September 9, 2010 Via: Email

Thomas Burack, Chairman
Site Evaluation Committee
New Hampshire Department of Environmental Services
29 Hazen Drive
Concord, NH 03302

Re: SEC Docket# 2009-02

Dear Chairman Burack,

I would like to thank you for the opportunity to testify before the Committee on August 27th. In my testimony I referenced two documents, a wood supply study commissioned in 2005 by the New Hampshire Timberland Owners Association (NHTOA) and the Society for the Protection of New Hampshire's Forests (SPNHF) and a United States Forest Service study regarding timberland ownership. These documents will be helpful as the committee deliberates over the question of wood supply and wood "sustainability".

<u>Wood Supply</u>
The ability to procure wood is complicated. There are many factors impacting the availability of wood for any particular wood-consuming market or facility. The NHTOA can say with confidence that from a biological stand point there is adequate wood in New Hampshire to power Laidlaw's proposed power plant. This is based on the 2005 wood supply study the NHTOA jointly commissioned with SPNHF (attached). This study uses a complex timber growth model with inputs from the United States Forest Service Forest Inventory Analysis (FIA) and the New Hampshire Department of Revenue report-of-cut (timber tax) data. And, in developing this model we assumed the permanent annual loss of 8,000 acres of timberland to development. Also worth mentioning is that since this study was commissioned, several significant things have occurred that would impact the model's projections, specifically the permanent closure of the Berlin pulp mill and the economic recession's impact on land development.

What this model does not consider are all the other factors (business and social) impacting wood availability such as, logging capacity, health of the saw log market, diesel fuel pricing, landowner attitudes toward harvesting and the health of regional pulp markets. Combined, all these factors influence what a wood-consuming facility will need to pay to attract wood and from what distance the wood will need to come from.

Wood Sustainability

Forest sustainability can be subjective. This subject gets even more complicated when looking across a region with multiple landowners with differing management objectives. Furthermore, any proposed sustainability standard should be weighed against the cost of implementing it and an assessment of whether it would actually benefit the state's forest resource. In most instances mandating wood sustainability standards that go beyond current forestry regulations and adherence to Best Management Practices will be difficult to enforce, costly to administer and in the end not ensure forest sustainability. New Hampshire has an excellent track record of voluntary compliance with Best Management Practices and a good regulatory framework and enforcement infrastructure in-place.

Furthermore, the assertion that the operation of a biomass facility in Berlin will result in widespread clearing of land to produce biomass fuel is inaccurate. Based on the New Hampshire Department of Revenue Administration's Current Use tax records 89.63 percent of Coos County is either enrolled in Current Use, under a discretionary easement or owned by a governmental entity. The Current Use acreage is owned by 3,135 individuals, each with different goals and objectives. Although any of these landowners has the right to clear their property for biomass production history has revealed this will not occur. In fact, most landowner surveys reveal that economic return is not a landowner's primary purpose for owning timberland. One of the most recent and comprehensive reports was done by Brett Butler and published by the U.S. Forest Service in June 2008 entitled, *Family Forest Owners of the United States, 2006*. This report summarizes results from the U.S. Forest Service's National Woodland Owner Survey. This study concluded there are many factors motivating forest ownership with the primary motivators listed in Figure 11 on Page 16. This chart effectively illustrates that the principle reason landowners own timberland is for aesthetic purposes (Scenic/beauty) where timber production ranked ninth on the list of reasons for owning land with just of 10 percent of the respondents listing it as either important or very important.

A copy of the full report can be viewed at,

http://www.nrs.fs.fed.us/pubs/gtr/gtr_nrs27.pdf

Again, I want to thank you for the opportunity to provide comments in this proceeding and please contact us if you have any questions.

Sincerely,

Jasen A. Stock
Executive Director

CC: Michael Iacopino

Modeling Project Summary Report
for NHTOA and SPNHF

by

Todd Caldwell, L.E. Caldwell Company

Introduction

The goal of this paper is to capture and convey primary concepts of the NHTOA and SPNHF wood supply model in a way that allows an interested party to gain enough understanding to think meaningfully about its output and ask equally meaningful questions. As well as a summary, for some readers it will hopefully be some sort of a launching pad. More detailed documents describing both the ATLAS software (the computer files that actually make the model run) and the formulation (what is behind the input data) are listed as footnotes to this document.[1] Those documents, in turn, have robust bibliographies that would enable more detailed research. The much appreciated funding for this work was provided by Farm Credit and its AgEnhancement Program.

How the Model Works and What can be Adjusted

The New Hampshire Timberland Owners Association (NHTOA) and the Society for the Protection of New Hampshire Forests (SPNHF) recently sponsored the reformulation of a wood supply model built in 2001 by forestry consultants L.E. Caldwell and R.J. Turner. The original wood supply modeling effort was sponsored by the Northeastern State Forester's Association (NEFA), with support of the USDA Forest Service (USFS). The study area was the states of New York, Vermont, New Hampshire, and Maine. That effort used the ATLAS (Aggregated Timberland Assessment System) computer program, a piece of software that requires input files for starting timber inventory, periodic harvest requests, growth & yield inputs, as well as coarsely defined management activities. The software is generally used to project regional timber inventories mandated by federal law (Resource Protection Act of 1974). These regional inventory projections become the estimates of the nation's future wood supply. The program was developed at the University of Washington by John Mills and Jonah Kincaid. The reformulation sponsored by NHTOA and SPNHF also used the ATLAS software, but changed the study area to include New Hampshire timberland and a broader timbershed area including northern Massachusetts, eastern Vermont, and western Maine. The New Hampshire output is described later in this report, while output for the adjacent regions accompanied an earlier submission.

The model functions by reading data from 3 input files which specify the inventory volume per acre, number of acres, growth rates, harvest levels and other options. Though the "program" is actually a series of executable files that run concurrently, they act on the data quite similarly to a big spreadsheet. In fact, it would be possible (though very time consuming) to duplicate ATLAS with an Excel spreadsheet. My point here is that ATLAS is deterministic. It does not "solve" any problems or have any random events built into it, it merely computes outputs based on the specified initial condition of the forest along with the growth, harvest, and management parameters it is fed. These computed outputs are simulations of future standing timber inventories, and the associated bookkeeping of timberland acres, growth, and harvest.

Input items that might typically be considered for adjustment logically fall in one of two groups. First and most commonly changed are some of the parameters just mentioned. These would include numbers specifying periodic area gain or loss of timberland, periodic harvest levels, yield curves reflecting growth on existing inventory volume, and a few other values that are less impacting to the ATLAS output. The second type of change or adjustment would be in the structure of the input information itself. This would be related to how timberland area is stratified (broken into groups) or what types of management are allowed to occur on the different strata. An example of a parameter type of adjustment would be an initial timberland area of 10 million acres losing timberland at the rate of 300,000 acres per period. This could be done by entering values for periodic acreage that are commensurately less than the initial acreage read by the ATLAS program upon startup. This is what we did in the NHTOA and SPNHF projections. An illustration of a structural type of adjustment could be not allowing the model to simulate any regeneration harvests (clearcutting for example). Most ATLAS formulations have a mixture of final harvesting and partial harvesting to simulate the real world where different removal intensities occur on different forest types or ownerships. We might simulate a ban on clearcutting or other rapid removal, even-aged treatment styles by removing all acres from the final harvest management units and putting them in partial harvest management units. Changing this mixture is an example of a structural adjustment.

Understanding Model Growth, Harvest, and Mortality

The model output describes the current and projected forest inventory volumes of merchantable wood in live trees at 10-year intervals over the planning horizon (in our case 50 years). By merchantable wood, we mean to imply 2 things. First, we mean portions of live trees that are reasonably sound and exclude rotten or defective sections. Second, we mean the portion of the bole (main stem) of trees >= 5" diameter at breast height (DBH) from a 1' stump height to a 4" top diameter. This excludes limbs, foliage, bark, and tops.

Understanding this output can be confusing. Large numbers are hard to scale mentally and most people don't think about wood volumes or acres at state or regional levels which require thinking in terms of hundreds of thousands, millions, and even billions of units. Moreover, the bookkeeping of forest change, as with most disciplines, has its own phraseology that can also be unclear. To help clarify how to think about changes in wood volumes, we've described the components of forest change below. These values are most often thought of in annual or periodic terms.

Accretion = The addition of new merchantable wood on trees of merchantable size.

Ingrowth = The addition of new merchantable wood from trees that have just attained merchantable size.

Gross Growth = Accretion + Ingrowth

Mortality = The loss of merchantable volume from tree deaths.

Net Growth = Gross Growth – Mortality

Removals = The loss of merchantable volume from the harvesting/cutting trees. Sometimes the loss of merchantable volume due to trees no longer being on timberland (land use change) is also counted.

Net Change = Net growth – Removals

Net change is the bottom line. It is the annual or periodic amount that the forest inventory volume has gone up or down. This part is simple. If net growth (from hereafter "growth") is more than you cut, net change is a positive number, the forest gains volume overall for the given time period. If you cut more than you grow, net change is a negative number, the forest loses volume overall.

Notice from above that all of these terms relate to the merchantable portion of the tree only. These standards (the 4" top and 1' stump height mentioned earlier) can vary by locale, but our report and model is based on the federal government's standards as just outlined, and follows accepted practice in that regard. This means that our model excludes yields of biomass chips taken from tops, limbs, foliage, and bark.

Within our model output, we report on initial and future merchantable inventory volumes, along with periodic *net growth* and *removals*. These volumes are all in units of millions of cubic feet. These numbers can be divided by 85 to get millions of cords per period. They can be further divided by 10 to get annualized estimates of net growth and removals. The report (submitted earlier as a separate document) provides growth and harvest values that are the net growth and harvest removals projected to have occurred during the proceeding 10 years. For example, the sheet beginning in 2005 shows the initial inventory and the subsequent net growth and harvest numbers pertaining to the years from 2005 to 2014. At the risk of being redundant, these are net growth numbers as mortality volumes are already removed during the yield curve building phase. Harvest numbers represent the removals due to logging and recovery of volumes from timberland lost by land use change. Harvest requests are entered in the input data by the modeler. The inventory, growth and harvest volumes we projected for New Hampshire are shown in aggregate in Table 1, with a conversion to cords and other useful per acre interpretations in Table 2.

Period	Timberland Acres (millions)	Inventory Vol. (million cu.ft.)	Periodic Net Growth (million cu.ft.)	Periodic Harvest (million cu.ft.)	Periodic Harvest Acres (millions)
2005	4.448	9,721.8	1,628.9	1,027.9	0.761
2015	4.368	10,223.9	1,505.6	1,027.9	0.750
2025	4.288	10,597.1	1,379.4	1,027.9	0.743
2035	4.208	10,839.4	1,257.9	1,027.9	0.739
2045	4.128	10,956.4	1,177.5	1,027.9	0.738
2055	4.048	10,990.7	N/A	N/A	N/A

Table 1. The aggregated results of the NHTOA and SPNHF model reflect growth and cut in 10- year periods. The harvest volume number is based on the average of the "report of cut" data from 2000 to 2004 collected by the Department of Resources, Economics, and Development (DRED). This table is for New Hampshire timberland and reflects increasing volume on a decreasing land base.

Period	Timberland Acres (millions)	Inventory Volume (million cords)	Inventory Volume Per Acre (cords)	Annual Net Growth Per Acre (cords)	Annual Harvest Per Acre (cords)
2005	4.448	114.4	25.7	0.43	0.27
2015	4.368	120.3	27.5	0.41	0.28
2025	4.288	124.7	29.1	0.38	0.28
2035	4.208	127.5	30.3	0.35	0.29
2045	4.128	128.9	31.2	0.34	0.29
2055	4.048	129.3	31.9	N/A	N/A

Table 2. The model projects timber inventory to increase at a decreasing rate over the next 50 years, given the assumptions of total net losses to timberland of 400,000 acres and harvests of 1.2 million cords per year. This is biologically realistic because as forest stands mature and senesce, growth rates decrease. For this to be occurring in the neighborhood of 30 cords per acre is a reasonable fit for a statewide average.

The reduction in New Hampshire timberland is based on our testing of the assumption that 8,000 acres per year of New Hampshire timberland would be lost to other land uses over the next 50 years. Another important assumption to point out is the harvest level of 1,027.9 million cubic feet per period, the equivalent of slightly more than 1.2 million cords per year (using the conversion of 85 cubic feet of solid merchantable wood per cord). This number is a 5-year average of the "report of cut" data organized by Matt Tansey at DRED. The inventory numbers are based on the last complete set of USFS FIA data, with growth and cut calculations applied for interim years to 2005.

Another look at inventory, harvest, and growth is provided in Table 3. This table simply compares volume metrics in the first 10-year period as compared to the last 10-year period in our 50-year projection. Figure 1 shows inventory, growth, and harvest broken out by hardwood and softwood, while Figure 2 shows growth-to-removal ratios by ecological habitat type. While all habitat types (except cedar-black spruce) show declining growth-to-removal ratios, the oak-white pine habitat type declines the most, partially due to land-use change's concentration in the southern half of New Hampshire (south of Coos, Carroll, and Grafton counties), where oak-white pine habitats prevail.

Period	Inventory Volume (million cf)	Harvest Volume (million cf/decade)	Growth Volume (million cf/decade)	Growth/Acre (cf/year)	Growth-to-removal ratio
Starting2005	9,721.8	1,027.9	1,628.9	36.6	1.58
Ending 2055	10,956.4	1,027.9	1,177.5	28.5	1.14

Table 3. Summary of selected measures for New Hampshire in the first and last decade of our 50-year projection.

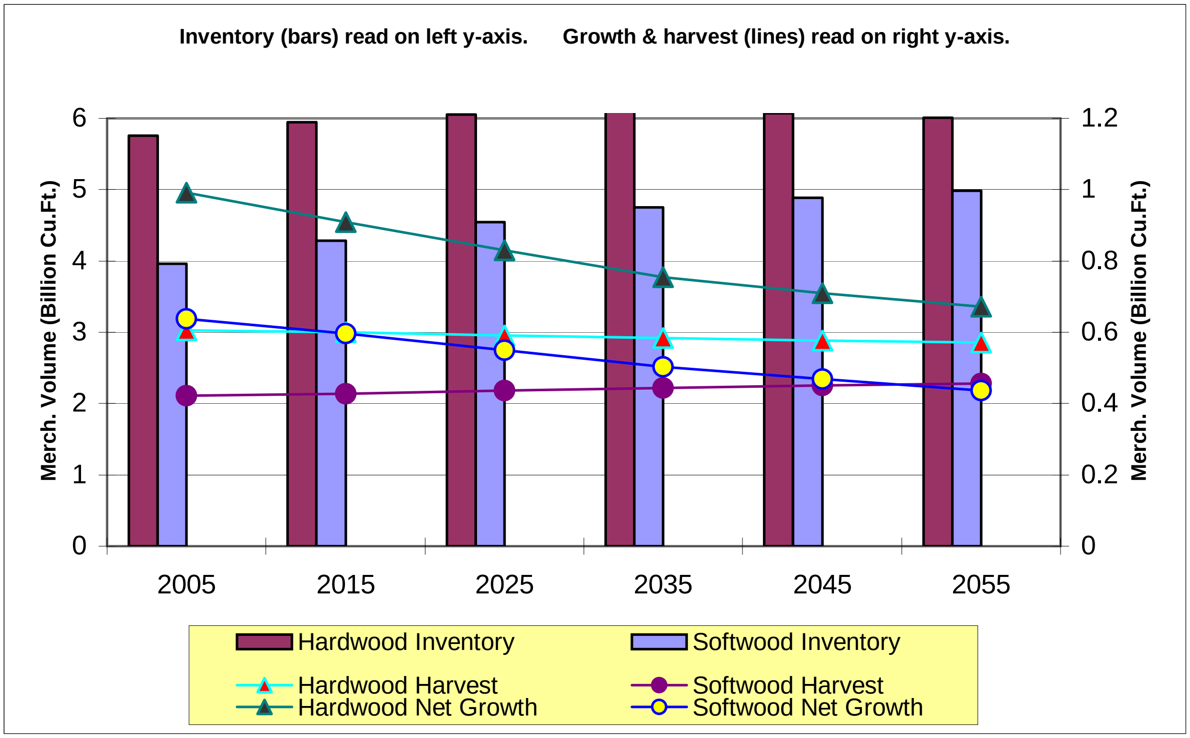

Figure 1. Inventory, periodic harvest, and periodic net growth for New Hampshire timberland by hardwood and softwood species groups.

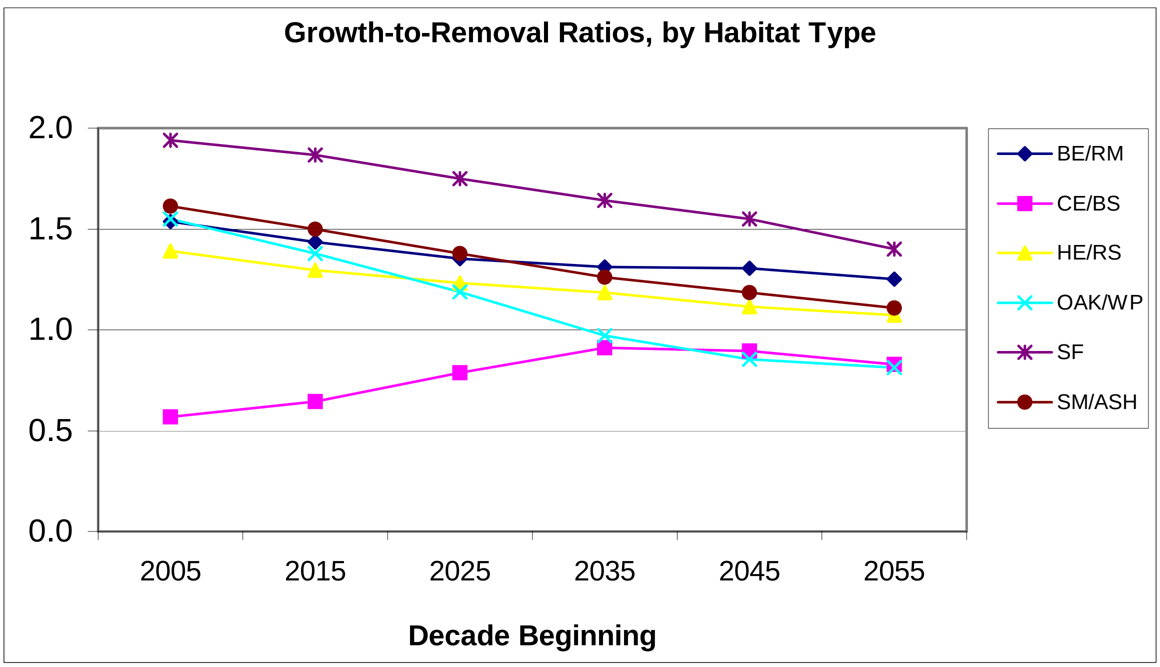

Figure 2. Growth-to-removal ratios on New Hampshire timberland by decade, show oak-white pine habitats having the most rapid decline. This is partially due to land-use change assumptions which impact southern locales more than northern locales.

Timber Supply Impacts of Land Use Change

The model projections corroborate certain aspects of New Hampshire's timber debate while at the same time possibly clouding other aspects. Before digressing too far into model results, I'll first make the observation that painful economic impacts or changes are generally felt by those people in firms or institutions operating at the margin. In other words, the assessment of having a healthy timber economy should not be made just because the very biggest and most heavily capitalized firms have not yet felt financial stress or shuttered facilities. The deterioration of resource economies and businesses usually occurs as a jagged line, with small or moderate periods of success bounded by periods of disruption and decline. The biggest players may appear quite healthy as others players struggle mightily to survive. It is also noteworthy that the data behind this model is a product of certain economic conditions that may not be replicated in the future. For example, the Berlin pulp mill, a major driver in North Country timber harvesting and utilization, is no longer operating. Market conditions impact harvesting behavior both quantitatively (how much is cut) and qualitatively (what tree species are taken and what silviculture is used). The model can be altered to better mimic future situations, but one model formulation does not fit all conditions.

We made the assumption that 8,000 acres per year of New Hampshire timberland would be lost to land use change, and that 70% of these losses would occur south of Carroll, Coos, and Grafton counties. The remaining 30% of the losses would occur within these counties. The largest single impact of this assumption is the skewing of the losses towards timberland acres with high frequencies of white pine and oak species. While the model does not have the capability to project individual species (it tracks hardwood and softwood species aggregated), it is organized by ecological habitat types, which have a strong species correlation. A part of the model corroborating an aspect of the timber debate is that the losses of timberland are not shared equally among habitat types (and therefore species). In other words, losses from the Oak/White Pine habitat type are heavier than other areas because the losses were geographically distributed to the south, where these land units predominate. Table 4 shows the relative percentages of the losses over time by habitat type based on our assumptions and projection in the model. The bottom line of these changes are that pine(s), oak(s), and hemlock will be most negatively effected by these types of changes. I leave red spruce out of that assessment because, although sometimes a component in the Hemlock/Red Spruce habitat type in the South, it is a minority component with the bulk of its presence in Spruce/Fir habitats, which are the least impacted from the land use change (except for Cedar/Black Spruce, which has a tiny presence of 12-13,000 acres). I view this as a mitigating circumstance for red spruce.

New Hampshire Timberland Loss (2005-2055) by Ecological Habitat Type in Millions of Acres

	Beech - Red Maple	Cedar - Black Spruce	Hemlock – Red Spruce	Oak - White Pine	Spruce - Fir	Sugar Maple - Ash	All Timberland Acres
2005	0.868	0.013	0.654	1.177	0.783	0.954	4.448
2015	0.851	0.012	0.64	1.15	0.773	0.941	4.368
2025	0.835	0.012	0.626	1.123	0.764	0.928	4.288
2035	0.818	0.012	0.613	1.096	0.754	0.915	4.208
2045	0.802	0.012	0.599	1.069	0.745	0.902	4.128
2055	0.785	0.012	0.585	1.042	0.735	0.889	4.048
% Loss	9.6%	5.2%	10.6%	11.5%	6.1%	6.8%	9.0%

Table 4. This shows the distribution of timberland loss within a habitat type, when 8,000 acres are lost per year and these losses are 70% in the South and 30% in the North. The South is defined as that timberland south of Carroll, Coos, and Grafton counties. The table suggests that Oak/White Pine habitats will be most heavily impacted by land use change, losing 11.5% of that area existing today. Spruce/Fir, Cedar/Black Spruce and Sugar Maple/Ash habitats will be least impacted in this scenario.

Summary observations regarding the annual loss of 8,000 acres of New Hampshire's timberland are that it will not have an immediate impact on statewide inventory volumes or growth rates. As common sense and history would validate, it will remove the better land. Eastern white pine and northern red oak frequent drier sites with better drainage, land equally preferred by developers and homebuilders. We view the timberland loss modeled as more of a nibbling away of the best, even from a historical context. Further, we suggest this rate of loss would be less dramatic than what occurred during the 19th century over similar time periods. A difference, however, is that those 19th century losses to farmland had the ability to revert to forest, while modern land use change likely has a much more permanent legacy.

How to Use the Model and this Information

This is somewhat of a warning not to take the model results, and our coarse observations, to mean there is no problem now or in the future. We are quick to acknowledge that inventory volumes may be increasing overall, but that does not mean that all species are enjoying that increase, or that the availability of sawlogs *to the marketplace* is increasing anywhere. Fragmentation, parcelization, landowner attitudes, issues of quality and grade, as well as many other factors will have their roles in future outcomes regarding the movement of timber from the woods to the mill. It is expected that these results will suggest different things to different people, and land use change in New Hampshire certainly has winners and losers.

This model is ready to be run and tested under a variety of scenarios. Earlier we mentioned most of the types of adjustments that could be made internally to test outcomes. One of the most interesting scenarios to us, would be one that tested a variety of harvest levels. We question what the harvest in New Hampshire actually is, as there seems to be some discrepancy between what FIA reports and what DRED report of cut data suggests. We ran projections with annual harvests pegged at the report of cut level of 1.2 million cords. However, we also recognize that FIA data suggests a harvest closer to 1.7 million cords, a significant gap. We suggest that understanding the relative consequences of this gap is valuable information. Other opportunities for the model could be in economic planning at resolutions higher than the entire State. While we have not pursued this to date, there is a spatial aspect to the data behind the model that could be further developed with some of the newer GIS-based technologies. This might be helpful for analysis regarding mill furnish or other studies related to sub-state regions. Lastly, we think the model could be used to test stump to mill friction levels that increase as landowner attitudes change and forest parcels decrease in size. This might be as simple as reducing the timberland area in certain habitat types to mimic area that while technically timberland, may face much higher hurdles with respect to the attitudes and logistics surrounding suburban forestry.

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[1] Gadzik, C. J. et al. 1998. Timber Supply Outlook for Maine: 1995- 2045. Dept. of Conservation, Maine Forest Service Report. www.maine.gov/doc/mfs/pubs.htm.

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Turner, R.J. and L.E. Caldwell. 2001. A Forest Resource Model of the States of New York, Vermont, New Hampshire, and Maine. NorthEast State Foresters Association (NEFA) Report. www.nefainfo.org/publications.htm.