an area of land with extensive tree cover. Forests are divided into stands, which are its basic management units. Forest stands are contiguous groups of trees that are similar in age, species composition, structure, potential site productivity, and on similar terrain. When managing a forest, a stand usually receives management treatments as a unit; for example, all the trees in a stand would be thinned or harvested at one time, while across the entire forest, treatments may occur at different times.

Site index is a measure of the ability of forestland to grow trees and includes soil productivity as part of its assessment. Site index always refers to a particular tree species, for example loblolly pine sites or white oak sites, as few species grow equally well on the same site. Site index is calculated as the average total height of the dominant trees in a forest stand at a base or index age. In the South, an index age of 50 years is commonly used for natural pine stands and

25 years for pine plantations. If forestland has the capacity to grow loblolly pines to an average height of 90 feet in 50 years, it is classified as site index 90 land for loblolly pines, base age 50. Understanding and measuring site index is important because of its dramatic impact on timber yield at harvest. Table 1 shows loblolly pine yields by site index for a 20-year old pine plantation. The amount of pulpwood produced on the highest site index land is over three and a half times as much as that produced on the lowest site index land.

Table 1. Pulpwood yields for a 20-year old loblolly pine stand on Virginia's coastal plain with 700 trees per acre at various site indexes.

Site Index (base age 25)	Yield (tons per acre)
50	60.5
60	92.3
70	141.5
80	216.4

Because site quality has such a major effect on timber yield, it should be a key element in valuing any forest tract. Higher site index land is worth more than lower site index land for timber production. If the forest is an investment and investment capital is limited, the highest site index portion of the forest should receive investment priority since this is the source of maximum timber production.

Assessing Forest Inventory and Timber Value

A forest inventory, which is a summary of the number and size of trees on a property, is necessary to determine the timber volume on a tract. It should list trees per acre by specific size

classes. Tree size is calculated using a measure of the diameter of the tree trunk at 4 ½ feet above the ground, called diameter at breast height, or DBH. Trees are typically grouped into 2 inch diameter classes; for example, a 10 inch tree would vary from 9.00 inches to 10.99 inches. Larger trees produce more valuable products and higher timber revenue. In the South, pulpwood is commonly trees in size from 6 inches to 10 inches (using 2 inch diameter classes, from 5.00 to 9.99 inches), chip-n-saw (small sawtimber) is commonly 10 to 12 inches, and sawtimber is 14 inches and above. Timber volume and, ultimately, the total timber value of the property can be determined by using the forest inventory numbers (divided into size classes) and calculating value by product classes (pulpwood, chip-n-saw, sawtimber). Measuring forest inventory and combining it with stumpage prices (price of timber on the stump) are the basis of estimating the revenue expected from a timber sale.

Forest yield is the amount of harvestable timber products. Pulpwood might be worth $8 per ton on the stump, while chip-n-saw could be worth $20 per ton, and sawtimber could be worth $30 per ton. Poles and plywood quality sawtimber might be worth $45 per ton. Pulpwood is usually expressed in cords (4 X 4 X 8 foot stacks of wood), cubic feet, or tons. Sawtimber is usually expressed in thousand board feet (MBF) or tons. A 1 inch X 1 foot X 1 foot board contains 1 board foot. There are other products like chip-n-saw (small timber that can produce some sawtimber, with the rest of the trees chipped for pulpwood) and large high quality logs suitable for plywood or poles.

Assessing Forest Stocking

Site index has a great impact on forest yield, but stocking impacts how that yield is distributed by product. Stocking is a measure of how many trees are in a forest stand relative to how many are

needed to attain the best growth. There are two common measures of stocking: trees per acre and basal area. Basal area is the cross-sectional area of trees at breast height (4 ½ feet above the ground) per acre, measured in square feet. Or, in plain English, basal area is the square foot area of the top of all the tree stumps on an acre of land if all the trees are cut 4 ½ feet above the ground.

To get the best growth rate and high quality wood, a forest stand should be fully stocked, not under-stocked or over-stocked. In the South, as a rule-of-thumb, the basal area of a mature forest stand should approximate the 50-year site index of the land. Using this rule, land that has a site index of 90 should have 90 square feet of basal area per acre. Some foresters may use the number of trees per acres as a stocking guideline, but it is a less reliable measure, unless the tree sizes and spacing are known. However, the concept of trees per acre may be more easily understood.

If your main interest is in total cubic feet or tons of wood produced, stocking has little effect on total yield. Stocking has a great impact, however, on the timber products available at harvest. Socking levels will determine how the trees in the stand will grow. You need a properly stocked stand to grow sawtimber. For example, in a 30-year old loblolly pine stand, stocking rates can produce nearly five times more sawtimber from a stand. Table 2 shows the amount of pulpwood and sawtimber that results from various stocking levels for this 30-year old loblolly pine stand. A forester will be needed to appraise stocking levels. Notice if you are just growing tons of wood (and products don't matter), then stocking does not matter. But if you are growing quality timber products, then it is critical. Existing stocking will be a factor to consider when evaluating a timber investment or donation.

Table 2. Pulpwood and Sawtimber yields for a 30-year old loblolly pine stand, site index 70, on the Virginia coastal plain.

	All Trees	----------Multiple Products----------	
	as Pulpwood	Sawtimber	Pulpwood
Trees Per Acre	(tons per acre)	tons per acre	tons per acre
500	140.7	46.8	86.9
600	141.0	34.6	99.5
700	140.7	25.5	108.6
800	139.6	18.7	115.0
900	138.3	13.8	119.3
1,000	138.3	10.1	122.0

Timber Value

The remaining topics all relate to timber value. Besides the primary factors that determine timber value, practical matters such as how the timber sale is organized or how well the timber sale contract is written can greatly impact the value realized by the owner of harvested timber. All of these issues will ultimately influence the value of donated timberland.

What are some of the factors that determine timber value? It is prudent for investors and owners to know how their timber is actually valued. There are two common types of timber prices: delivered and stumpage. Delivered is the price if you deliver the timber to a mill; stumpage price is for timber as it sits on the stump in the woods. Stumpage price is less than delivered price as someone has to harvest and transport stumpage to the mill. What factors influence the price offered for timber?

Timber volume is a major factor in determining total value. The owner expects to be paid for the amount of timber sold. While it sounds like a simple concept, it may not be as easy as it seems. Timber is sold as a lump sum or "per unit." With lump sum sales, the owner sells the timber from a specific area or marked timber for a negotiated price and the buyer obtains ownership for the actual timber volume that is found there. A professional forester needs to perform a timber cruise (statistical estimate of timber volume from field measurements) to ensure the owner knows the volume being sold. In a "per unit" sale the owner receives payment for the actual amount of timber as it is cut and delivered to the mill. This means the owner needs to monitor the timber harvest or have some sort of security system in place to ensure payment for all loads from the tract and that the timber was properly merchandized (e.g., is there sawtimber in a load of pulpwood?).

When assessing timber volume from a harvest, there are a few basic questions that need to be answered on how the cut timber is measured. What unit is the wood measured in (e.g., cords, MBF, tons, cubic feet)? If it is MBF, what scale is being used (there are many "log rules" and they vary). Is there a conversion between volumes? MBF is often converted into tons for payment purposes.

Other considerations include understanding the value of the particular tree species, as some timber species are worth more than others. Size of the trees is another important consideration, as average diameter increases on a tract, so should the price of the timber. Larger diameter logs have much greater board foot volumes and value; both size and quality contribute to this value. Even the length of the timber sale contract can impact timber volume. If the seller allows the buyer a couple of years to get all the timber off the tract, and logging occurs at the end of the

contract period, there would be two years of extra growth the seller never gets paid for if it were a lump sum sale.

Harvesting cost is a second major factor. Timber value is based on the value of wood delivered to a processing facility, minus harvesting costs and transportation costs. The company that buys a tract of timber incurs costs (overhead cost of personnel and vehicles, timber cruising, biding, legal work, and the cost of unsuccessful bids). These costs are deducted from a bid. The largest cost deducted from log values is the actual cost of harvesting the timber, which is influenced by many factors. The type of harvest has a huge impact (a partial cut is much more expensive than a clearcut). Timber size and species also affect the costs of harvesting. On a per unit of volume basis, large timber is less is less expensive to harvest than small timber. Hardwood species require more time to remove the limbs than do pines and are, therefore, more expensive to harvest.

Weather conditions directly influence harvesting costs. Wet weather probably increases harvesting costs more than any other single factor. Wet weather reduces skidder capacity and many landowners ban logging during wet weather to minimize soil damage. Sales restrictions will result in lower timber prices. As mills can only stockpile so much timber to carry them through wet periods, tracts that can be efficiently logged in wet weather often earn premium timber prices.

The physical terrain and soil type of a tract affect logging. Fragile soils and steep slopes require special care and extra effort from machine operators. If access is limited or challenging, it can add costs. Rights-of-way may need to be acquired and logging roads constructed. Any constraint on the logger adds costs (e.g., gas lines, power lines, and streams decrease productivity and increase hazard). Many states have special harvesting restrictions on streamside

areas that protect water quality. Any landowner-imposed restriction on logging is likely to increase costs (e.g., length of work day or work week, condition of logging roads, aesthetic barriers, or special treatment for game habitat).

Transportation cost is a third major factor. Costs of moving loggers to and from various timber tracts can vary greatly. The distance that equipment must be moved to begin logging a tract and the number of machines to be moved affects total harvesting costs. As the amount of wood to be moved from a tract increases, however, the influence of moving costs is greatly reduced (the cost per unit of production goes down).

Transportation from the tract to the mill is another significant cost. Factors that influence this cost are distance to the mill on public roads, condition of public roads and bridges, urban areas between the tract and mill, and distance and condition of woods roads. Gross truck weight laws can also be a factor.

Forest owners need to be aware that stumpage price is derived from delivery value minus the costs of purchasing, harvesting, and hauling timber from a tract Owners can control only a few of the factors, like contract restrictions. Certainly, fewer restrictions should produce better timber prices. However, restrictions impact post-harvest tract conditions. Forest owners have a tradeoff between higher timber prices and control of harvesting operations on their property. Higher timber prices may not compensate for increased site preparation and planting costs on the new forest stand from a poor harvesting job.

Timber Sale Fundamentals

A timber harvest is just one action from a forest management plan; it should be part of the owner's management strategy and goals. It has huge silvicultural implications, impacting today's forest stands and tomorrow's forest stands, and affecting the future productivity of the entire

forest. Unless the owner is well-versed in timber sale requirements, a professional forester's services will likely be well worth the investment. If the forest is well-managed, the owner will have a forest resource management plan and a supplemental timber harvest plan. For most forest owners, this is not a do-it-yourself project.

As a first step the property boundaries and timber sale boundaries need to be clearly marked. Next, it is important that the trees to be cut are clearly identified to avoid accidently cutting trees that are not meant to be cut, or trees on a neighbor's property. The contract should specify exactly which trees are to be cut and uncut in a partial sale. Adjacent neighbors should be contacted, as there will likely be traffic from loggers and it could avoid a misunderstanding. It may also be helpful if there are other people in the area knowing what is going on, perhaps helping the owner keep track of timber removed from the tract.

Second, the best timber price should be obtained and this means marketing the timber. This is a major reason a forester is recommended; they have the contacts and experience to best market timber. Many consider sealed bids to be a means to maximize timber price. Certainly, the better the marketing, the greater the number of bids, and that will produce the highest timber prices. Timber will be sold on a lump sum or per unit basis. Lump sum eliminates many timber security issues as there is less need to keep track of timber (unless a partial sale is involved, then someone must see that no "extra" timber is cut).

The owner needs to know what the timber is worth. Units of timber measurement tend to be confusing and many owners don't understand them (cord, MBF, tons, cubic feet). There are many log rules and that means there are many kinds of MBF's. Some timber species are worth much more than others. Average DBH of a tract will largely control price, but tree quality is another big factor. Again, this is not a do-it-yourself operation for most owners.

Third, a timber contract is a must. There are dozens of contract issues. These are addressed below.

Fourth, the owner needs to be certain a quality logging firm will be operating on the property. There are many competent professional loggers, but, as in any business, there are also those who are less competent. The owner would regret hiring one of the less competent. Best Management Practices (BMP's) could become an issue. BMP's are established practices that offer protection to your property and reduce soil erosion from harvesting operations. The forest owner is ultimately responsible for voluntary BMP compliance. The choice of logger has a huge impact on what the finished job looks like in terms of BMP compliance.

Fifth, someone needs to monitor the timber sale. Only by regular visits can the owner or forester be certain contract provisions are being met. A good logger will have to interpret the contract to fit the actual conditions on the ground. Sometimes the logger's interpretation may differ from the owner's interpretation. The logger may also suggest contract modifications that will increase profit.

Sixth, once the logging operation is complete, a final inspection should establish the tract has been left in the condition specified in the contract. Does logging slash meet requirements? Have all marked trees been harvested and are all unmarked trees uncut? Are any erosion control practices in place? Even for a tract left in good condition, the owner will have erosion and water pollution concerns; post-harvest land is more vulnerable to these problems. There are post-harvest BMP's that must be put into place. Regeneration is often part of the post-harvest planning.

Timber Contract Fundamentals

Most forest owners harvest timber. Donated timber needs to be harvested periodically. The experience can vary from pleasant to catastrophic and often the difference is due to a well-written timber sale or timber deed contract.

A clearly-written, legally-binding contract should be the basis of all timber transactions. A document that can be recorded at the courthouse is best. Ideally, the owner will seek the advice of three professionals; an accountant, lawyer, and forester. A timber sale is often a large financial transaction and ought to be treated as one would treat any other large financial transaction. Four basic issues need to be resolved by the contract: (1) the exact timber being sold, (2) the terms and prices, (3) restrictions on logging operations, and (4) property protection measures and BMPs. Below are some of the many questions to consider before proceeding with any timber sale contract.

- Who are the buyer and seller?
- Who actually owns the timber?
- Will the buyer and seller have agents or deal directly with each other?
- If the seller is an absentee landowner, who will represent him or her?
- Can the buyer assign rights?
- What is the length of the contract?
- What if the timber sale is incomplete at the termination date?
- Are extensions allowed and is there a cost? There would certainly be a cost to the seller due to delayed regeneration.
- Can the logging job be shut down during bad weather?

- Will the owner be notified when operation begins, is temporarily shut-down, and ends?
- What is the legal description of the location of the sale and exactly what is being sold? Exactly what is being sold needs to be clearly defined. It can be just as important to define what is not being sold. Besides a formal legal description, a tract location map should be included, with property lines and sale boundaries. If there is a problem precisely defining the sale boundary, the owner should insist that a well-defined boundary be established. Exact, precise definitions of the trees being sold are an absolute necessity.
- What tree species are included and excluded.
- What trees sizes are to be cut and how will it be measured (if tree size is defined by DBH there will be no precise way to tell if a cut tree actually met the requirements; maybe measurement should occur on the stump portion of the tree)?
- Will the cut trees be marked? Flagging should never be used for marking; it is temporary. If paint is used, the owner should be certain that the stumps are also marked and that there is no way additional trees can be marked later.
- Trees grow; if cut trees are defined by DBH or merchantability, which date is used to establish if they are included in the sale? The date of the contact or the date of harvest?
- What units of measure will be used?
- What is the timber price and payment schedule? The timber price per unit can be tricky and is why a forester should be involved. Lump sum or per unit sales will mean different types of payment schedules.

- Will there be a down payment?
- Will there be a performance bond or security payment? This can ensure contract provisions are satisfied and can be used to ensure soil, water, and other resources are protected. All owners would want to require adequate insurance is in place and should be certain the contract places liability for the logging operation on the buyer. This is crucial as harvesting operations are dangerous.
- Are state best management practices to be followed? A harvest map ought to be part of any timber harvest plan and needs to include tract and sale boundaries, location of landings, stream crossings, logging roads, and any environmentally sensitive areas like wetlands or special wildlife habitats.
- What conditions does the owner expect the landings, stream crossings, and logging roads to be left in? Where will the buyer have access to the property and will it be limited in any way (gates)? Some owners are sensitive about logging slash and debris; and contract specifications can address this issue. Each restriction increases logging cost.
- What if unmarked trees are cut or cutting occurs across a boundary? Penalties need to be explicit.
- What if timber is improperly merchandized (sawtimber included in a load of pulpwood on a per unit sale)? On a per unit sale, utilization standards are important. Both maximum stump height and top diameter need to be specified so that no usable wood is left in the woods.

- Fire is sometimes an issue. The buyer should be required to follow all fire laws. What if the seller suffers injury due to a fire caused by the logging operation? What if the timber is destroyed mid-harvest by fire or hurricane? Arbitration is often specified in the contract to handle disagreements.

Timber sales represent an opportunity to have improvements made to the property. Keep in mind the tract conditions at the end of a harvesting operation are the tract conditions at the beginning of the site preparation and regeneration operations. Perhaps the contract can include provisions to ensure the tract is left in shape to minimize the cost of regeneration. Gates could be added and roads lengthened. Maybe precommercial thinning could be accomplished on an adjacent stand while the equipment is nearby. Obviously, this would increase overall harvesting cost, but it might be the most cost-effective way to achieve these improvements.

Conclusion

Foundation managers can increasingly expect to obtain offers of donated forestland and timber properties. Often these assets come with "strings attached," like retaining the land in forest, expectations that the forestland will be retained in some sort of ownership on a perpetual basis, or limitations on timber harvesting. Forests and timber are complex investments and many financial managers are not well-versed in their management requirements. The forestry fundamentals presented in this bulletin should provide these managers the basic issues to address in terms of forestry basics, timber value, sales, and contracts. These represent the basics the manager needs to know prior to bringing a forestry professional into the discussion.

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