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THE EMERGENCE OF HBU IN TIMBERLAND INVESTMENTS: NEW OPPORTUNITIES, NEW STRATEGIES

Chung-Hong Fu, Ph.D., *Managing Director*

Economic Research and Analysis

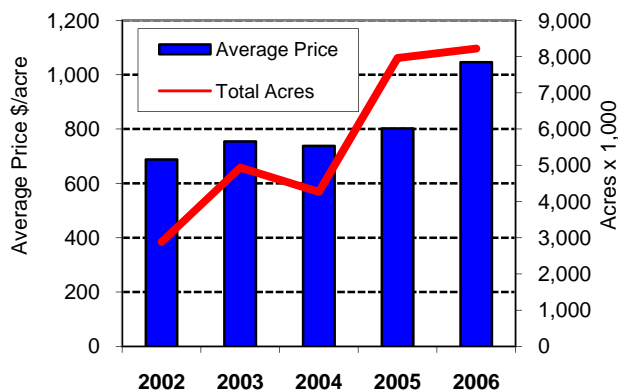
Chris Curth, *Managing Director*

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Introduction



Source: RISI Timberland Sales Database

Figure 1. North American timberland transactions: average price and total acres sold.

Recent years witnessed a unique occurrence within the investment grade North American timberland marketplace. In the context of declining timber prices and an impending major housing market downturn, timberland values continued to increase to record levels during the year. Sales prices averaged \$1,046 per acre in 2006, an increase of 52% over the 2002 average price of \$688 per acre achieved just five years earlier (Figure 1).

When considering the various factors that may be contributing to higher timberland prices, a number of explanations are available. Industry analysts have observed a strong influx of investor capital into the asset class, creating a demand for timberland that has outpaced supply. Others point to a low interest rate environment that has deflated discount rates and leverage costs, and thus raised asset values. An argument can be made that the growing familiarity of the asset class among investors has lowered risk premiums. Along a similar vein, as transaction volume has increased, the timberland marketplace has become more efficient, and liquidity premiums have declined.

While all of these arguments have merit, one additional leading factor that has captured attention among timberland investors is the growing recognition of higher and better use land (“HBU”) values. An investment property may be initially purchased as commercial timberland, but at final liquidation all or a portion of that land may be determined to have economic value higher than that of timber production. This higher economic value, if captured or successfully developed prior to disposition of the timberland asset, can enhance investment returns of a timberland portfolio.

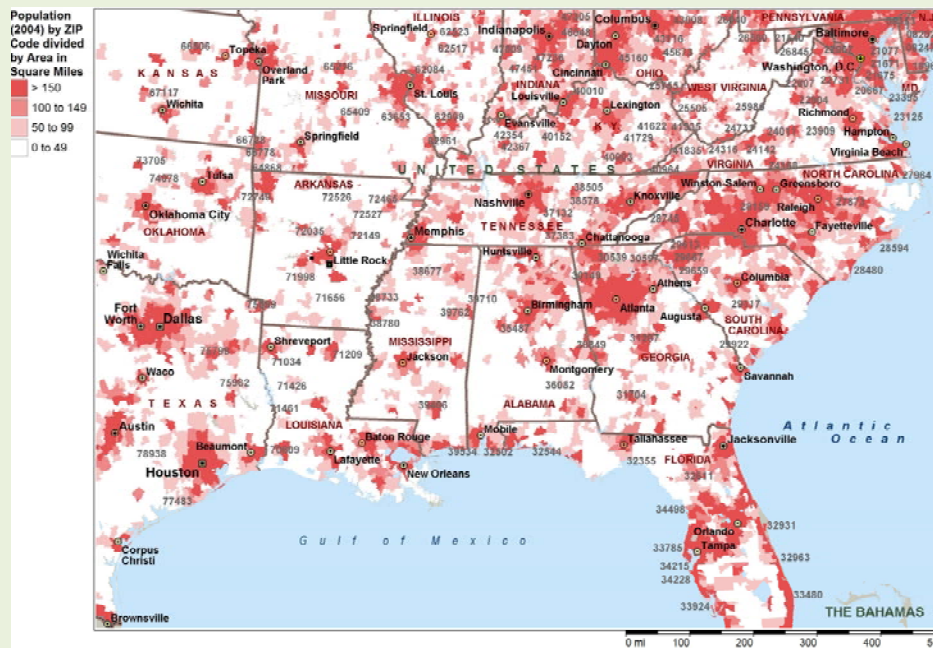
HBU represents the market value of an undeveloped piece of forested land exceeding what can be earned if that property is managed solely for timber production. The higher value may be derived from a diverse range of sources, including conservation and ecological value, as well as commercial or residential development value.

Economic development and population pressures in the United States provide a strong foundation for an increasing shift in land use patterns leading to greater



HBU values. Urban expansion is pushing prices of some rural land beyond what is profitable for timber production. This trend is expected to continue. The 2005 Resource Planning Act (RPA) Assessment Update from the USDA Forest Service estimates 30% growth in the US population by 2030. As a consequence of this anticipated growth, 26 million acres of timberland are expected to be lost to development in that time period.

Population Density of the Southeast in 2004.



Source: U.S. Census Bureau

Research indicates that when population density reaches approximately 50 per quarter mile, there is a 50:50 chance of practicing forestry. When population reaches 150 people per square mile, forestry approaches zero and other higher economic land uses supplant timber production (Wear et al., 1999). As the population continues to grow, more forestland is expected to be converted to other uses.

As a result of this evolving landscape, HBU has become, and will continue to be, an increasingly relevant investor consideration within the timberland asset class. The goal of this paper is to introduce the HBU concept and demonstrate how higher and better use considerations can be interwoven into an ownership and disposition strategy of a timberland portfolio lying in the path of progress.

This topic will be addressed in three primary areas. First, the theory behind how the marketplace develops and recognizes HBU will be examined. Second, the specific portfolio benefits of HBU will be explored. Finally, strategies and tactics that timberland investment managers (TIMOs) might develop to capture HBU and



maximize returns of a timberland investment will be addressed.

The Theory behind HBU Development

The forces behind timberland conversion into HBU are a complex combination of economic and demographic forces that evolve over time. However, despite its complexity, the process can be summarized into three main drivers:

1. Asset movement towards highest valued use
2. Varying abilities of landowners to capture value
3. Economic development's impact on valuations among landowners

Equation 1. Economic value of an asset.

$$V = \sum_{t=0}^{\infty} \frac{v_t^e}{(1+r)^t}$$

The current net value of an economic asset (V) is equal to the sum of all expected values to be gained by the owner during the possession of that asset (v_t^e), adjusted by a discount rate (r), which reduces the value as the time period (t) is extended. If that asset is sold, the net proceeds are included as well. Note that different owners would have different discount rates.

Driver 1: An Asset Moves to its Highest Valued Use

The value of timberland is the sum of the benefits the owner expects to receive in the foreseeable future, adjusted by the *value of time* (Equation 1). That *value of time* is also known as the *discount rate*. For pure industrial timberland, that value (V) is the discounted stream of net income from timber sales coming from the forested property.

What is sometimes overlooked is that to certain potential owners this timberland value may also incorporate non-cash attributes. The joy of hunting, bird watching or the simple pleasure of owning a home in the woods could potentially confer value to the landowner. If so, those values (v_i) will be factored into Equation 1. Regardless of which attributes are incorporated, all economic agents lead to a value – either explicitly or conceptually – for a forest property using Equation 1 to derive a maximum amount the buyer is willing to pay for the asset. Under a free market system, the timberland asset will sell to whoever is willing to pay the most for it.

Equation 2. Value of a produced good or service derived from a set of inputs.

$$v_t^k = \sum_{g=1}^n P_g^k \times Q_g^k(i_1, i_2, \dots, i_s)$$

Unit Value or Price

Production function

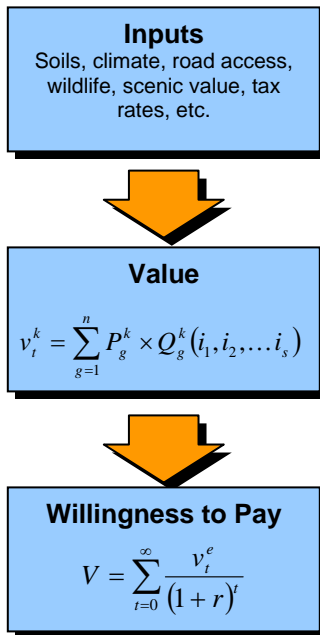
The total value (v) available to each type of owner (k) at any given time (t) depends on the sum of all the different products (g) that can be produced (quantity Q) from the inputs (i) the owner has and the unit price (P) the owner gives to all those products.

Driver 2: Different Owners have Different Abilities to Capture Value

HBU emerges from timberland because different types of landowners have differing capabilities (and goals) to generate value from forestland. For example, a forest products company may not create value from forestland in the same way as a residential developer or a conservation organization. There are a variety of products that can be derived from a set of inputs. This is known as a production function. However, the production function – which forms the basis of economic



Process of Determining a Value for a Timberland Property



Different Values by Different Users: An Example with Sand

Timberland is not unique to this process. There are many other types of economic assets that can produce very different values depending upon the user. Take for instance, the common commodity of sand. A state highway authority uses it to cover the public roads during icy weather. A glass maker uses it to create bottles and glasses. A chip maker refines it to create silicon wafers that will be made into computer microchips. We have three different users with three very different economic values for sand. The glass maker can outbid the state road authority for the sand. The chip maker can outbid the glass maker. From that perspective, timberland is no different than sand. Some timberland owners, depending on their abilities and goals, can out-compete other owners for the same resource under the right conditions.

Figure 2. Process of determining a value for a timberland property by a landowner or potential landowner



Driver 3: Economic Development Alters the Valuation among Landowners

Thus far, it has been observed from the first two drivers that the source of timberland value can be derived from a basket of goods and services. Those goods and services need to be produced and valued, but not all landowners have the same abilities or goals to produce all goods and services or understand the value of each.

However, the first two drivers by themselves would not create HBU from timberland. The catalyst is economic development and demographic expansion. Growth in a region in the form of jobs, population and household income, among other things, affects the production function (equation 2) of each owner type and thus affects how much different landowners will be willing to pay for the land (equation 1).

For clarification, rising population density by itself does not directly create HBU. It is a proxy for the myriad of changes that alters the land's potential value among different owner types.

$$v_t^k = \sum_{g=1}^n P_g^k \times Q_g^k(i_1, i_2, \dots, i_s)$$



Changes that accompany population growth effects inputs (i) and the prices of the forestland products (P).

<p>Timberland Investor Rising population lowers the value for the investor interested solely in timber values.</p> <ul style="list-style-type: none"> • Rise in property taxes • Reduction in the number of mills in a wood basket as the urban periphery encroaches • Rising restrictions on logging and other industrial forestry operations (e.g. prescribed burns, herbicide treatments) 	<p>Individual & Developer Rising population raises the value for the individual private landowner and developer.</p> <ul style="list-style-type: none"> • Increasing attention towards aesthetics • Growing need for wildlife, recreation, and hunting • Availability of utilities for water, sewer and electricity • Development of social services such as schools, day care, etc. • Increasing proximity to employment and retail services • Improved infrastructure such as roads
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For example, an increasing population lowers the value for the investor interested solely in timber values because of the rise in property taxes that accompanies area development activities. There is also an observed reduction in the number of mills within a wood basket as



“For the timberland investor, understanding the factors that generate HBU is instrumental in constructing an effective HBU disposition strategy for a timberland portfolio.”

the urban periphery encroaches. As population density increases, greater restrictions on logging and other industrial forestry operations negatively impact the value of timber productivity.

Concurrent with lower economic returns for the timberland investor, increasing population and job creation raises land values in many ways for the private landowner and the developer as land use urbanizes. The desirability for natural aesthetics grows. Wildlife habitat protection concerns rise, and recreational users seek protection from development encroachments. Demand for new subdivisions, schools, roadways, public services, parks, and employment centers increases. Changes in the area infrastructure, social services, and community dynamics affect economic values as well. Pressures for greater availability of utilities such as water, sewer and electricity will rise just as demand for new schools, day care and churches become more apparent. As proximity to employment and retail increases, value increases for the private landowners and developers.

HBU is the result of economic development and population growth that creates new values exceeding that which can be created from pure timber production. Those new values, however, are the domain of different classes of landowners and not that of the traditional forest products company or the timberland investor.

Application for Timberland Investors:

For the timberland investor, understanding the factors that generate HBU is instrumental in constructing an effective HBU disposition strategy for a timberland portfolio. How disposition packages are constructed, timing of sales, and how to shape the infrastructure and services in the region are all based on understanding the three drivers and their application.

Before detailing the strategies for capturing HBU, a discussion of the specific benefits HBU provides a portfolio of timberland investments is warranted.



Opportunities of HBU in Timberland Investments

“In one respect, capturing HBU is similar to growing plantation timber. Productivity is based on good planning and effort. A passive approach is neither good for timber production nor for extracting full HBU values from forestland.”

Recognizing and capturing HBU values in timberland confers a number of benefits to a timberland portfolio. The three leading benefits are:

1. Acquisition competitiveness
2. Enhanced returns
3. Diversification

Competitiveness in Acquiring Properties

Demand for investment grade timberland has continued to increase, creating a competitive market. An ability to identify incremental current and future HBU values from a timberland property allows an acquisition bidder to offer a more competitive purchase price without sacrificing target return. Likewise, a more refined perspective of a property's true HBU potential also reduces risk of overpaying for that potential.

Enhancing Return

In one respect, capturing HBU is similar to growing plantation timber. Productivity is based on good planning and effort. A passive approach is neither good for timber production nor for extracting full HBU values from forestland. Methodical cultivation and extraction of non-timber HBU values from rural land offers greater return potential than a passive or reactive approach.

Portfolio Diversification

Returns from HBU land values generally do not correlate closely with timber returns. The low correlation between HBU and timber offers opportunities for portfolio diversification as periods of poor timber markets may be countered by strong real estate values, and vice versa. By recognizing and introducing HBU-enhanced forest assets into a timberland portfolio, overall volatility may be reduced, offering the potential for higher risk-adjusted returns.

The diversification benefit is not only sector-wide, but regional as well. HBU is highly location specific, arguably even more so than timber, where HBU performance of one metropolitan area is often quite different from the HBU of another metropolitan area. Therefore, significant diversification benefits can be achieved by acquiring timberland properties across



different nuclei of urban growth, each with a unique HBU growth pattern.

It is important to note, however, that if improperly estimated and incorporated into the investment profile, HBU has the potential to add rather than reduce risk in a portfolio. Non-timber values from a timberland investment are usually harder to forecast and value than timber. The opportunity for miscalculation is therefore greater. Risk controls and sensitivity tests are essential tools to prevent excessive exposure of HBU, where the added risk of valuation errors may exceed the diversification benefits provided.

HBV Capture Strategies

There are two distinct strategies for capturing HBU values: passive and active. A passive or reactive approach assumes HBU values “naturally” emerge in the market and there is little that can be done to affect the realized property price at disposition. An active approach cultivates HBU opportunities. Proactive measures are taken to affect the value functions (equations 1 and 2) of potential HBU buyers. A proactive effort is made to recognize additional inefficiencies contained within rural land markets.

The following comments will focus on describing the primary active strategies deployed to extract greater HBU value from a timberland portfolio. This applies not only to investors who directly manage their timberland assets, but also investors who have hired a timberland investment manager (or TIMO) to administer their timberland holdings. For the latter, the investor should ascertain that the managers they hire offer HBU expertise and adopt an active approach to fully capture HBU values of their portfolio.

Goal of an Active HBU Strategy

Most HBU strategies try to influence the value equations of future buyers (equations 1 & 2) in three key dimensions:

1. **WHEN:** Understand the economic development pattern of the region, which will alter the valuations of different types of landowners. Timing is important.
2. **WHO:** Determine which land buyer to target and know the accompanying production function (equation 2).



3. **HOW:** Realize that there exists a cause-and-effect relationship in land development where previous actions will alter the future development course (and thus HBU values) of the region.

A well developed HBU strategy encompasses the WHEN, WHO, and HOW. While an HBU strategy for each timberland investment is unique, there are four major themes that are common to HBU-enhanced forest assets:

1. Begin with knowledge and network base of the regional land market
2. Perform property specific improvements
3. Influence market factors that affect land value
4. Stage property disposition temporally and geographically

Case Example: A Holding Near Little Rock

An investor client of Timberland Investment Resources, LLC (TIR) recently acquired approximately 16,000 acres of timberland from a major forest products company south of Little Rock, Arkansas. Located within 30 minutes of the Little Rock airport and bordered by two highways, the property was considered to contain exceptional HBU potential. An economic and demographic analysis highlighted the strong and vibrant healthcare industry in Little Rock that serves the state. The portfolio management team met and built relationships in Little Rock with (a) school districts, (b) the state economic development authority, (c) utility companies, (d) county zoning boards, and (e) major developers. These upfront initiatives will serve as a foundation on which to build a long-term HBU strategy for the property.

Begin with a Knowledge and Network Base

The foundation of any effective HBU strategy begins with a strong knowledge and network base. Begin with a proper land appraisal from appraisers dedicated to real estate and with working expertise in rural land markets. This should be followed by an evaluation of demographic and economic growth trends. Growth in a surrounding region may be more residential (such as a bedroom community serving an urban center), recreational (such as a golf resort) or commercial (such as a retail development or a new factory). How growth develops will shape HBU disposition strategies to take advantage of that growth.

A third area of knowledge is an assessment of the transaction activity within the local land market. Beyond price, it is valuable to determine who bought the property and what the plans are for the acquired property. Is it being held as an investment for the long-term, or is a retirement community being planned? An HBU disposition plan should complement the activity and plans of other landowners in the area.

This last point leads to another major component of an effective active HBU strategy: building a network. Establishing a presence in the marketplace is important. Where possible, identify the stakeholders in the market and reach out to them. This group includes not only



leading landowners, but also county planning boards for development, zoning boards, utility commissions and school district boards.

Strategy 2: Property Specific Improvements

An action plan for enhancing HBU values can have two goals: (a) affect the property directly; (b) affect the regional market. For the former, the strategy is focused on changes to the property which attract a higher value in the market than the timberland could provide in its current state. The goal is to move up the “value chain” through altering the inputs in the production function of equation 2 of the prospective buyer. In other words, make the property more attractive for alternative uses.

Case Example: The “Real Estate” Timber Cut

How land looks often affects its desirability among buyers. In one investor’s timberland portfolio that contains HBU, TIR has selectively employed a “real estate” cut as its final timber harvest rather than a traditional clear cut. A real estate cut leaves about 50 trees per acre. This can be combined with in-wood chipping, which removes much of the unsightly debris from a logging operation. As a result, leaving a clean grassy ground with light tree cover on a tract creates an aesthetically pleasing landscape designed to be attractive to buyers of 20 to 100 acres who desire a large wooded estate or a horse farm.

Property specific improvements include (a) providing good road access, (b) developing viewsapes that highlight unique areas such as scenic views to bluffs and rivers; (c) dressing up a recently harvested section to appear as grassy open space or a lightly wooded area. However, any and all improvements must be made in a manner that targets a specific type of landowner. Improper application of land improvements may not be cost effective and may even be detrimental to the value of the land, as some improvements are valued by some landowners, but not by others.

One important dimension that will affect the marketability of the land is the parcel size of the property at disposition. The size of the land being sold will help determine the target buyer. The region where the timberland investment is located will have a development pattern that is better suited for certain landowner types than others. Selling the right parcel size that recognizes the buyer profile will maximize value.

Further, a region’s ownership composition could change over time. As a result, the property improvement strategy for HBU will need to adapt to an evolving composition of land buyers as economic development progresses. For instance, initially merchandizing 500 acre sections to land speculators and high net worth individuals seeking hard assets may be the optimal strategy. A few years later, it may be more appropriate to sell large 200 acre recreational tracts to individuals seeking a horse farm or wooded home site. In the final phase of the investment, it may be best to sell 100 acre parcels to developers wanting to build high density



residential subdivisions. Further discussion of timing HBU disposition is presented in the fourth strategy.

Finally, if the HBU opportunity of a timberland investment is of exceptional potential and scale, then a land development Master Plan of the entire tract may be warranted. Working closely with community urban planners who can provide insight into where roads and utility lines are planned is of enormous importance in laying out interior roads and identifying development nodes within the boundaries of the designated property. In marketing either the whole tract or partial tracts within the larger property, the development of the Master Plan becomes a valuable marketing tool when presenting the investment opportunities afforded by the offered holding to specific target groups known to undertake such developments successfully. Depending on investor objectives, the Master Plan may lead into a joint venture or other cooperative arrangement with partners (such as developers) to maximize the development potential of a rural property.

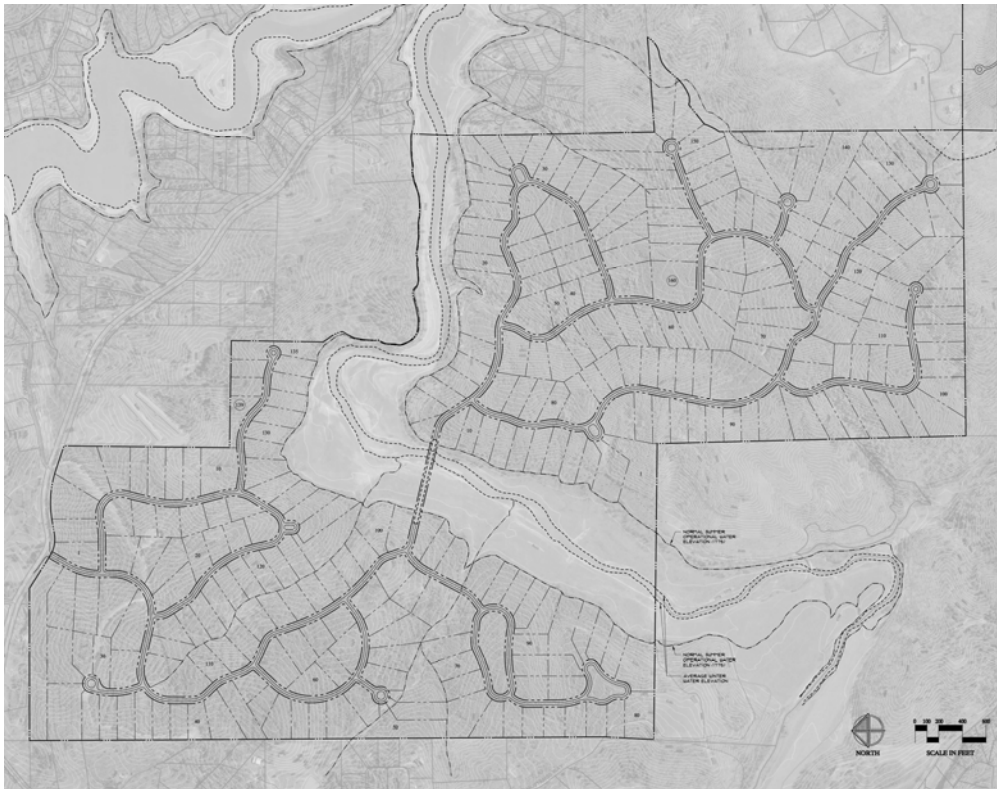


Figure 3. An actual master land development plan created by TIR real estate team for a tract from a client property in North Georgia, located in a corridor of growth between Atlanta, GA and Chattanooga, TN.

**Case Example: Bringing in Sewer Services**

An investor client of TIR has a portfolio of timberland holdings in Northwest Georgia, surrounding the Interstate 75 corridor running between Atlanta, GA and Chattanooga, TN. The TIR management team determined that new sewer services would enhance the real estate value for certain properties in the portfolio. Working with the local utility, several tracts of land were sold to the utility to allow them to provide sewer service and treatment to the area. The investor benefited from the development of higher values of its timberland holdings in two counties, as real estate developers are willing to pay more knowing with certainty it will be served with sewer.

Strategy 3: Affecting the Market

Improving a property to enhance HBU value is only one element of a more comprehensive strategy. A proactive HBU strategy for a timberland investment should not overlook the opportunity to add value by affecting the market environment. This can be achieved through adding to the value equation (equation 1) and by changing the inputs to the production function (equation 2).

The following examples offer different possibilities available to affect the regional land market, and thus bolster HBU potential to a timberland investment:

- For developing areas, petitioning for zoning changes from agricultural to residential can attract buyers concerned about entitlement. A major catalyst of HBU development spreading to other portfolio holdings occurs when buyers add ancillary services such as an anchor retail or commercial establishment to the rezoned property. If “negatives” such as trailer parks or poultry farms are nearby, lobbying the zoning board to prohibit such uses in the future may be warranted.
- Encouraging the addition of utility services and infrastructure into the region can greatly enhance access to a selected property or allow for homes to be built at higher densities. Sometimes, soils in the area are not well suited for septic tanks; in such as case, adding sewer services can allow for high density residential development. One method is to sell or donate part of the timberland portfolio to utilities and public works to ensure that roads, water, sewer and electrical distribution lines are constructed in close proximity to the property.
- Working to add social and economic “magnets” nearby such as schools, churches, parks, and greenways add to the quality-of-life in the area and encourage people to build residences and businesses in proximity to these quality of life additions. Many times timberland portfolios adjoin scenic and bucolic state parks. To ensure that development does not encroach on the pristine ambiance of the rustic setting, the timberland owner can work closely with the state to negotiate a win-win transaction where



selected tracts are absorbed into the public domain and the residual portfolio properties in proximity to the park maintain high appeal for recreational or residential land uses.

- Open communications with public officials involved in planning and development in the region is so important to achieving success in the long term ownership and disposition strategy of a proactive HBU timberland portfolio. Through diligent input and participation, the timberland owner can influence the long-term economic development path that can add HBU potential to portfolio properties.

Strategy 4: Staging Development Temporally and Spatially

The creation of an HBU ownership and disposition strategy is typically not a single event that occurs at the end of the investment. Rather, it is an extended process that spans the whole investment cycle. Consideration of disposition timing and property location is important. An effective HBU disposition plan recognizes the fact that HBU sold today will impact nearby HBU sold in the future. Recognizing this, an effective strategy stages HBU land sales across time and location to create synergies in building future value for the area. This exercise should be a paramount feature and objective of the portfolio management plan.

For example, a timberland holding is situated on a ridge adjacent to a state park and possesses excellent scenic views of the park and other portfolio properties in the valley below. It would be advisable to first sell the elevated tract to a conservation minded organization to protect the wilderness qualities of the peaks and ridges. The tracts located in the valley below may have greater appeal for residential development if it were known that the park and mountain ridges would never undergo conversion to mountain development. The timber might be reserved for future harvesting by the landowner but the final cutting would be sensitive and recognize that the pristine ridge lines should be protected from any haphazard clear cutting.

Timing and coordination is also valuable between real estate and timber operations. An HBU disposition program should synchronize with the timber harvest

Case Example: TN Cumberland Plateau

A TIR client acquired timberland in 2006 in east Tennessee, principally on the elevated Cumberland Plateau, some of which offers extraordinary views high on bluffs overlooking river basins and wooded valleys. The portfolio footprint is suited to benefit from the economic development and economic growth of the cities of Chattanooga and Knoxville. The HBU strategy is to begin with a strategic marketing effort designed to attract high quality investors to select high profile properties in the portfolio. An important aspect of this effort is to sell to investors and developers who will create destination resorts and communities. This will not only generate an initial round of capital gains for the portfolio, but also provide a foundation for rising values for the remaining holdings that neighbor the destination resorts and flagship communities.



“Increasing prices of U.S. timberland properties in recent years are in part due to the incorporation of perceived HBU values. In this emerging market, a proactive HBU strategy is increasingly important.”

plans – and if applicable, with the timber supply contract with a forest products company. It may not make economic sense, for instance, to invest in tree fertilization if the land will be sold as HBU soon thereafter, with little of the sunk cost being recouped in the sale price.

Summary and Conclusions

Not long ago, higher and better use land values above that of timber production were considered somewhat of an extra bonus in a timberland investment; HBU was something that was not generally counted upon or valued in acquisition, but was welcomed if it emerged during the disposition phase of the investment. Today, a different environment exists. Increasing prices of U.S. timberland properties in recent years are in part due to the incorporation of perceived HBU values. In this emerging market, a proactive HBU strategy is increasingly important.

Adapting to this new environment and creating an effective ownership and disposition strategy that seeks to isolate HBU opportunities within a timberland portfolio should begin at acquisition. Timberland property should be carefully assessed for HBU potential before purchase. After acquisition, an HBU improvement plan should be constructed that adds or expedites value creation. This includes segregating HBU lands into different disposition stages and designating different HBU types to different levels of improvements. The timing of the disposition and the type of improvement should coincide with the profile of the target landowner.

The intent of this paper has been to provide a road map for acquiring and managing timberland portfolios in an evolving economic climate where population growth and real estate development have the potential to materially alter the characteristics of a timberland portfolio over its designated ownership life. Proactive management of HBU opportunities can meaningfully improve portfolio performance from both a timber and real estate perspective, and consequentially, are an increasingly important consideration in the professional management of timberland.



Authors' Biographies

Chris Curth

Chris Curth serves as the Director of Real Estate at Timberland Investment Resources, LLC. Prior to joining TIR Chris was Senior Managing Director of Landauer Associates, Inc., an international real estate advisory firm. For nearly thirty years Chris directed all national disposition activities on behalf of the institutional clients of Landauer. Notably, he spearheaded the creation of Ownership Strategies and Disposition Programs relating to multiple property portfolios of land and commercial enterprises. Timberland investors have sought the expertise of Chris on timberland holdings possessing development opportunities due to their proximity to the growth corridors of regional metropolitan areas. Chris has directed various portfolio dispositions with estimated values exceeding \$1.0 billion. He has held the MAI designation, has written numerous articles on real estate disposition methods and techniques, and has often been sought by private and public property owners for pre-marketing strategic planning.

Chris is a graduate of Georgia State University. He is a licensed Real Estate Broker and his memberships have included The Counselors of Real Estate, Appraisal Institute, Atlanta Board of REALTORS, Georgia Association of REALTORS, and the National Association of REALTORS.

Chung-Hong Fu

Chung-Hong Fu is Director of Economic Research and Analysis at Timberland Investment Resources, LLC. Hong is a graduate of Northwestern University where he received a BS in Biology, Duke University where he received a Master of Environmental Management and Columbia University where he received a Master of Business Administration (MBA). In addition, Hong received a Ph.D. in Forest Economics from North Carolina State University

Hong began his career at Temple-Inland Forest Products Corporation where he served as a Resource Utilization Specialist and Business Analyst. In these roles, Hong provided economic and research analysis that supported executive decision making across a range of issues including asset securitization, acquisition and optimization. In addition, Hong served as Senior Investment Analyst for Global Forest Partners where he performed global timber acquisition analysis, created a variety of decision support models and directed currency risk management analysis.

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