

Additional Information:

Merchantable Wood

Quantity

County level estimates of all-live total biomass, as well as average annual growth, removals, and mortality were obtained from the Forest Inventory and Analysis Database (FIADB) version 3.0 (U.S. Department of Agriculture, Forest Service 2008). New FIA data, when available, will be updated in the model. All quantity data were presented on a dry ton basis.

County level estimates were allocated to “zip code tabulation areas” (ZCTAs) based on area proportionality, e.g., if a ZCTA accounts for ten percent of a county, ten percent of the county’s data are assigned to that ZCTA. If a ZCTA boundary crosses multiple counties, proportions for each county were summed.

ZCTAs are based on the 2000 census definition and were obtained from the U.S. Census Bureau (U.S. Census Bureau 2000). Area proportionality was performed using ArcGIS which produces a file containing ZCTAs, county Federal Information and Processing Standard (FIPS) codes, and the percentage each county has in the ZCTAs (<http://www.esri.com/software/arcgis/> Accessed January 5, 2009). An ORACLE™ database was created for this file of FIA and BT2 county level data. ZCTA level estimates were derived from the information in this database (<http://www.oracle.com/database/index.html> accessed January 5, 2009).

Confidence bounds of individual county level FIA data can be wide. Therefore, estimates of individual ZCTAs were not used in this study, but ZCTAs were aggregated together into larger groupings of “bio-basins” where confidence bounds may be comparable to aggregate county groupings.

Cost

Merchantable wood resource costs are the stumpage prices of the trees harvested. The stumpage prices for BioSAT’s 13 Southern states were obtained from the Standing Timber Stumpage Price Summary table in Timber Mark-South’s (TMS) Journal of Southern Timber Prices publication for the 2nd Quarter 2010 (Vol. 35 No. 2) with some adjustments. The TMS stumpage prices are quoted for tree types (species) that do not perfectly match BioSAT’s tree types, so they were matched as follows:

TMS	BioSAT
Pulpwood - Hwd	Lowland Hardwood - Pulpwood
Sawtimber - MixHwd	Lowland Hardwood - Sawtimber
Pulpwood - avg. of Pine and Hwd	Mixed Natural Softwood and Hardwood - Pulpwood
Sawtimber - avg. of Pine, Oak and MixHwd	Mixed Natural Softwood and Hardwood - Sawtimber
Pulpwood - Pine	Natural Softwood - Pulpwood
Sawtimber - Pine	Natural Softwood - Sawtimber
Pulpwood - Pine	Pine Plantation - Pulpwood
Sawtimber - Pine	Pine Plantation - Sawtimber
Pulpwood - Hwd	Upland Hardwood - Pulpwood
Sawtimber - avg. of Oak and Hwd	Upland Hardwood - Sawtimber

Also, Timber Mart-South does not report stumpage prices for Oklahoma, Kentucky and some Texas counties. Averages of prices that are reported were used for these states and counties as follows:

- Oklahoma uses the average of Arkansas and Texas prices.
- Kentucky uses the average of Tennessee and Virginia prices.
- Some counties in Texas use the average of Texas prices.

The stumpage prices for BioSAT's 20 Northeastern states were obtained from a variety of sources (See Appendix A). The stumpage prices are quoted for tree types (species) that do not perfectly match BioSAT's tree types, so they were matched as follows:

State	Source's classification/definition	BioSAT classification
Pennsylvania	northern red oak	Upland HW Sawtimber
	white oak	Upland HW Sawtimber
	mixed oak	Upland HW Sawtimber
	black cherry	Upland HW Sawtimber
	white ash	Upland HW Sawtimber
	hard maple	Upland HW Sawtimber
	soft maple	Upland HW Sawtimber
	yellow-poplar	Upland HW Sawtimber
	misc. hardwoods	Upland HW Sawtimber
	white pine	Pine Plantation Sawtimber
	hemlock	Pine Plantation Sawtimber
	Harwood Pulp	Upland HW pulpwood
	Softwood Pulpwood	Pine Plantation Pulpwood
Southern New England	Red oak	Upland HW Sawtimber
	white oak	Upland HW Sawtimber
	other oaks	Upland HW Sawtimber
	ash	Upland HW Sawtimber
	cherry	Upland HW Sawtimber
	sugar maple	Upland HW Sawtimber
	red maple	Upland HW Sawtimber
	tulip poplar	Upland HW Sawtimber
	yellow birch	Upland HW Sawtimber
	black birch	Upland HW Sawtimber
	paper birch	Upland HW Sawtimber
	white pine	Pine Plantation Sawtimber
	red pine	Pine Plantation Sawtimber

	hemlock	Pine Plantation Sawtimber
	spruce	Pine Plantation Sawtimber
	pulpwood	Mixed_Natural_SW_HW_Pulpwood
New Hampshire	white pine	Pine Plantation Sawtimber
	hemlock	Pine Plantation Sawtimber
	red pine	Pine Plantation Sawtimber
	spruce & fir	Pine Plantation Sawtimber
	hard maple	Upland HW Sawtimber
	white birch	Upland HW Sawtimber
	yellow birch	Upland HW Sawtimber
	oak	Upland HW Sawtimber
	ash	Upland HW Sawtimber
	beech and soft maple	Upland HW Sawtimber
	spruce & fir pulpwood	Pine Plantation Pulpwood
	hardwood & aspen pulpwood	Upland HW pulpwood
	pine pulpwood	Pine Plantation Pulpwood
	hemlock pulpwood	Pine Plantation Pulpwood
New York	ash, white	Upland HW Sawtimber
	chery, black	Upland HW Sawtimber
	maple, red (soft)	Upland HW Sawtimber
	maple, sugar (hard)	Upland HW Sawtimber
	oak, red	Upland HW Sawtimber
	pine, white	Pine Plantation Sawtimber
	aspen	Upland HW Sawtimber
	basswood	Upland HW Sawtimber
	beech	Upland HW Sawtimber
	birch, yellow	Upland HW Sawtimber
	butternut	Upland HW Sawtimber
	elm, american	Upland HW Sawtimber
	hemlock	Pine Plantation Sawtimber
	birch, white	Upland HW Sawtimber
	hickory (spp.)	Upland HW Sawtimber
	oak, chesnut	Upland HW Sawtimber
	oak, white	Upland HW Sawtimber
	pine, red	Pine Plantation Sawtimber
	spruce (spp.)	Pine Plantation Sawtimber
	tulip poplar	Upland HW Sawtimber
	walnut, black	Upland HW Sawtimber
	birch, white pulpwood	Upland HW pulpwood
	mixed n. hardwoods pulpwood	Upland HW pulpwood
	aspen pulpwood	Upland HW pulpwood

	hemlock pulpwood	Pine Plantation Pulpwood
	pine pulpwood	Pine Plantation Pulpwood
	spruce/fir pulpwood	Pine Plantation Pulpwood
Illinois	ash	Upland HW Sawtimber
	basswood	Upland HW Sawtimber
	beech	Upland HW Sawtimber
	cottonwood	Upland HW Sawtimber
	sweet gum	Upland HW Sawtimber
	elm and hackberry	Upland HW Sawtimber
	hickory	Upland HW Sawtimber
	cherry	Upland HW Sawtimber
	soft maple	Upland HW Sawtimber
	sugar maple	Upland HW Sawtimber
	black oak	Upland HW Sawtimber
	pin oak	Upland HW Sawtimber
	red oak	Upland HW Sawtimber
	white oak	Upland HW Sawtimber
	yellow poplar	Upland HW Sawtimber
	sycamore	Upland HW Sawtimber
	black walnut	Upland HW Sawtimber
Missouri	ash	Upland HW Sawtimber
	black walnut	Upland HW Sawtimber
	cottonwood	Upland HW Sawtimber
	elm	Upland HW Sawtimber
	hickory	Upland HW Sawtimber
	mixed hardwoods	Upland HW Sawtimber
	oak (mixed species)	Upland HW Sawtimber
	post oak	Upland HW Sawtimber
	red oak (group)	Upland HW Sawtimber
	soft maple	Upland HW Sawtimber
	walnut, black	Upland HW Sawtimber
	white oak (group)	Upland HW Sawtimber
	shortleaf pine	Pine Plantation Sawtimber
MI, WI, & MN	aspen	Upland HW Sawtimber
	white birch	Upland HW Sawtimber
	yellow birch	Upland HW Sawtimber
	ash	Upland HW Sawtimber
	hard maple	Upland HW Sawtimber
	beech	Upland HW Sawtimber
	white pine	Pine Plantation Sawtimber
	Other hardwood	Upland HW pulpwood

	Spruce	Pine Plantation Pulpwood
	soft maple	Upland HW Sawtimber
	basswood	Upland HW Sawtimber
	red oak	Upland HW Sawtimber
	white oak	Upland HW Sawtimber
	other hardwood	Upland HW Sawtimber
	jack pine	Pine Plantation Sawtimber
	red pine	Pine Plantation Sawtimber
	spruce	Pine Plantation Sawtimber
	other softwood	Pine Plantation Sawtimber
	jack pine pulpwood	Pine Plantation Pulpwood
	red pine pulpwood	Pine Plantation Pulpwood
	spruce pulpwood	Pine Plantation Pulpwood
	spruce/fir pulpwood	Pine Plantation Pulpwood
	other softwood pulpwood	Pine Plantation Pulpwood
	aspen pulpwood	Upland HW pulpwood
	white birch pulpwood	Upland HW pulpwood
	basswood pulpwood	Upland HW pulpwood
	oak pulpwood	Upland HW pulpwood
	other hardwood pulpwood	Upland HW pulpwood
Maine	ash	Upland HW Sawtimber
	beech	Upland HW Sawtimber
	cedar	Upland HW Sawtimber
	hemlock	Pine Plantation Sawtimber
	red oak	Upland HW Sawtimber
	Cedar	Upland HW pulpwood
	red/white maple	Upland HW Sawtimber
	spruce & fir	Pine Plantation Sawtimber
	sugar maple	Upland HW Sawtimber
	white birch	Upland HW Sawtimber
	white pine	Pine Plantation Sawtimber
	yellow birch	Upland HW Sawtimber
	red pine	Pine Plantation Sawtimber
	white oak	Upland HW Sawtimber
	aspen/poplar	Upland HW Sawtimber
	aspen/poplar pulpwood	Upland HW pulpwood
	hemlock pulpwood	Pine Plantation Pulpwood
	mixed hardwood pulpwood	Upland HW pulpwood
	spruce & fir pulpwood	Pine Plantation Pulpwood
	white pine pulpwood	Pine Plantation Pulpwood
WV	red oak	Upland HW Sawtimber

	white oak	Upland HW Sawtimber
	mixed oak	Upland HW Sawtimber
	black cherry	Upland HW Sawtimber
	yellow-poplar	Upland HW Sawtimber
	hard maple	Upland HW Sawtimber
	soft maple	Upland HW Sawtimber
	ash	Upland HW Sawtimber
	hickory	Upland HW Sawtimber
	walnut	Upland HW Sawtimber
	Hard Pulp	Upland HW pulpwood
	Soft Pulp	Pine Plantation Pulpwood
Ohio	walnut	Upland HW Sawtimber
	white oak	Upland HW Sawtimber
	red oak	Upland HW Sawtimber
	cherry	Upland HW Sawtimber
	hard maple	Upland HW Sawtimber
	soft maple	Upland HW Sawtimber
	ash	Upland HW Sawtimber
	yellow poplar	Upland HW Sawtimber
	basswood	Upland HW Sawtimber
	hickory	Upland HW Sawtimber
	pine	Pine plantation sawtimber

Some states did not have reported values. When this was the case, the weighted averages of a state nearby were used. This can be seen in a few instances. Below are the states that did not have values and the weighted averages from the other state:

- New Jersey uses the weighted averages of New York's prices.
- Vermont uses the weighted averages of New Hampshire's prices.
- Iowa uses the weighted averages of Wisconsin prices.
- Indiana uses the weighted average of Ohio's prices.

In many cases, multiple values were provided for certain regions or species. When this occurred, the median of the data was used. For other states, some regions had reported values and other regions did not. There were also instances where values were reported for certain types of wood, but not for other types. The exact details of these instances are described below:

- For Illinois, hardwood and softwood pulpwood and softwood sawtimber are using the weighted average of southern Wisconsin for Illinois north (zone3) and central (zone 2). The weighted average of northern Arkansas prices are used for Illinois south (zone 1). When using values

reported from the department of natural resources, the stumpage values were used. After compiling the values, the medians were taken for each category. There was a range reported. The lower value of each range was used.

- With Michigan, the counties on the map that were not put into a certain region used the values for Region 1.
- In Missouri, the average prices for each species from each region were used. The median of these values was taken for each category and region. The statewide stumpage prices reported were not used. Take northern Arkansas (zone 2 from timbermart south) standing timber pulpwood prices (both softwood and hardwood) for the softwood and hardwood pulpwood values in Missouri. Take northern Arkansas (zone 2 from timbermart south) standing timber pulpwood prices (both softwood and hardwood) for the softwood and hardwood pulpwood values in Missouri. Use the southern Wisconsin prices for northern and southwest Missouri softwood sawtimber (values were already provided for southeast Missouri softwood sawtimber). For hardwood sawtimber, the central region uses the weighted average of the other 3 regions.
- In Minnesota, region 1 used the values from Minnesota Region 2 for softwood sawtimber values. The median of each region was used. The area of the map that is not given a region is using region 1 data.
- In New York, the Delaware/Catskill region is using the values from Hudson/Mohawk for the softwood and hardwood pulpwood values. When selecting prices, the average price range (median) was used for each region. The median of these values was taken for each category and region.
- In Pennsylvania, the northeast and southwest regions used the weighted average of softwood pulpwood values from the northwest and southeast region of Pennsylvania for the softwood pulpwood values. The southwest region hardwood pulpwood values come from the weighted average of the Pennsylvania counties hardwood pulpwood values that were already present. The pulpwood values already present used the “Private and Other Public Pulpwood Stumpage” values. For the sawtimber prices, the average values provided were used. A median of these values was then taken for each category.
- For the New England states, which includes Rhode Island, Connecticut, Massachusetts, Delaware, and Maryland, a variety of calculations were used. Mixed softwood and hardwood pulpwood values for Maryland and Delaware use the weighted average of “East of CT River” and “West of CT River” data from mixed natural softwood and hardwood pulpwood values that were already present (from Connecticut, Rhode Island, and Massachusetts). Hardwood and softwood pulpwood values used the weighted average of the mixed softwood and hardwood pulpwood values from CT, RI, and MA. Mixed softwood and hardwood sawtimber values use the weighted average of CT, RI, and MA softwood and hardwood sawtimber prices. For the “East of CT River” and “West of CT River,” the median values provided were used. A median of these values was then taken for each category. Maryland and Delaware values come from the weighted average of the other New England state’s values.

- In West Virginia, region 4 hardwood sawtimber uses the values from Region 3 hardwood sawtimber. The pulpwood values come from the values presented in the international scale. The softwood sawtimber values come from timbermart south. The values from Virginia, Region 1, were used. Hardwood pulpwood Region 4 and 5 are using the value from West Virginia region 3. Softwood pulpwood Region 4 is using the values from softwood pulpwood Region 3. When using the data presented, the median of each region was taken for each category. The state averages provided were not used. Region 1 hardwood and softwood pulpwood use the values from Region 2.
- In Ohio, northeast softwood sawtimber prices were used for the west and southeast. The pulpwood values used Region 1 of Pennsylvania for the northeast Ohio prices. Region 4 of Pennsylvania provided southeast Ohio Prices. A weighted average of northeast and southeast Ohio prices was used for west Ohio prices.

Merchantable wood harvesting costs are estimated by the Auburn Harvest Analyzer (AHA) Cost Models created by Shawn Baker and Dale Greene from the Center for Forest Business, Warnell School of Forestry and Natural Resources at the University of Georgia. The harvesting cost models generate roundwood production costs from stands harvested via the defined harvesting systems. The primary drivers for the models are quadratic mean diameter, tons per acre removed, trees per acre removed, tract size, and average height of dominant trees (in hardwood stands only, if available). These are highlighted in purple. If trees per acre removed are known, that value should be input, but it is currently calculated based on a volume equation (citation available from Shawn Baker and Dale Greene if needed).

Values which can be altered based on the need to adjust conditions for a specific tract are highlighted in green. A document of input assumptions for these cells in each stand type for each harvesting system is attached. Separate values are available for either clearcut or thinning harvests. A macro will need to be written to pull each value from the assumption worksheet and insert it into the necessary model. Each value has the appropriate cell reference labeled beside it.

Input values for machine costs are based on the machine rate equations (citation available from Shawn Baker and Dale Greene if needed). These are calculated on the worksheet labeled "Equipment Costs" in the assumptions file. Included here are average purchase prices for machinery and assumptions about costs to own and operate machines throughout their useful life. These also are estimates based on frequent discussion with contractors and industry personnel. Fuel cost can be adjusted on this page, and is highlighted in green. Other petroleum based lubricants are valued as a ratio of fuel cost, thereby changing as fuel increases or decreases.

At the bottom of the main AHA page, highlighted in yellow, are the three main outputs of the model: loads and tons of wood produced per day from the tract and cost per ton to cut and load this material on a truck for transportation to a facility. The hauling costs are not included in this cost.

Appendix A

CT RI MA DE MD: Southern New England Stumpage Price Survey Results

The survey is a result of joint efforts of Cooperative Extension at the University of Massachusetts and Connecticut, and the state forestry agency in Rhode Island.

Second Quarter 2010 (April-June)

www.canr.uconn.edu/ces/forest/pricesht.htm

Illinois: Illinois Timber Prices for November 2009 through February 2010.

Prepared by the Illinois Field Office of the National Agriculture Statistics Service in Cooperation with the Illinois Department of Natural Resources-Division of Forestry.

http://web.extension.illinois.edu/forestry/il_timber_prices/pdf/itp_feb2010.pdf

Maine: 2008 Stumpage Prices by Maine County

Compiled from the 2008 Landowner Report

Department of Conservation, Maine Forest Service. Forest Policy and Management Division.

<http://www.state.me.us/doc/mfs/pubs/pdf/stumpage/08stump.pdf>

Michigan: Timber Mart North Price Report.

Volume 16, Number 1. October 2009-March 2010

Prentiss & Carlisle. Forest Resource Management and Timberland Services

Wisconsin: Timber Mart North Price Report.

Volume 16, Number 1. October 2009-March 2010

Prentiss & Carlisle. Forest Resource Management and Timberland Services

Minnesota: Timber Mart North Price Report.

Volume 16, Number 1. October 2009-March 2010

Prentiss & Carlisle. Forest Resource Management and Timberland Services

Missouri: Missouri Timber Price Trends.

Missouri Department of Conservation, Forestry Division

Quarterly Market Report Vol. 20, No. 2.

http://www.mdc.missouri.gov/sites/default/files/resources/2010/07/9321_6381.pdf

New Hampshire: Average Stumpage Value List

Prepared by Jesse Bushaw, LPF. Department of Revenue Administration

April 1, 2010- September 30, 2010

http://www.nh.gov/revenue/munc_prop/documents/avgstumpval04_10_09_10.pdf

New York: Stumpage Price Report

New York State Dept. of Environmental Conservation, Division of Lands and Forests. Forest Utilization Program

Summer 2010 / #77

http://www.dec.ny.gov/docs/lands_forests_pdf/spr2010summer.pdf

Pennsylvania: Pennsylvania Woodlands Timber Market Report

The Pennsylvania State University School of Forest Resources, Cooperative Extension
Second Quarter 2010 April-June

<http://extension.psu.edu/tmr/2010/2-10%20TMR/TMR%202nd%202010.pdf>

Ohio: Ohio Timber Price Report

7/31/2010

Fall 2009 to Spring 2010 Comparison

The Ohio State University Extension

oardc.ohio-state.edu/ohiowood

West Virginia: West Virginia Timber Market Report

March 2010

The West Virginia Division of Forestry

http://ahc.caf.wvu.edu/joomla/index.php?option=com_wrapper&view=wrapper&Itemid=62&Name=Value

Additional Source: Timber Mart-South

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