

Are the Economics of a Sustainable Maine Forest Sustainable?

by Mike LeVert,
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Mike LeVert, Charles Colgan and Charles Lawton discuss the transformation of the economic environment of Maine's forests over the past two decades. Paper companies have sold most of their holdings; residential and conservation demand for land has increased; forestland prices have skyrocketed; and new classes of landowners have different strategies, objectives, and time horizons than the old industrial landowners. The authors believe that management of Maine's forests must now address changes in the economic environment with the same intensity as threats such as the spruce budworm were addressed if we are to keep Maine's forests as forests. 🐉

INTRODUCTION

Maine's North Woods are a state and natural treasure. The volume and quality of land, natural beauty, wildlife habitat, productive resources, and recreational opportunities are unmatched in the eastern United States. Over the past two decades, this unique area has experienced greater change than it has seen over the previous century. The industrial structure of the forestry business has changed; the ownership structure of forestland has changed; the residential and conservation demand for this land has increased; and the price of the land has risen to unprecedented levels. For those responsible for managing the forest, the question naturally arises, "Do these changes constitute a threat to the forest's long-term sustainability as a source of productive and recreational value?" To examine this question, a group of land- and mill-owners, government officials, and academic foresters and naturalists have formed the Keeping Maine's Forests as Forests Study Group. This article is based on a paper prepared to serve as the kick-off agenda for this group. It is intended to assemble the scattered, confusing, and often apparently contradictory data on Maine's forestland into a concise statement of both the baseline facts and the public policy issues they raise.¹

THE CHANGING ECONOMIC ENVIRONMENT OF MAINE'S FORESTS

In the past two decades Maine's North Woods have experienced rapid and unprecedented changes. The traditional structure of the relationship between the forest ownership and the forest products industry that characterized most of the 20th century has been dismantled and reorganized. What was once a forest used primarily to supply fiber to lumber, paper, and other manufacturing industries while providing a mixture of relatively low-impact recreational opportunities has become a forest of highly diverse ownership serving many different purposes. Industrial landowners have sold most of their timberland holdings, replaced by new classes of landowners—investment firms, logging contractors, developers, conservation groups, high net-worth individuals—with different ownership objectives, strategies, and time-commitments.

Rising demand for land has pushed up land prices at the same time that the forest products industry has faced loss of market share in a number of product lines and several older mills have closed or reduced capacity (Innovative Natural Resource Solutions 2005). This price increase coupled with current and future threats to pulp, paper, and lumber demand (e.g., paper mill closures, machine shut-downs, and the slumping housing market) indicates that some new owners are looking beyond wood products to justify their investment, at least in the near term. As the gap widens between income from harvesting activities and income from other uses such as development and conservation easements, keeping forests as forests (that is, as sources of a sustainable supply of wood fiber, permanent wildlife habitat, and a broad range of public recreational activities) becomes harder to justify financially. Returns primarily from supplying raw materials for forest products may no longer be enough for landowners to achieve their financial objectives.

The difficulty of realizing an adequate return on investment by managing land for forest products portends an era where keeping land forested becomes less economically feasible, particularly for lands with high amenity values such as those accessible to lake or river shore frontage or mountain lands with significant views. Increasing prices for these and other types of forestlands in the face of at best stable returns for stumpage suggests that land buyers are speculating on the rising value of the land. One of the results of this dynamic could be that landowners significantly increase the level of aggressive harvesting to cover the opportunity costs of rising land values.

Forestland sold for development is clearly likely to be an issue at the fringe of the forest where access is easy, close to amenities such as lakes and rivers, and

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towns are nearby to support development. How far this trend may spread into the interior of the Unorganized Territories is uncertain. Many locations north of Millinocket with waterfront or viewsheds are not accessible by deeded right of way. (Cabins and camps in this region are held by lease rather than deed.) Until infrastructure such as public roads and utility lines becomes available or landowners choose to shift to selling rather than leasing land, the development potential (and by extension, the conservation value) of these parts is reduced and timber production probably remains the highest and best use of that land for the foreseeable future.

Higher timberland prices, reflecting real and perceived growing demand for other uses, threaten sustainable forest management.

Maintaining timber production as an economically viable use of forestland matters because Maine's forests are a unique resource in the eastern United States, as the largest contiguous tract of forestland east of the Mississippi, and as the dominant player in the forest products markets in New England (Innovative Natural Resource Solutions 2005). By comparison with other forest areas around the world, Maine's forests are a model of sustainable management (Maine Forest Service 2005). While harvest levels have approximately doubled since the 1950s, standing timber volumes have increased by 87 percent, and natural regeneration is not a problem. This resource helps to maintain a wood products and recreational/tourism industry that contributes significantly to the overall Maine economy.

The questions are: what are those paying historically high prices for Maine forestland expecting from that land? And, more importantly, will they undertake actions on their land that will jeopardize its availability for traditional management, forest product harvesting, and public recreation in the future? The purpose of this paper is to outline ways to answer these questions and to highlight some of the implications they pose for public policy in Maine.

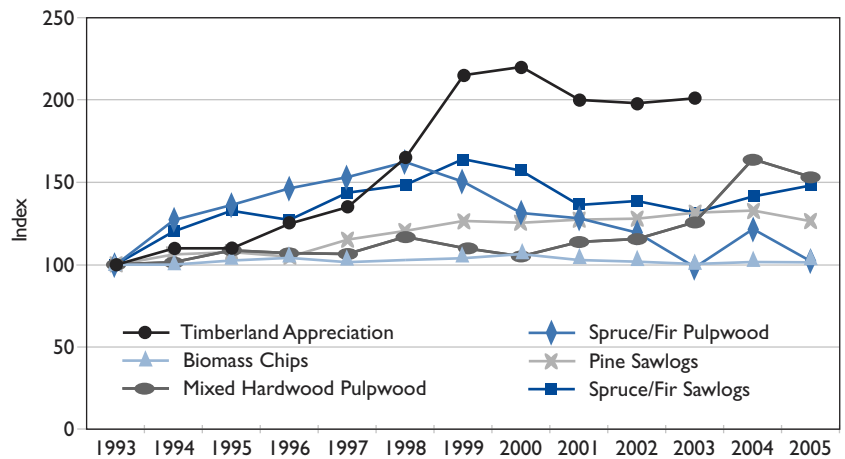
RECENT PATTERNS OF FORESTLAND PRICES IN MAINE

The prices landowners have recently been willing to pay for large tracts of forestland lead to the conclusion that many buyers are speculating on extracting income from the land from sources other than long-term, sustainable forest management. With timberland prices reflecting demand beyond that of raw material for forest products, forest landowners not directly involved in the forest products industry must consider options other than sustainable forest management to justify their investment. Non-industrial owners may hold land on the expectation of simple long-term price appreciation, but their options for assuring an adequate return also include development, sub-divisions, the sale of conservation easements, the sale of kingdom lots, and aggressive harvesting strategies. If development or unsustainable harvesting becomes the rule rather than the exception, what will Maine's forests—and communities dependent on those forests—look like in a decade or two?

Higher timberland prices, reflecting real and perceived growing demand for other uses, threaten sustainable forest management. As buyers expend more capital to purchase forestland, pressure increases to extract more of the non-speculation value from the land, that is, to remove the value of the standing timber. For example, highly leveraged buyers typically need to realize a substantial return in a very short time period. Harvesting above levels of sustainable yield becomes an attractive option when asset appreciation or the realization of that appreciation is based primarily on the bare land value's rising market price, independent of the trees. Development of high-amenity parcels such as waterfront is an example. Recent demand for conservation is another. Conservation organizations may choose to buy or protect land for strategic purposes, even after an aggressive harvest above sustainable yields has substantially reduced the timber and ecological value (Hagan et al. 2005).

Even if the opportunity cost of sustainable forest management decreases (i.e., demand for alternative, non-forestry uses declines or demand and/or price for other wood-based products increases), new buyers will be challenged to realize adequate returns from invest-

FIGURE 1: **Index of Returns from Maine Timber and Timberland, 1993–2005**



Sources: Maine Forest Service; Lutz 2003; author's calculations

ments in some types of sustainable harvesting practices. Maine Revenue Services reports that the average value of net new growth per acre per year over the past 50 years is \$13. Likewise, Maine's Tree Growth Tax Law calculates the value of Maine's forestland in the North Woods as ranging from \$86 to \$142 per acre based on its productivity as a timber-producing asset (northern Maine average of \$114/acre; statewide average of \$158/acre). As an illustration of the difficulties new forest landowners will face to keep their land as sustainably managed forests, in 2005 an independent appraiser valued approximately 7,700 acres in Maine's North Woods at greater than \$700 per acre (total value of \$5.5 million) (Maine Forest Service n.d.). Annual revenues from net growth were calculated at less than \$15 per acre per year, implying that even at favorable loan rates, using the land for sustainable-yield timber harvests (simply defined as cutting no more than annual growth) was not a viable financial strategy (Maine Forest Service n.d.). Such a parcel held for 50 years would have an internal rate of return of less than 0.2 percent if only the annual growth were harvested and sold at \$15 per acre (this rate of return assumes no income is realized by land appreciation or sale of the property).

Returns from timberland come from both operating income, as mentioned above, and from appreciation realized by a final sale. Land prices have generally increased steadily over history, and buyers are either hoping for a rapid increase in the value of land because of possible shifts to other uses or are simply awaiting continued land price appreciation. Maine forestland, which is generally much lower priced than other forestlands in the U.S., may also be seen as having greater appreciation potential even if no change of use is anticipated. Indeed, appreciation rates in Maine have accelerated above their long-term average since the mid-1990s.

It is also likely that the drivers of appreciation vary by region. In far northern regions where a lack of infrastructure limits development options, appreciation may primarily be driven by a tight supply of timberland (more buyers than sellers) and an improved ability of sophisticated investors to capture the full value

of the land compared to paper and lumber industrial owners. In regions closer to population centers and amenities, appreciation has more likely been driven by speculation on the potential for development.

The existence of a speculative component of timberland prices (an expectation that land will increase in value whatever is done with it) can be observed from evidence that land is being sold and marketed at prices well above its standing timber value. James W. Sewall Company reports that prices as a percentage of gross timber value are at an all time high for Maine. Recent transactions "reflect significant buyer expectations of non-timber products and revenues" (James W. Sewall Company 2005: 4). An index of Northeast timberland returns, based on operating income and land appraisals, indicate that timberlands appreciated in value by 12 percent and 17 percent in 2003 and 2004, respectively. Given modest increases in stumpage prices during these years (see Figure 1), these gains can be attributed primarily to appreciation of the bare land value, that is, the non-forestry value of the land (James W. Sewall Company 2007). Bill Ginn, of The Nature Conservancy and longtime observer of the North Woods, stresses the demand for recreational use of the forestland, "Increases in prices are being almost exclusively driven by recreational interest. Investors are not paying more for land because trees are worth

more, but because of increased interest for recreational use” (personal communication). Recreational use, in this context, includes buying forested tracts for personal purposes, e.g., a camp, retreat, second home.

Further evidence of speculation comes from observed sales. One appraiser reports observing an estimated 10 percent to 15 percent increase in the sale prices of large parcels over 50,000 acres since 2004. An Internet search for parcels currently on the market (December 2007) shows 11 parcels over 1,000 acres for sale in northern and western Maine, averaging \$700/acre. Well-known sales where timber may have been of secondary concern include the 25,000 acres sold by J.D. Irving, Limited, to Gardiner Land Company near Baxter State Park for \$1,000/acre (2003); 19,000 acres in Bowerbank sold by Hancock Timber Resource Group to Plum Creek Timber Company for \$800/acre (2004); 4,100 acres on Square Lake purchased by Lakeville Shores (a.k.a. Haynes) from William Moscovic for \$912/acre (2002); John Malone’s purchase of 7,500 acres near Spencer Lake from Plum Creek Timber Company for \$1,000/acre; Roxanne Quimby’s purchase of 24,000 acres from J.D. Irving, Limited, for \$500/acre (2003). (These sales are primarily on the edge of the North Woods and are not representative of land values in far northern sections of the Unorganized Territories without infrastructure.)

Researchers in Georgia suggest \$800/acre as a regional threshold for impending land use conversion (Wear and Newman 2004). Maine’s threshold will be different, but the recent rate of appreciation in land prices begs the question: At what price does forest management in the North Woods no longer make sense economically?

WHAT LIES BEHIND CHANGES IN FOREST OWNERSHIP?

Increasing opportunities for purchasing land in the North Woods were precipitated by the widespread divestiture of timberland by vertically integrated forest products firms (that is, firms that own forestland and used the output from the land as input to paper or lumber mills, hereafter referred to as industrial firms). The abandonment of vertical integration as a business

strategy by traditional industrial firms, particularly the pulp and paper companies, has led to the decoupling of timberland assets from production facilities and the sale of millions of acres of former industrial owned land.

This divestiture was accompanied by globalization of the forest products industry, with the pulp and paper, lumber, and secondary wood product markets losing market share to lower cost competitors from Latin America and Asia since the mid-1990s (Innovative Natural Resource Solutions 2005). Pressure to improve financial efficiencies led to consolidation, specialization, and a reorganization of the U.S. forest products industry. Widespread divestiture of industrial timberland began in the late 1980s, partly to pay down debt incurred from consolidation of firms, partly to provide capital to invest in specialized products and markets, and partly to provide immediate returns to shareholders (Binkley et al. 2005; Hagan et al. 2005). The sale of 2.3 million acres of former Great Northern Paper land by Bowater, Inc., to 15 different owners in the early 1990s served as the seminal event leading to the end of forest products industry’s dominant ownership of Maine’s forestland (although International Paper had effectively separated its land and mill operations as separate profit centers within the company in the 1970s).

This reorganization of the forest products industry has been accompanied by growing demand from other sources for forestland in the North Woods, facilitated by two major trends. First, the rise of investment firms such as timber investment management organizations (TIMOs) and real estate investment trusts (REITs) provided a cash-rich supply of timberland buyers. Investors are attracted to timberland because of high historical risk-adjusted returns, low risk relative to other types of investments, and low correlation with inflation and other investments (Binkley et al. 2006; Lutz 2006). Further, provisions of the Internal Revenue Code made timberland attractive as an investment vehicle for these types of organizations, particularly compared with traditional corporations. Such ownerships, while often focused on management and income from timber harvesting, have very different investment horizons than the vertically integrated forest products landowner. Where the vertically integrated company owned land to feed mill investments that were expected

to last 50 years or more, the new owners expect to own land for perhaps 10 to 15 years, capturing as much value as possible in that period of time and then turning the land over to a new owner, at, it is hoped, an appreciated price.

At the same time, a substantial increase in demand from other users of forestland has occurred. The most visible has been demand for recreational properties, which has increased dramatically and has shifted from traditional camps to second homes, including in some cases, luxury second homes. In the Unorganized Territories, the population has grown by five percent each decade from 1970 to 2000, with an accelerated rate of growth since 2000. The Western Mountain and Moosehead regions of the Unorganized Territories have experienced the bulk of this growth, 17 percent and eight percent, respectively. Growth in the number of houses has outpaced population growth, rising by 16 percent since 1990 (Planning Decisions 2006). Seasonal homes increased by 18 percent in the 1990s (White 2006), with net land accounts in the Unorganized Territories increasing 31 percent from 1985 to 2005 (Planning Decisions 2006). (A net land account is a parcel of land or two or more contiguous parcels of land owned by the same individual or entity.) Parcelization and the sale of “kingdom lots” are two manifestations of increased demand for properties used for personal recreational purposes. Maine forestland prices may be much higher than historical norms or the underlying value of the standing timber would suggest, but their sheer abundance makes them appear very cheap relative to almost any other privately owned forested region in North America.

Another new use is conservation, the purchase of large tracts of land to prevent development. Eleven conservation easements of 10,000 acres or more were established between 2000 and 2005 (OPLA 2006).

Taken together, the rise of timberland investors and increased demand from other users has provided an outlet for the divestiture of industrial timberland. The results have been dramatic. In the 15 years from 1990 to 2005, the share of ownership by industry fell from 60 percent to 15 percent, with one firm, J.D. Irving, Limited, a family-owned Canadian company, owning 1.2 of the 1.8 million acres of remaining industrial land. Investment firms, including TIMOs

and REITs, increased their share of forestland ownership more than tenfold to 4.7 million acres; logging contractors increased their ownership more than fivefold to more than 500,000 acres; non-profit conservation groups increased their ownership twelvefold to more than 350,000 acres; and “kingdom buyers,” individuals with high net worth buying land primarily for private recreation, have accumulated well over 100,000 acres (Hagan et al. 2005). (The preceding statistics on landownership changes refer to transactions and parcels greater than 5,000 acres in size.)

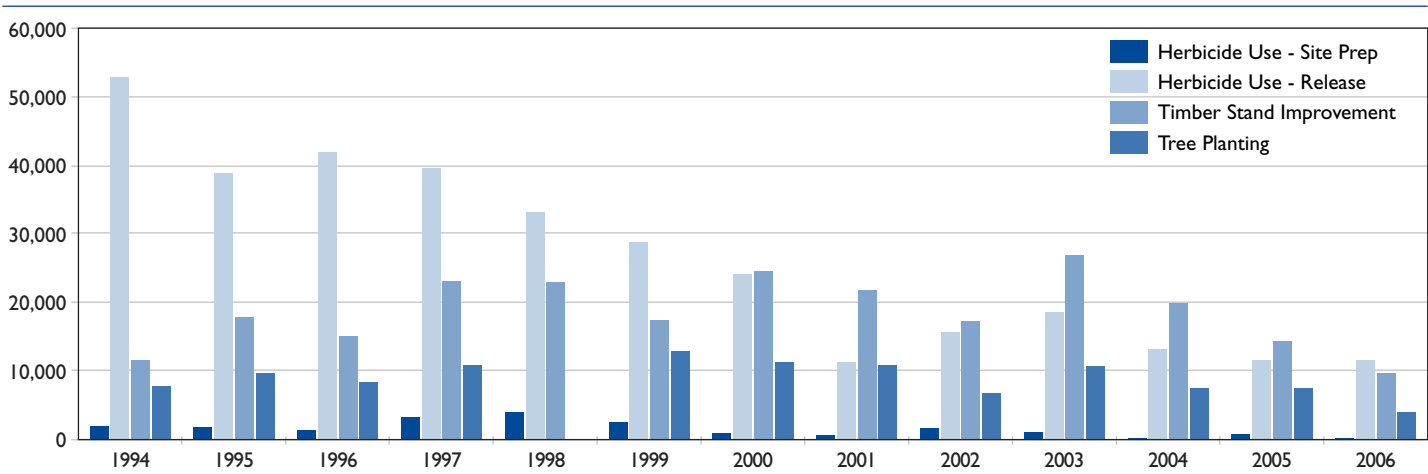
The abandonment of vertical integration as a business strategy by traditional industrial firms, particularly the pulp and paper companies, has led to the decoupling of timberland assets from production facilities and the sale of millions of acres of former industrial owned land.

IMPLICATIONS OF THE CHANGES

The effect of these changes has been a paradigm shift. Whereas vertically integrated forest products companies owned land almost solely to provide a steady supply of raw material to their mills, *non-industrial owners view forest products as only one of a myriad of choices to monetize their asset*. Competing uses and rising land values have increased the opportunity cost of holding land solely to grow and sell timber at rates consistent with the principle of sustained yield, making intensive harvesting, land use conversion, and further parcelization more likely events.

Many new timberland owners also hold different views towards intensive silviculture and forestry research than their industrial predecessors (Clutter et al. 2005; Hagan et al. 2005). In a survey of Maine

FIGURE 2: Investments in Silviculture in Maine, 1994–2006



Source: Department of Conservation, Maine Forest Service, Silvicultural Activities Reports, 1994–2006

landowners, Hagan et al. (2005) find financial investors are significantly less likely to engage in intensive management. Clutter et al. (2005), in interviews with senior forestland managers, notes that TIMO managers view silviculture as a commodity. The decision to apply silviculture treatments boils down to “What will the market pay for this treatment if applied?” Investments in silviculture and/or research and development only make sense when one can “cut the value out with a saw” (Clutter et al. 2005).

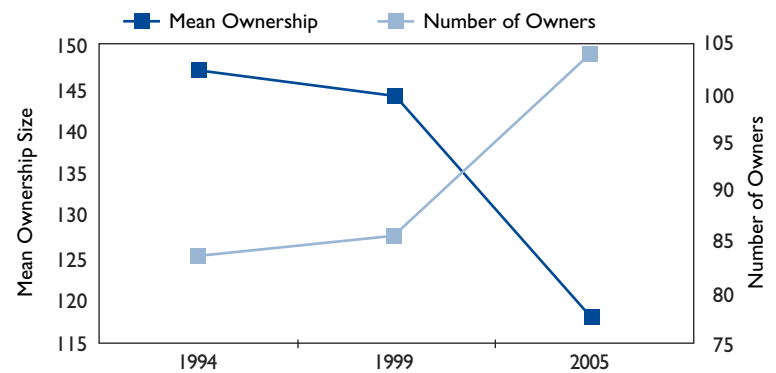
The Maine Forest Service reports a 60 percent reduction in investment in intensive forest management activities such as planting, pre-commercial thinning, and competition control in less than 15 years. In 1994, approximately 70,000 acres were treated by these techniques. By 2004, that number had declined to less than 30,000 (Figure 2). Virtually all the treated acres were on the remaining industry-owned lands (Don Mansius, Maine Forest Service, personal communication). The reasons for this decline are complex. Changing ownership objectives provide one reason, but the level of investment in silviculture such as pre-commercial thinning and herbicide application for competing species control has also been influenced by the changing characteristics of the Maine forest in the wake of the spruce-budworm outbreak of the 1970s and 1980s. However, it is clear that owners with greatly shorter time horizons for ownership will be unlikely to undertake expensive silviculture invest-

ments whose return will not be fully realized for some decades after they expect to hold their land, unless they have reasonable assurance that future purchasers of the their land will pay them back for their investments. Future buyers may indeed do so, much as a future buyer of a house may repay the owner for the investment in a new roof. But the owner still takes a risk that the market conditions at the time of sale will encourage the buyer to pay for the roof.

Likewise, there has been concern that non-industrial owners may invest less in research and development than their industrial counterparts. However, the University of Maine’s Cooperative Forest Research Unit (CFRU) may be one of the reasons investments in R&D have remained high in Maine and continue to make economic sense. The CFRU provides an opportunity for landowners to voluntarily contribute to research designed to improve forest management strategies and is one of the longest running and largest research cooperatives in the nation. Essentially it centralizes research and development dollars and provides information to landowners to further sustainable forest management practices. Member organizations contributed \$583,000 for R&D during 2005–2006.

The multitude of owners and their heterogeneous objectives matters a great deal in shaping a coherent sustainability strategy for Maine’s forests. In Maine’s North Woods from 1994 to 2005, the number of

FIGURE 3: Number of Owners and Mean Ownership Size, > 5000 acres, 1994–2005



Source: Hagan et al. 2005

owners with 5,000 acres or more increased 30 percent, while the mean parcel size decreased 20 percent (see Figure 3, reproduced from Hagan et al. 2005). Southern New England offers an example of the problems of a fractionated landownership pattern, which has contributed to the loss of the forest products industry and wildlife habitat diversity in that area. Because, in general, the owners of small forested parcels do not actually manage them for timber (Butler and Leatherberry 2004), these areas have become largely monotypes of middle-aged stands of hardwoods and what harvesting does take place is often high-grading.

Fragmented ownership may also make a large difference in the ability to realize other values from Maine's forests. Though Maine's forests have been distinguished by the highest rate of private ownership in the U.S., access to these forestlands for recreation purposes has generally been quite open and low cost for the general public. New owners may or may not view public recreational access the same way. Owners more focused on private recreation or preservation may be incompatible with traditional public access. Recent statewide surveys to landowners indicate a substantial attitude shift on the part of landowners toward public access. Surveys of members of the Small Woodland Owners of Maine (SWOAM) show a substantial increase in number of properties restricted to public access, from 14.9 percent in 1991 to 39.4 percent in 2005 (Acheson 2006: 25). The National Woodland Owners Survey estimates 18,000 family owners posted their land in 2006, a 300 percent increase from 6,000 owners in 2003 (Butler 2008). These trends are mostly indicative of changes in southern and central Maine, and surveys by the Maine Forest Products Council of landowners with more than 50,000 acres show little or no change in access practices. However, as northern woodland areas become more similar to southern areas through parcelization and the development of kingdom lots, and as landowners feel more pressure to find new ways to monetize their woodlands, Maine's long-standing tradition of low-cost and widely available public access to private land may be threatened. (See Acheson [2006] for a detailed discussion of public access to privately owned land in Maine.)

Clearly high-amenity land will be under increasing pressure for conversion to developed uses, particularly

in areas such as Rangeley and Moosehead, where road access and local communities provide the regional infrastructure that can support development. But the extent to which this type of demand extends beyond accessible high-amenity lands is uncertain. While most of the North Woods now lies within a mile or so of decent private roads (Maine Forest Service 2005), much is still remote from supporting infrastructure or services. Unless and until this changes and LURC endorses investments in public roads and utilities, the development potential of much of the interior of the Unorganized Territories remains limited.

At the same time, demand for wood as input to manufactured products is likely to grow despite recent problems in the lumber and pulp and paper industries. Exchange rates now favor exports of Maine forest products, which have traditionally been Maine's largest export by volume and value. The interest in using wood chips and pellets to replace oil has increased dramatically. On the horizon are potential technology developments such as cellulosic ethanol and bioplastics, which could greatly increase the demand for wood as a raw material. New timberland buyers may also be considering potential timber shortages with increased demand from developing countries such as China. Such developments probably do not explain the recent run-up in forestland prices, but do suggest there are new industrial uses for wood products that could create additional demand for forestland in the future.

What is clear about the recent changes in the structure of the forest industry, of forestland ownership,

and of the prices of forestland is that Maine's forest is a much more economically complex and dynamic place than it was 20 years ago. Determining appropriate forest management policies to assist forest landowners in keeping forests as forests while realizing a reasonable financial return has become correspondingly complex. The growing demand for forestland for non-harvesting uses and differences across large portions of forestland caused by fragmented ownerships make for particularly difficult challenges.

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THE CHALLENGE AHEAD

In many ways, the biological and ecological environment of Maine's forestlands has stayed stable or even improved in the years since the last spruce budworm cycle ravaged the forests. But the economic environment has changed dramatically in ways that call into question how much of Maine forests can be retained as lands actively managed for timber production that continue to improve in condition. The management of Maine's forests must now address the changes in the economic environment with the same energy and intensity with which threats such as the budworm were addressed.

While the general nature of the problems can be identified, much remains unclear. Developing a policy for forest management that keeps Maine's forests as forests and ensures sustainable management for the multiple values that arise from the Maine woods requires much clearer answers to several questions that

could not be answered here. We identify several key questions that arise from our brief assessment of recent economic trends and challenge the community of public, private, and non-profit organizations with responsibility for Maine's forests to find appropriate answers:

1. How can land transactions and prices be better monitored to create data for analysis that is spatially and temporally consistent? Much of the evidence for the changing economic environment is comprised of anecdotal evidence from occasional transactions. Much of it is also confined to the edges of the North Woods, where the majority of recent transactions have taken place. This makes extrapolations to the interior of the Unorganized Territories challenging. Public systems for recording land sales and prices are currently not capable of producing data that would allow detailed analysis over time of what is happening in the markets for Maine forestlands. Can these systems be improved in a timely and cost-effective manner?
2. How are differences in the economic environment manifesting themselves in different parts of the Maine woods? Do rising land prices in interior parts of the Unorganized Territories suggest different expectations than along the fringes? Does a lack of public roads or utilities in far northern Maine effectively limit development there and confine it to places like Moosehead and Rangeley? Or will this leading edge eventually be pushed northward?
3. What are the expectations of the owners of Maine's woods about the future demand for forestland, timber, and forest products? How, if at all, are owners factoring possible changes such as the rising demand for high-amenity retirement and recreation lands, for possible new commodity forest products like energy in the form of chips, pellets, or cellulosic ethanol, or for using forestlands in carbon sequestration strategies to deal with climate change? Is everyone just focused on the next

five to 15 years? Will current turbulence in capital and real estate markets affect views about the long term appreciation trends in forestland? If so, how, and with what implications for the market for Maine forestland?

4. What does the future hold for investments in silviculture and research and development? What level of investment makes sense economically to the new owners of Maine's timberland? Is this level enough to ensure a sustainable forest and viable forest products industry?
5. What is and should be the role of conservation strategies in the new economic environment? Given strained state and federal budgets, how can the amount of money needed to buy conservation easements be matched with the demands? How can conservation strategies be matched with harvesting strategies to better support long-term sustainability of the forest as a whole?
6. What is the public's role in the new economic environment? Maine cares a great deal about its forests and has made significant efforts to assure their health and sustain a diversity of uses. State government has some tools at its disposal, such as harvesting regulation, its own land conservation activities, taxes, and planning and zoning. How can these tools be best deployed in the new environment? What new approaches could be taken to meet landowners' objectives while ensuring public values for the future (timber supply, wildlife habitat, clean water, public access, etc.)?

These are admittedly complex and difficult questions, most without definitive answers. However, the future of the largest forest in the eastern United States, the Maine North Woods, hinges on our understanding of at least the range of plausible answers to these questions. 🐾



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Please turn the page for article endnotes and references.

ENDNOTE

- I. An initial version of the paper was presented to the first meeting of the Keeping Maine's Forests as Forests Study Group held on February 15, 2008, at the University of Maine in Orono. This is a slightly revised version of that paper, benefiting from the comments of the members of the group who attended that meeting.

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