

Maine Tree Growth Tax Law – The Valuation Process  
(Revised 1/18/2017)

The intent of the Maine Tree Growth Tax Law (TGTL) is to value forestland for its ability to grow commercial forest products as its current use, rather than a valuation based on so-called “highest and best” uses. The valuation process is designed to monetize the average annual net wood production rate by forest type and county.

The derivation of a TGTL valuation is a multi-step calculation and estimation process; most of these steps only change on a periodic basis, with one element changing annually.

The Maine Forest Service (MFS) uses Maine’s Forest Inventory & Analysis (FIA) data as supplied by the respective United States Forest Service Northeastern or Northern Research Station (NRS). The valuation process is completely updated and recalculated when new inventory data becomes available.

- 1973 – 1984 TGTL valuations used the 1959 and 1971 periodic inventories, and the growth over this period.
- 1985 – 1997 TGTL valuations used the 1959, 1971, and 1982 periodic inventories, and the growth between each of the two periods.
- 1998 – 2008 TGTL valuations used the 1959, 1971, 1982, and 1995 periodic inventories, and the growth between each of the three periods.
- 2009 – 2015 TGTL valuations used the 1959, 1972, 1983, 1995 periodic inventories, and the 1999 – 2003 annualized inventory, and the growth between the each of the four periods.
- 2016 TGTL valuation will be using the addition of a new basis point. It will use the 1959, 1972, 1983, 1995, periodic inventories, the 1999-2003 annualized inventory, and the growth estimated between each of these four periods. The new basis point is the 2009-2013 annualized inventory, and its growth estimate from the 2004–2008 period.

The unique geographic area used at different steps in the valuation process has not been consistent. Potential geographic areas include 16 individual counties, 9 FIA Units (a NRS grouping for a statistically based growth estimate), regions, and Megaregion (a MFS aggregation based on similar patterns of land ownership, forest types, and management).

Megaregion	Region	FIA Unit	County
Northern	Northern	Aroostook	Aroostook
		Piscataquis	Piscataquis
		Somerset	Somerset
Eastern	Eastern	Hancock	Hancock
		Penobscot	Penobscot
		Washington	Washington
Southern	Capital Area Region	Capital Area Region	Kennebec Knox Lincoln Waldo
	Casco Bay Region	Casco Bay Region	Androscoggin Cumberland Sagadahoc York
Western	Western	Western Region	Franklin Oxford

Step 1 – Calculation of the average annual net growth percent, by species groups, by geographic area.

This step is derived by calculating the long-term average annual net growth on timberland and dividing it by the respective long-term average inventory estimate and converting it to a percentage basis. This step has been recalculated five times using an ever-changing variety of scales: 1) Area of interest; 2) Species of interest; and 3) Product quality of interest.

To provide just a single basis of comparison, the respective overall statewide growth percent was:

Species Group	1972	1982	1995	2003	2013
Softwood Spp.	3.77%	3.20%	2.82%	2.36%	2.54%
Hardwood Spp.	2.32%	2.65%	2.59%	2.49%	2.83%
All Spp,	3.31%	3.01%	2.73%	2.41%	2.65%

Step 2 – Acreage assignment of TGTL Forest Type, by geographic area

MFS has either requested a special typing run from the RS or has reprocessed individual plot data in-house to derive the specific acreage allocation for TGTL defined hardwood, mixedwood, and softwood forest types. There are two confounders to any analysis of long-term trends in forest types. The first is that the forest type assignment can change solely due to a change in the NRS typing algorithm. The second is a forest type change due to disturbances, like harvest or an ice storm, which actually can change the species composition mix.

To provide a single basis of comparison, the overall statewide TGTL forest type assignment (million acres) has changed as follows:

TGTL Forest Type	1972	1982	1995	2003	2013
Hardwood	3.72	3.86	4.91	4.43	4.28
Mixedwood	6.70	6.79	7.17	7.43	7.33
Softwood	6.47	6.60	5.24	5.35	5.63
Total	16.89	17.25	17.32	17.21	17.24

Step 3 – Mean stocking (cubic feet per acre) by species within each TGTL Forest Type, by geographic area.

The average stocking by respective species is divided by the overall stocking to get a proportionate share (%).

To provide a single basis of comparison, the statewide stocking (cubic feet per acre) by TGTL Forest Type is:

TGTL Forest Type	1972	1982	1995	2003	2013
Hardwood	795	1,023	1,322	1,253	1,232
Mixedwood	1,184	1,181	1,260	1,407	1,535
Softwood	1,570	1,577	1,399	1,428	1,299
Overall Average	1,258	1,305	1,266	1,374	1,383

The overall acreage increase in the hardwood and mixedwood TGTL forest type assignment in step 2 coupled with the overall increase in hardwood and mixedwood stocking means that these two types are carrying a bigger share of the potential productivity.

Step 4 – Mean productivity (cubic feet/acre/year) is a chain calculation using data from previous steps.

The respective stocking per acre (Step 3) is multiplied by the respective growth percent (Step1). Within each TGTL forest type the mean productivity is summed to a single value each for all softwoods and all hardwoods.

To provide a single basis of comparison, the overall statewide mean productivity (cubic feet per acre per year) by TGTL type has ranged as follows:

TGTL Forest Type	1972	1982	1995	2003	2013
Hardwood	22.1	31.2	33.6	30.9	34.4
Mixedwood	40.2	39.0	35.5	36.2	44.4
Softwood	59.8	53.1	39.7	35.6	33.9

Step 5 – Determination of average stumpage value per cubic foot by species, by product, by geographic area is actually 3 parts, 2 of which are periodic, and 1 is annual.

Part A – is the annualized part, and uses the annual MFS published Stumpage Price report. The stumpage report data is used to derive an overall volume weighted stumpage value per cord or MBF. This data is provided to Maine Revenue Services (MRS).

Part B – is a periodic data table, by species, by geographic area containing inventory estimates of pulpwood volume (million cords) and sawtimber volume (MBF) and the sawtimber CF to MBF conversion. This data table is also provided to MRS.

Part C – is the second periodic part and provides product weights. Product weights are the proportions of pulpwood and sawtimber in inventory within a specific TGTL Forest Type, within a geographic area. Product weights are used to partition the respective productivity from Step 4 into specific product (pulpwood or sawtimber) productivity. There are four product weights – softwood pulpwood and softwood sawtimber add up to 1.00 and hardwood pulpwood and hardwood sawtimber add up to 1.00.

Step 6 – is the final calculation and MFS supplies this in a report to MRS.

Average Annual Net Productivity (cubic feet per acre per year) is monetized by multiplying the average stumpage value (\$ per cubic foot), producing an annual value per acre per year. This average annual productivity (stumpage income due solely to growth) is first discounted 10% to reflect inaccessible wood or inoperable stands. The resultant is capitalized at 8.5%. In effect answering in reverse the question, “What valuation per acre is required to

provide an 8.5% annual return, a return that is 90% of the average annual productivity of \$X per acre?”

Maine Revenue Services averages the three most current year valuations in order to moderate variations in stumpage value and publishes the TGTL 100% Valuation by TGTL Forest Type by County (\$/acre) effective April 1 of the tax year. The valuations published for the 2009 tax year are a look-back and an average of separate annual valuations based on calendar year stumpage values from 2008, 2007, and 2006.

***Why did the 2009 TGTL valuations change so disproportionately between regions?***

The TGTL recalculation process conducted in the fall of 2008 was in response to two factors. The first was the interest and intent of the Maine Forest Service to update the process using the newest FIA inventory for Maine, which had been completed in 2003, and published in 2005. The second was in response to requests, findings, and recommendations from the Task Force charged by the 2008 legislation in the LD 543 Resolve, “To direct a review of issues concerning the Maine Tree Growth Tax Law.”

The TGTL calculation process has had major resets in the past; originally 1972; then again in 1974, 1984, and 1998. In 2008, a more refined data analysis provided more accurate values for a wider range of species-products in statistically valid geographic areas.

In the 2008 recalculation process:

- Growth percent was calculated for 6 softwood species groups (balsam fir, spruces, pine spp., northern white cedar, hemlock, and all other softwood spp.) and for 9 hardwood species groups (red maple, sugar maple, yellow birch, white birch, beech, ash spp., aspen spp., northern red oak, and all other commercial hardwood spp.). Geographic spatial scale was maintained for most of the individual counties, or aggregations to either FIA Unit or Megaregion.
- Red Oak was separated from Other Commercial Hardwood throughout the valuation process and treated as a separate species.

The current rates (2009) more accurately reflect the area-specific productivity of forestland to grow tree species and forest products. Depending on where property is located, there could be noticeable shifts in values, either upwards or downwards, from previous valuations. There will always be seemingly inexplicable differences between adjacent geographic valuation areas, whether they are counties, FIA Units, or Megaregions. As always, a comparison of TGTL valuations with so-called “highest and best” valuation rates is a useful exercise for making an informed decision about enrolling land in the program. Contact the Maine Forest Service at (207) 287-8430 for further information and assistance.

***Why did the 2016 TGTL valuations change so disproportionately between regions?***

*(Analysis of impacts in the MFS Recalculation of the 2015 Tree Growth Tax Law (TGTL) Valuation (Initially prepared in December, 2016 at the request of David Ledew, MRS))*

This synopsis will compare values for different steps in the TGTL valuation process between 2008 and 2015. For the below noted Steps 1 – 4; the 2008 calculation used Maine’s FIA data for the 5-year period ending in 2003, while the 2015 calculation used Maine’s FIA data for the 5-year period ending in 2013

**Step 1 - Growth Percent**

Growth percent is based on the calculation of average net growth divided by average inventory over a long period of time. For 2008, the growth percent is represented by the 1958 – 2003 timeframe, whereas the 2015 calculation of growth percent considered the average over the 1958 – 2013 timeframe. The below table shows the net percentage change, in growth percent, from the 2008 calculation to the 2015 calculation

Megaregion/FIA Unit	All Softwood Species	All Hardwood Species	All Species
Northern (Aroostook, Piscataquis, and Somerset counties)	+0.15%	+0.37%	+.024%
Eastern (Hancock, Penobscot, and Washington counties)	+0.28%	+0.25%	+0.27%
Capital Area (Kennebec, Knox, Lincoln, and Waldo counties)	+0.03%	+0.31%	+0.16%
Casco Bay (Androscoggin, Cumberland, Sagadahoc, and York counties)	+0.14%	+0.42%	+0.27%
Western (Franklin and Oxford counties)	+0.08%	+0.24%	+0.16%
Overall Statewide	+0.18%	+0.34%	+0.24%

Since all regions experienced an increase in the growth percent, this factor, just by itself, will lead to increased valuations, because the valuation is based on annual productivity, i.e. annual growth.

**Step 2 – TGTL Forest Types**

The TGTL recognizes three major forest types: softwood, mixedwood, and hardwood. Types are assigned to FIA plots on the basis of which species group represents the majority of basal area/acre. The Softwood TGTL Type needs to have 75% or more of its basal area/acre in softwood species, the Hardwood TGTL Type needs 75% or more of the basal area/acre in hardwood species and the Mixedwood TGTL Type represents forests where neither softwoods nor hardwoods comprise 75% or more of the basal area/acre. Historically, the Softwood TGTL Forest Type acres have the highest valuation, then Mixedwood, and Hardwood typically has the lowest. The TGTL Type assignment is based on species composition and stocking (basal area/acre) and can change over time due to natural stand development, natural disturbances of insects and disease, or more usually by harvesting activities. The table below tracks the change (Million acres) between the 2008 calculation and the 2015 calculation.

Megaregion/FIA Unit	Softwood TGTL Type	Mixedwood TGTL Type	Hardwood TGTL Type
Northern (Aroostook, Piscataquis, and Somerset counties)	+0.19	-0.13	-0.02
Eastern (Hancock, Penobscot, and Washington counties)	+0.13	-0.04	-0.07
Capital Area (Kennebec, Knox, Lincoln, and Waldo counties)	-0.01	+0.03	-0.04
Casco Bay (Androscoggin, Cumberland, Sagadahoc, and York counties)	-0.02	+0.02	+0.01
Western (Franklin and Oxford counties)	0.00	+0.02	-0.04
Overall Statewide	+0.28	+0.10	-0.15

Two distinct trends are apparent. In the Northern and Eastern Megaregions, Softwood acres increased with corresponding decreases in both the Mixedwood and Hardwood TGTL Types, and this movement, just by itself, will result in more acres having a higher valuation in these two regions. In the other three regions, the overall movement is an increase in Mixedwood TGTL Type acres with corresponding losses in Softwood and Hardwood. This movement, just by itself, will result in a mixture of acres, some decreasing in value and others increasing in value.

### Step 3 – Mean Stocking (Cubic feet per acre)

This is another important step which calculates the average volume of various species and products within each region and TGTL Forest Type. In general, by itself, increases in stocking will result in an increased valuation, since stocking is the implied “Principal” to

which the growth percent, the implied interest rate is applied. The table below provides the change in stocking (cubic feet/acre) between the 2008 calculation and the 2015 calculation.

Megaregion/FIA Unit	Softwood TGTL Type	Mixedwood TGTL Type	Hardwood TGTL Type	Overall Average Stocking/Acre
Northern (Aroostook, Piscataquis, and Somerset counties)	-164	+12	-81	-77
Eastern (Hancock, Penobscot, and Washington counties)	-23	+118	-47	+40
Capital Area (Kennebec, Knox, Lincoln, and Waldo counties)	-198	+330	+114	+209
Casco Bay (Androscoggin, Cumberland, Sagadahoc, and York counties)	+40	+337	+92	+197
Western (Franklin and Oxford counties)	-236	+189	+45	+78
Overall Statewide	-129	+128	-21	+9

Overall, there is a mixed change within the regions and forest types. In the Northern region the overall impact is a reduction in stocking, especially the softwood type. The Eastern region has stocking reductions in both softwood and hardwood, which are more than offset by the increase of 113 cubic feet/acre in mixedwood. Both the Capital Area and Casco Bay have very large increases of more than 300 cubic feet/acre in mixedwood stocking and a large increase of around 100 cubic feet in hardwood acres. The overall increase in these last two regions is around 200 cubic feet (2.4 cords/acre in 10 years).

#### Step 4 – Mean Annual Productivity (Cubic Feet per acre per year)

This step combines the independent impacts of Step 1 -Growth Percent and Step 3 – Stocking; providing a single value for evaluation. In effect if mean annual productivity increases, then by itself, this will lead to increases in the respective region/forest type valuation. The below table presents the change in the Mean Annual Productivity from the 2008 calculation to the current 2015 calculation

	Softwood	Mixedwood	Hardwood

Megaregion/FIA Unit	TGTL Type	TGTL Type	TGTL Type
Northern (Aroostook, Piscataquis, and Somerset counties)	-2.67	+4.16	+2.04
Eastern (Hancock, Penobscot, and Washington counties)	+3.31	+6.83	+1.71
Capital Area (Kennebec, Knox, Lincoln, and Waldo counties)	-5.36	+16.57	+7.66
Casco Bay (Androscoggin, Cumberland, Sagadahoc, and York counties)	+5.25	+16.95	+9.36
Western (Franklin and Oxford counties)	-9.09	+9.95	+5.58
Overall Statewide	-1.66	+8.18	+3.54

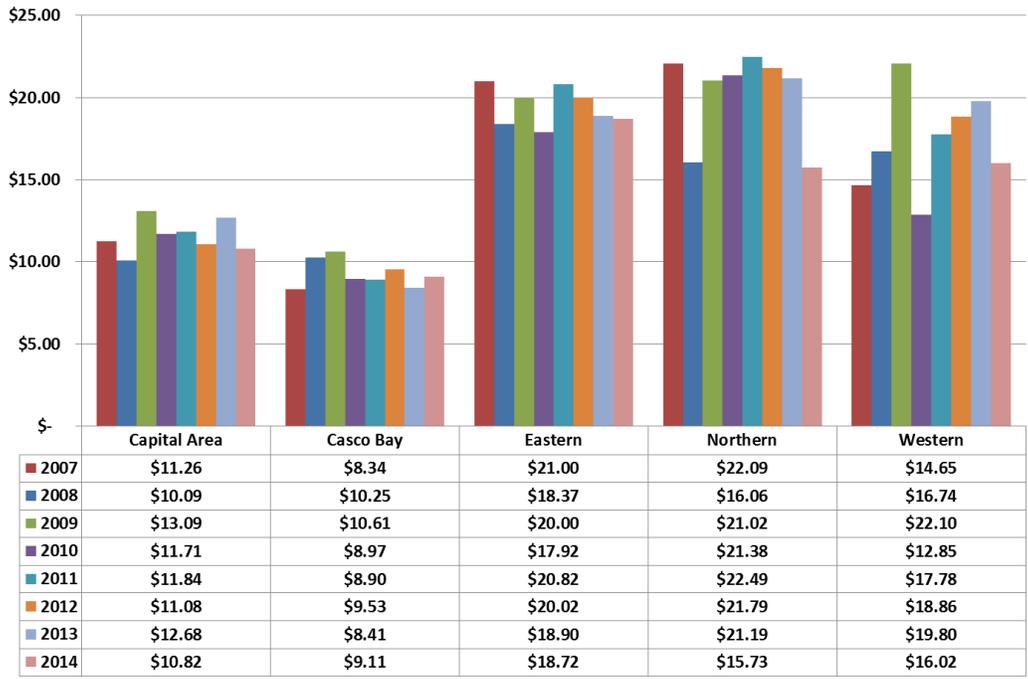
The most frequent change in productivity over the timeframe between the 2008 calculation and the 2015 calculation is an increase; ranging from a low of 1.71 cubic feet/acre/year in the Eastern Hardwood TGTL Forest Type to a high of 16.95 in the Casco Bay Mixedwood TGTL Forest Type. There are three decreases, all in the Softwood TGTL Forest Type, ranging from a drop of 2.67 cubic feet/acre/year in the Northern region to a 9.09 decrease in the Western region.

#### Step 5 – Average stumpage prices

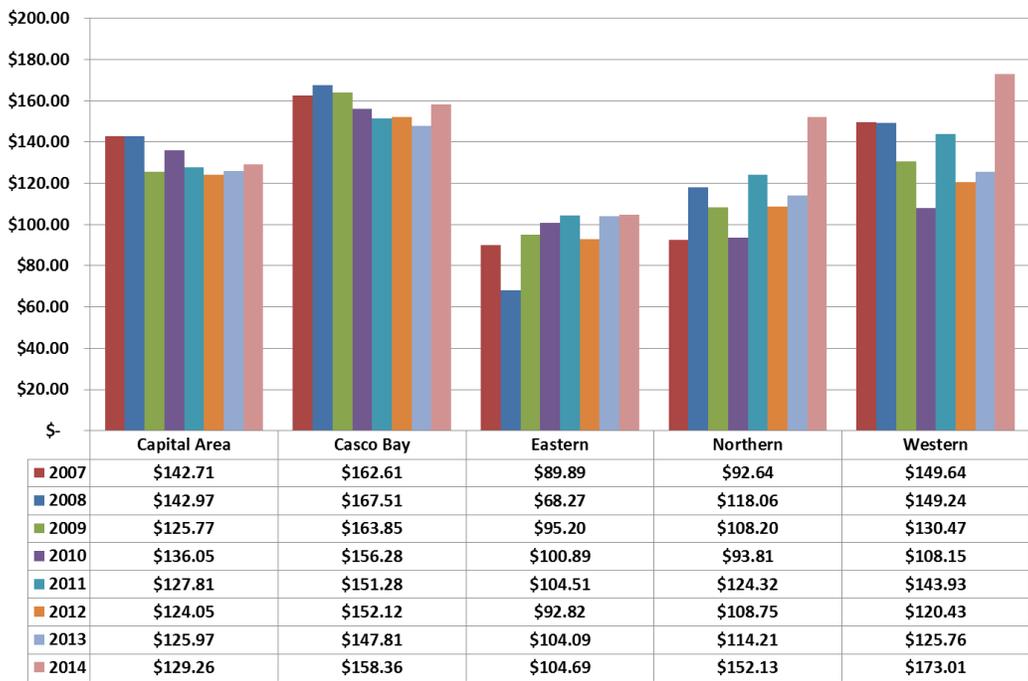
Stumpage prices are used to convert the annual productivity (cubic feet/acre/year) into a financial return (\$/acre/year). There are two different ways that MFS uses stumpage prices in its Annual Landowner Report.

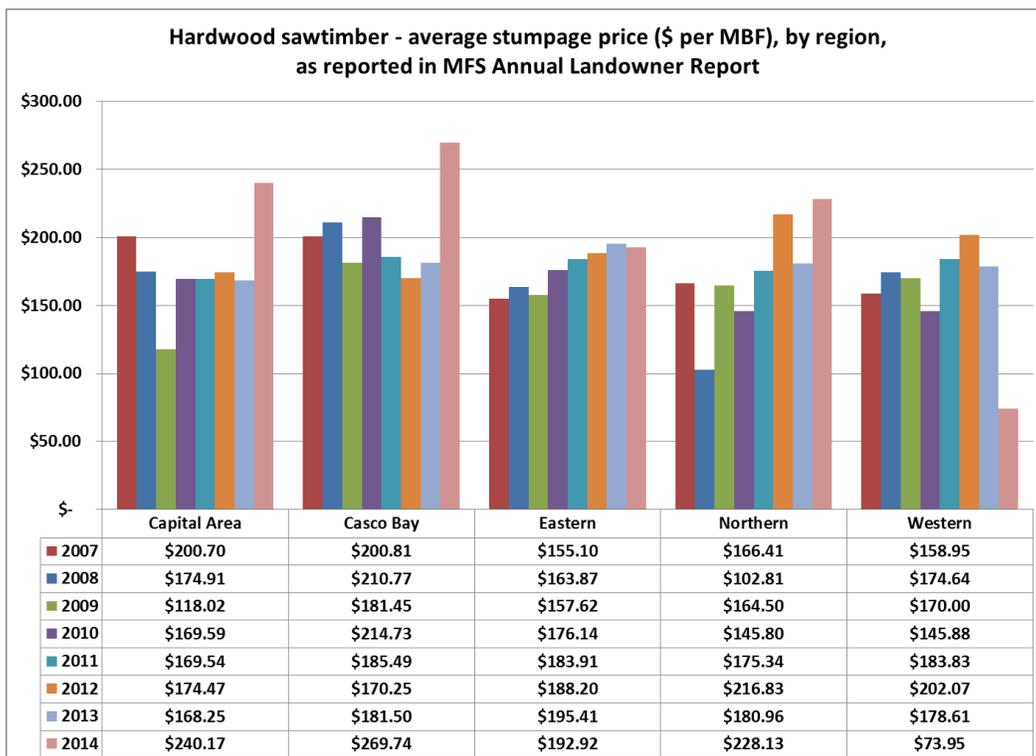
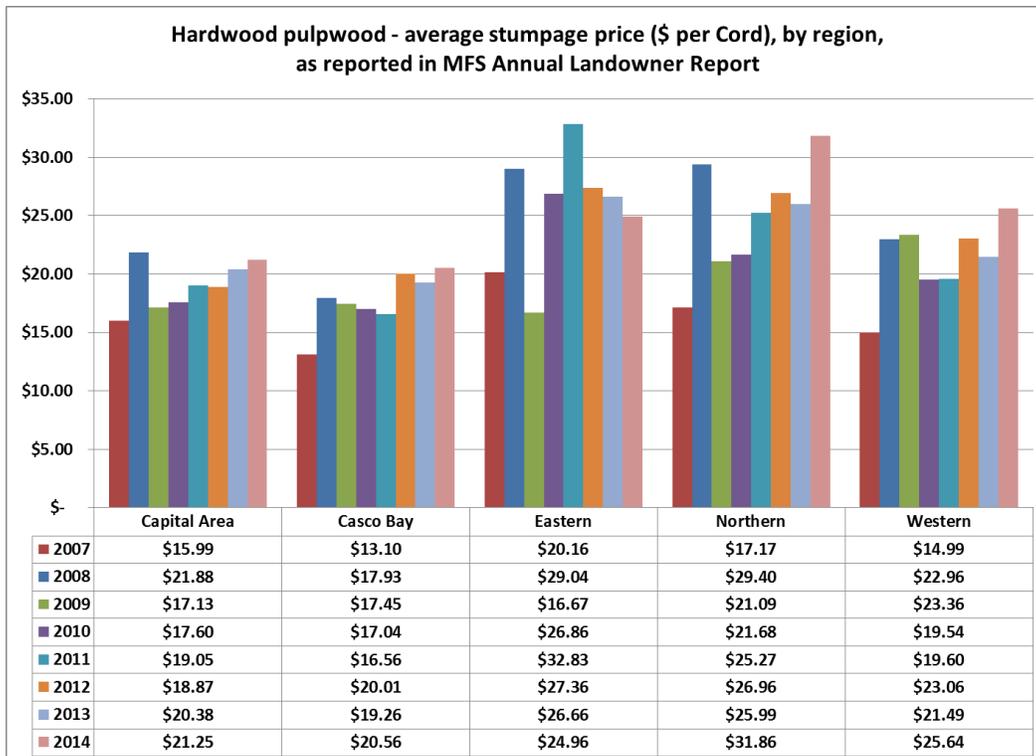
The first method (Step 5A) takes the reported information on stumpage sales volume and stumpage sale price from the individual landowner reports to construct (Section 1 of 3) a weighted average sales price for two major species groups (Softwood and Hardwood) and two major products (Pulpwood and Sawtimber); this calculation is reflecting actual harvest removals. The annual changes in each of the regions are indicative of various and ongoing supply/demand responses to Maine's diverse forest markets.

**Softwood pulpwood - average stumpage price (\$ per Cord), by region,  
as reported in MFS Annual Landowner Report**



**Softwood sawtimber - average stumpage price (\$ per MBF), by region,  
as reported in MFS Annual Landowner Report**

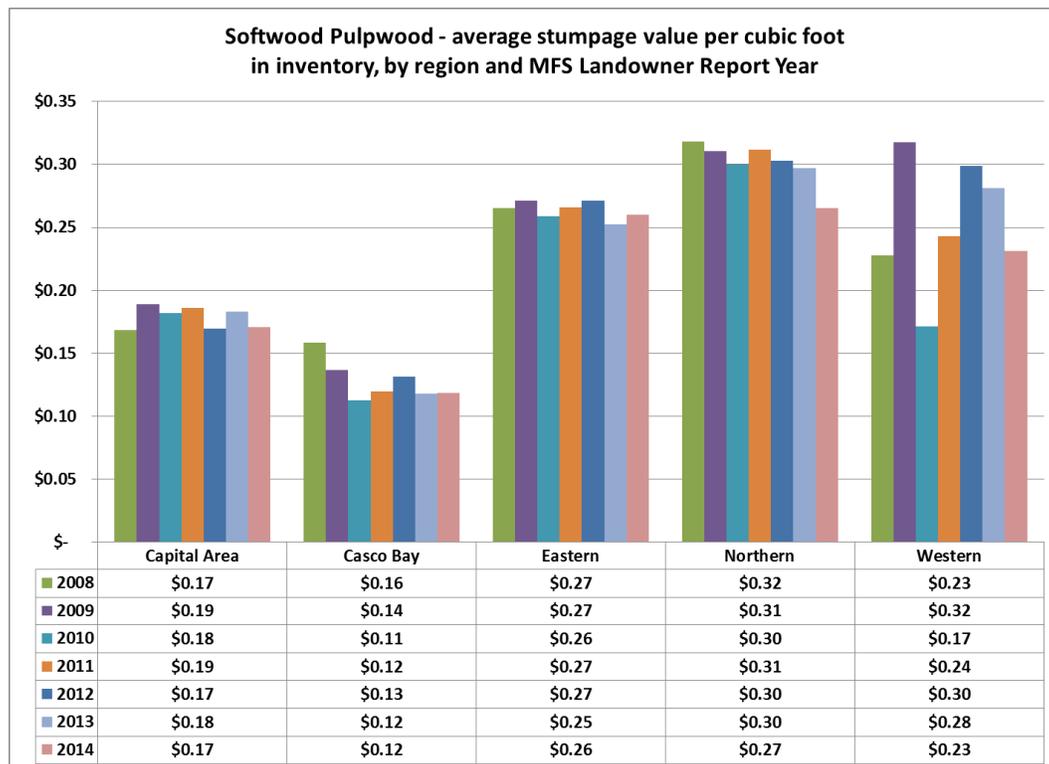


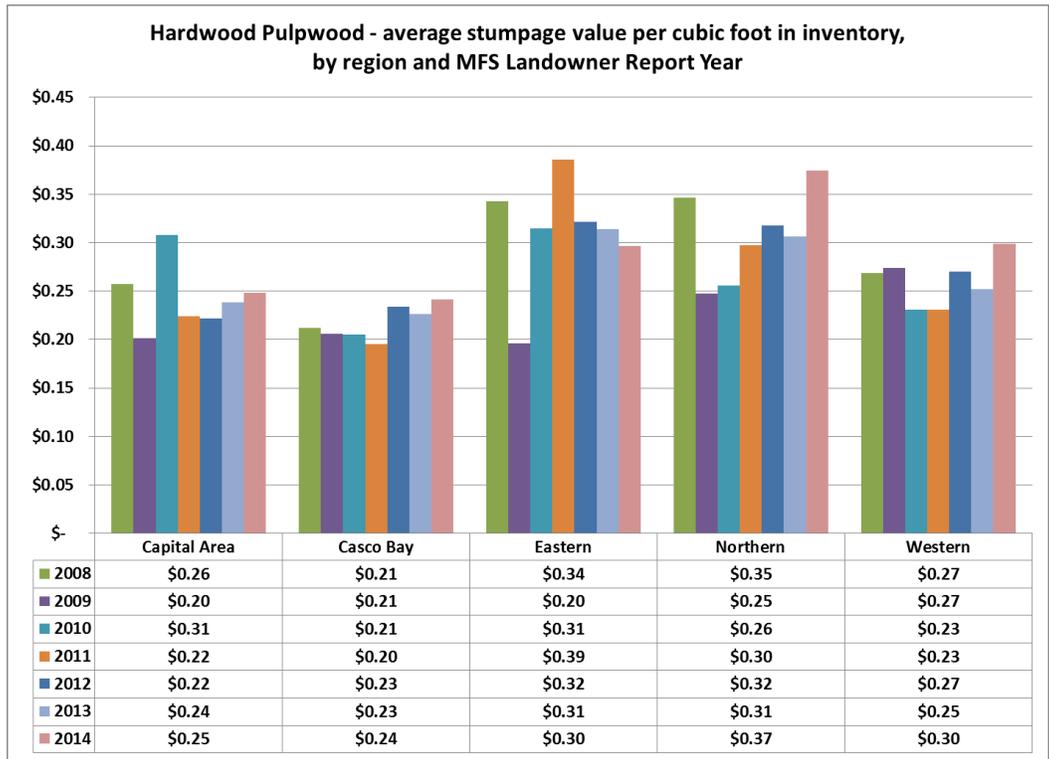
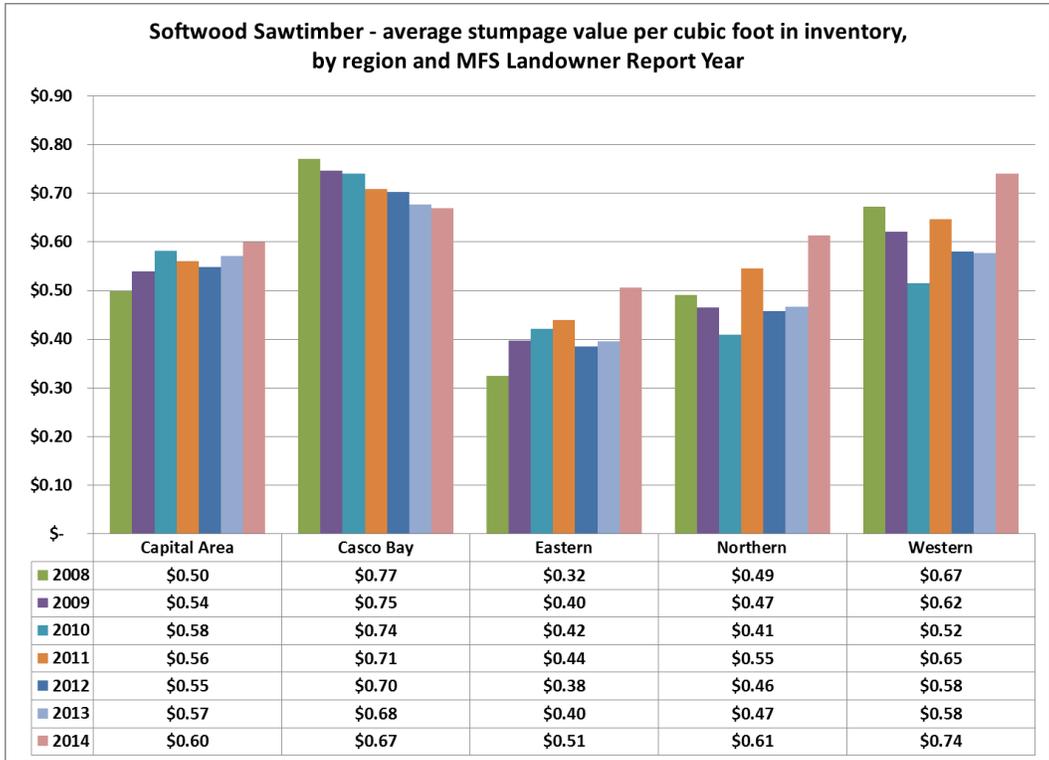


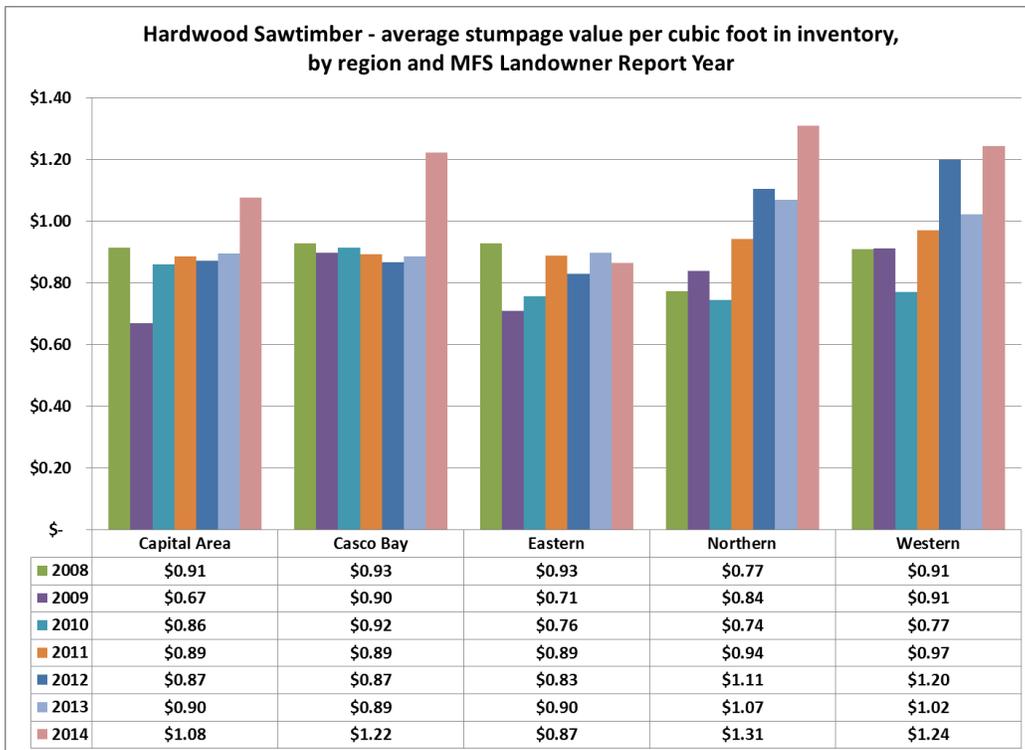
Because this version is a unit volume basis, \$ per Cord or MBF, it is much more sensitive in year to year changes. ***(The very visible anomaly in the Western Region for Hardwood Sawtimber stumpage prices in 2014 is under investigation and verification).***

The second method (Step 5B) takes the average stumpage price, by species and product, calculated in Section 1 of 3, and multiplies it by the respective estimated standing inventory of that species/product to obtain a total valuation of the inventory. It then derives a new weighted average price for the same two major species groups and two products as Step 5A. But because the standing inventory has a different composition than the annual stumpage harvests, it results in a different average stumpage value. The value is converted to an “Average \$/Cubic Foot” using 85 cubic feet per cord and derived conversions from respective FIA data of cubic feet/MBF. This now allows direct comparisons of pulpwood and sawtimber values, and because it is representing the estimated standing inventory it is less sensitive to the annual changes in underlying reported stumpage prices.

For the correct interpretation of the following graphs, the following context needs to be taken into consideration. The 2008 average stumpage value per cubic foot is based on the previously noted 2003 Maine FIA data and the 2008 stumpage price report. For noted years and bars of 2009 – 2013, the only thing that changes is the annual calculation of the average stumpage price; the underlying inventory estimate does not change. The displayed 2014 bar is based on two new pieces of data, the new 2013 Maine FIA dataset generates a new inventory basis and the incorporation of the 2014 stumpage prices, this combined effect makes it more difficult to interpret trends from 2013 to 2014.





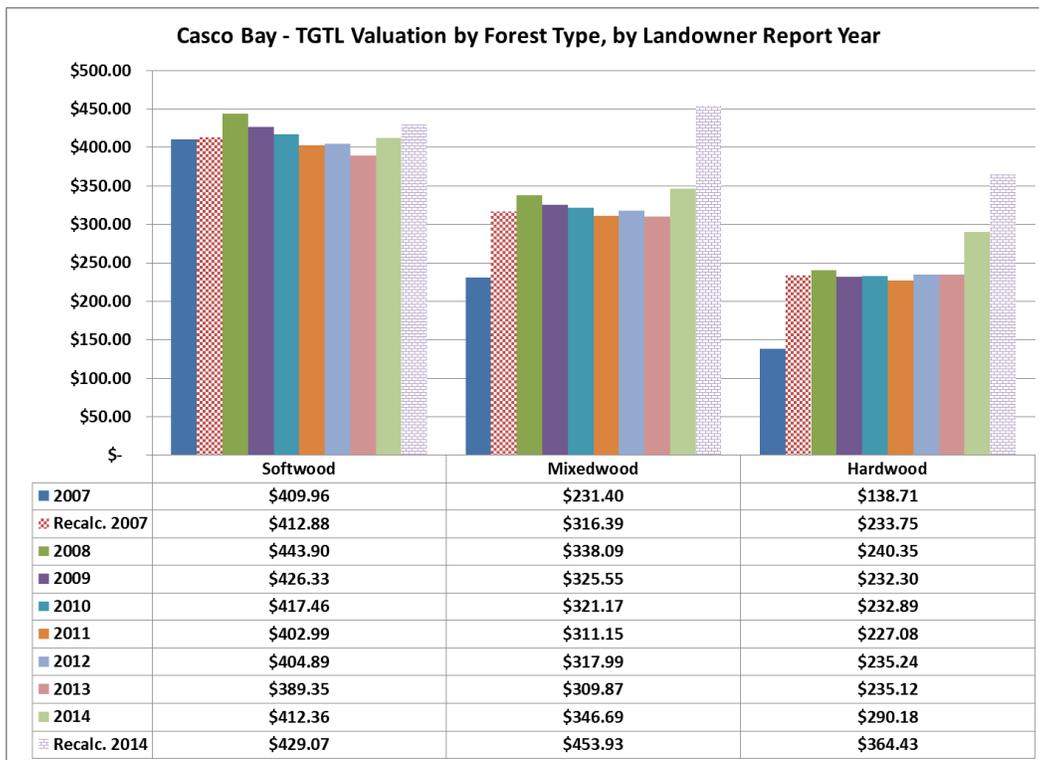
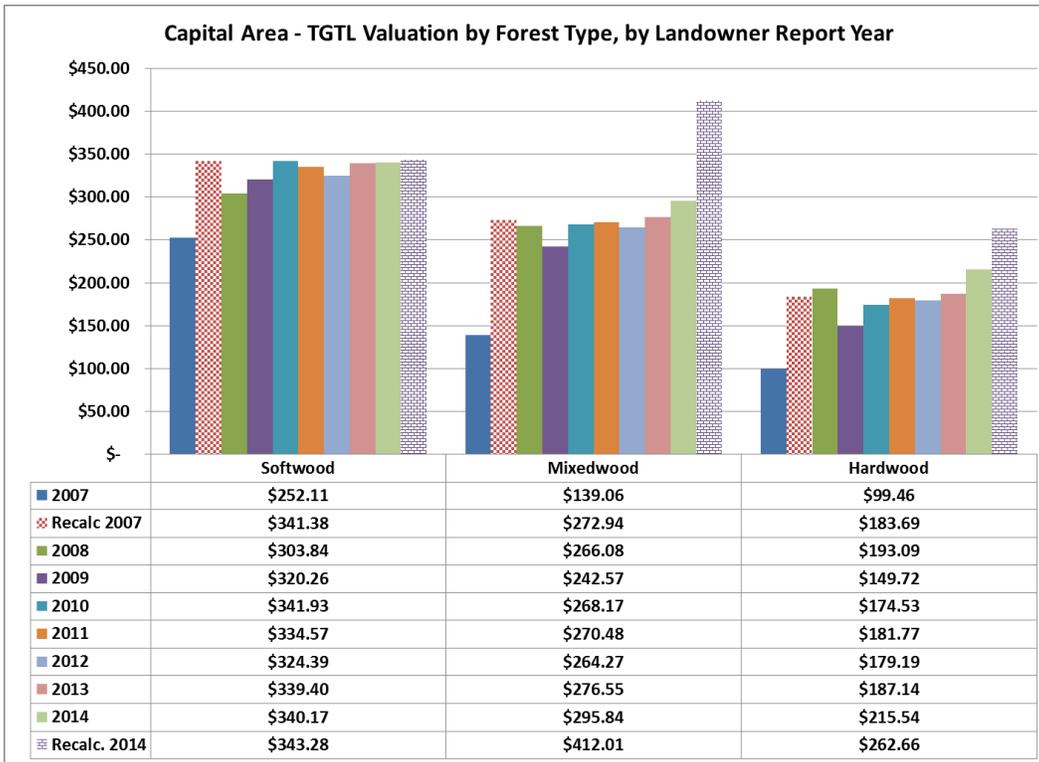


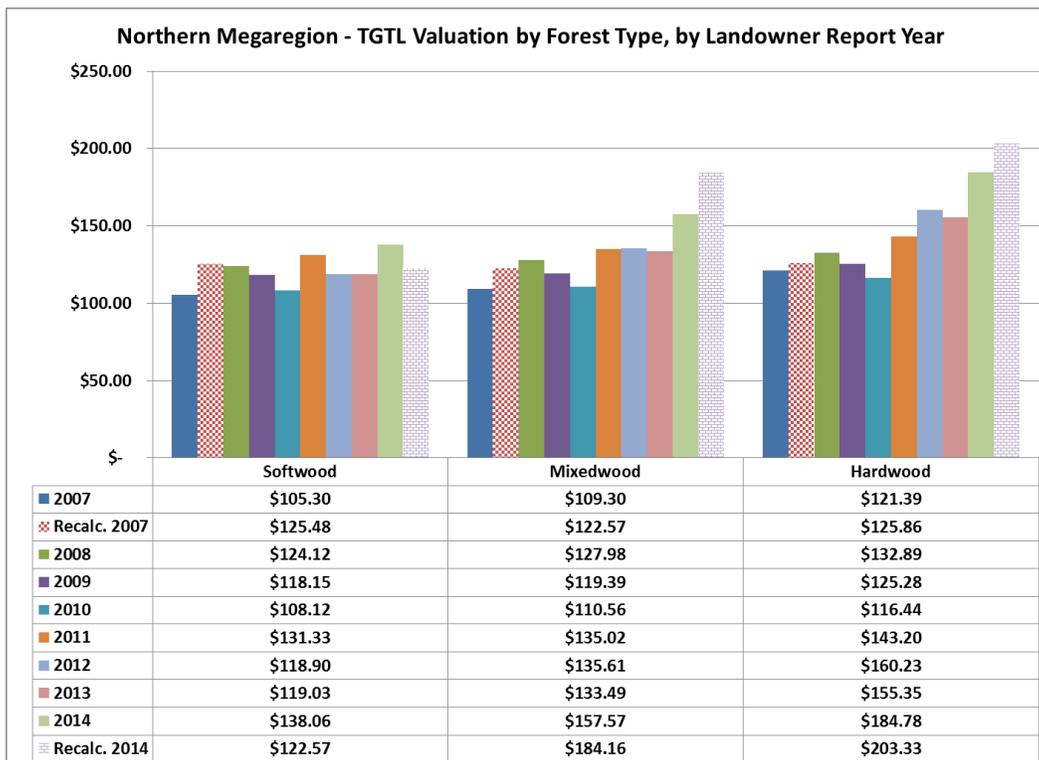
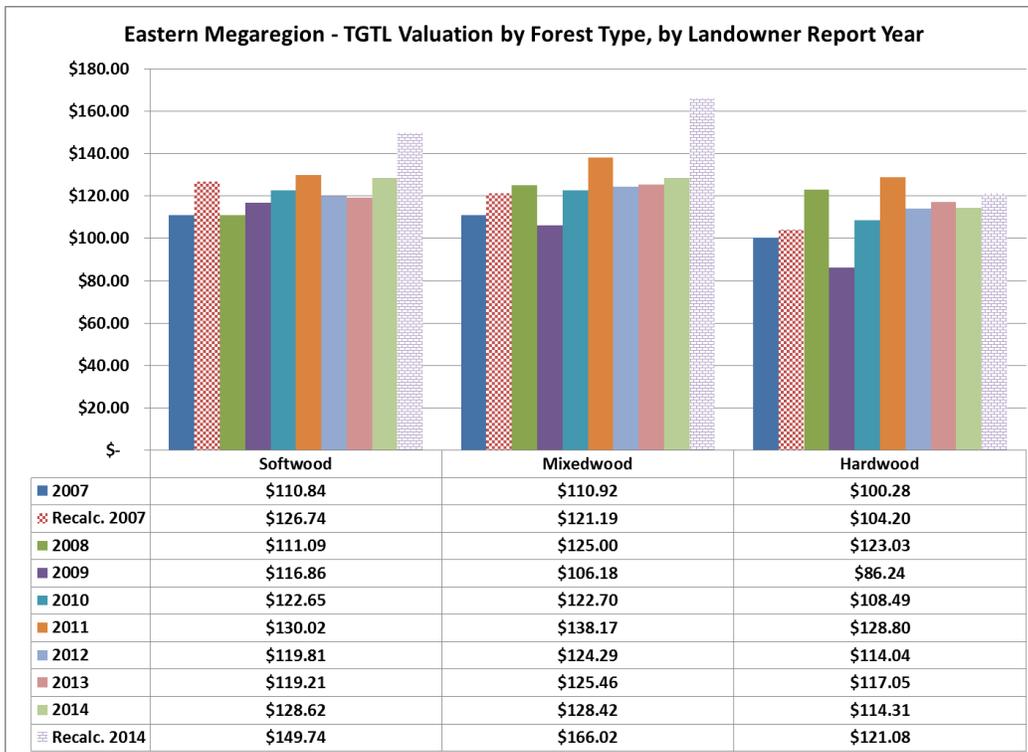
#### Step 6 – MFS Tree Growth Tax Law valuation by forest type

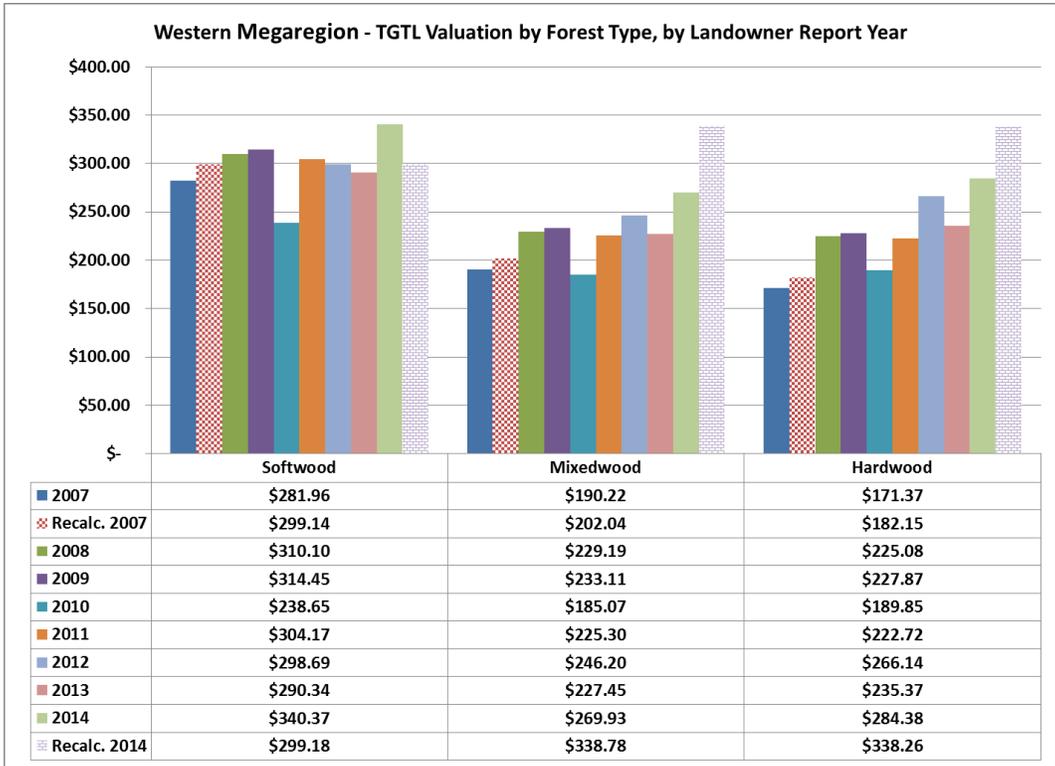
In section 3 of 3 of the Annual Landowner Report, MFS calculates an annual valuation for each region and for each of the three TGTL Forest Types. For the four noted species/product combinations, the annual productivity (Cubic Feet/Acre/Year) is multiplied by the average stumpage price (\$/Cubic Foot) to obtain an annual increment value (\$/Acre/Year). The sum of the four species/products represents the financial productivity of the net growth on an average acre. This sum is discounted 10% to reflect areas of inaccessible wood or inoperable stands. The discounted sum is then capitalized at 8.5%. In effect this step is answering the question, “What valuation per acre is required to provide an 8.5% annual return, a return that is 90% of the average annual financial productivity per acre per year.

Important points to understanding the below graphs –

- The 2007 bar is the previous valuation process prior to the planned revisions in calendar year 2009.
- The Recalc. 2007 shows how the scheduled revision process would have impacted that previous valuation.
- The 2008 bar is the first to use the revised valuation process and the new FIA dataset of 2003.
- For the 2009 – 2014 bars, the only part of the valuation process that changes every year is the recalculation and incorporation of a new average stumpage price.
- The Recalc. 2014 now shows the impact of finally incorporating the new Maine FIA 2013 dataset into the valuation process.







Synopsis – The calculation of an annual valuation for the Tree Growth Tax Law program is a multi-step process, and it is extremely difficult to point a finger at just one of those steps and equivocally state that this is the reason for a valuation increase or decrease. The aggregation of counties, species, and products masks a lot of fine scale detail and possibly some counter-current trends.