New York State Energy Research and Development Authority

Renewable Fuels Roadmap and Sustainable Biomass Feedstock Supply for New York

Annual Update #2 (2012)

January 2013

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Renewable Fuels Roadmap and Sustainable Biomass Feedstock Supply for New York

Annual Update #2 (2012)

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ABSTRACT

The Renewable Fuels Roadmap and Sustainable Biomass Feedstock Supply Study for New York (Roadmap), which was issued in April 2010, assessed the prospects for the expansion of biofuel production in New York State, focusing on resource availability and economic and environmental impacts. Energy from liquid biofuels represents a possible pathway for reducing greenhouse gases, establishing a domestic energy economy, and adapting to climate change.

The purpose of this second of two Annual Updates (Update) to the Roadmap is to provide new information that has become available since the Roadmap was issued. Forest inventory data for New York State have been updated based on a revised sampling schedule. Previously, USDA Forest Service Inventory and Analysis (USDA FIA) data were collected once every 10 years and the data were summarized. The survey is now designed so that a portion of the plots is measured each year and the entire set of plots is re-measured every five years. In addition to redesigning the sampling procedures, some changes were made to how tree biomass was estimated from the plot data that are collected (Widman *et al.* 2012). As a result of these changes, it is valuable to update the assessment of the amount of forest biomass that is both technically and potentially available for the production of biofuels, bioenergy, or bioproducts.

KEY WORDS

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Biofuels
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Feedstock
Greenhouse gas emissions
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The team is grateful for the guidance and review provided by NYSERDA's Project Manager, Judy Jarnefeld.

ACRONYMS AND ABBREVIATIONS

DBH	diameter at breast height
ODT/yr	oven dried tons per year
PAFD	potentially available forest biomass
Roadmap	2010 Assessment (Woodbury et al., 2010)
SYM	sustainable yield management
TAFB	Technically Available Forest Biomass
TANCB	technically available non-commercial biomass
TPO	Timber Products Output
USDA FIA	USDA Forest Service Forest Inventory and Analysis

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INTRODUCTION

Since the completion of the Renewable Fuels Roadmap and Sustainable Biomass Feedstock Supply for New York (Roadmap; Wojnar et al., 2010), forest inventory data for New York State have been updated based on a revised sampling schedule. Previously, USDA Forest Service Forest Inventory and Analysis (USDA FIA) data were collected once every 10 years and the data were summarized. The survey is now designed so that a portion of the plots is measured each year and the entire set of plots is re-measured every five years. In addition to redesigning the sampling procedures, some changes were made to how tree biomass was estimated from the plot data that are collected (Widman et al., 2012). As a result of these changes, it is valuable to update the assessment of the amount of forest biomass that is both technically and potentially available for the production of biofuels, bioenergy, or bioproducts. The two assessments of forest biomass potential that have been completed as part of this project will be referred to as the 2010 assessment, which was completed as part of the Roadmap (Wojnar et al., 2010), and the 2012 assessment, which is the subject of this report.

The objective of both the 2010 and 2012 assessments was to estimate the sustainable level of woody biomass that could be harvested from forests in New York on an annual basis and used for the production of biofuels, bioenergy and/or bioproducts. The same suite of restrictions and limitations were applied to the available USDA FIA and Timber Products Output (TPO) data in the 2010 and 2012 assessments. Because of the scale of these assessments and the nature of the available datasets, site-specific sustainability concerns could not always be incorporated into these estimates. Issues related to the sustainability of site-specific harvesting activities, particularly forestry best management practices and forest biomass harvesting guidelines, were discussed in Appendix E of the Roadmap (Woodbury *et al.* 2010). During both the 2010 and 2012 analyses, restrictions were applied at the county level and a sustainable yield management (SYM) model was used at the township level to address concerns related to sustainable harvesting. The main restrictions that were applied for both the 2010 and 2012 assessments are listed below in Table 1 and further details are available in Appendix E of the Roadmap (Woodbury *et al.* 2010*)*.

Table 1. Restrictions applied to address sustainability concerns during the estimate of annual biomass potential from New York forests (from Appendix E of Woodbury *et al.* 2010).

Limitation or Restriction Applied	Issue or Concern Being Addressed
Estimates of available woody biomass are based on the area of timberland[1] in New York, not forestland, so forest preserve[2] and other protected areas were not included.	Woody biomass in parks with harvesting restrictions and other protected areas that are not currently accessible for harvesting should not be included
Set the upper limit for harvesting as the net annual growth rate[3] on timberland in each county in New York.	Depleting New York forest resources at a rate faster than they are growing by using a sustained yield approach. Under this restriction New York forest biomass capital within each county is not reduced.
Limiting the proportion of forest residues that can be collected. In this analysis, 35% of the currently unused residues from logging are left on site. In addition, estimates of increased biomass harvested from the "all live merchantable"[4] class were limited to a four-inch top diameter, meaning that all tops and branches from these trees would also be left on the site.	Because of the concerns related to nutrient removals and biodiversity associated with the removal of coarse and fine woody debris during biomass harvesting, limits were set on the proportion of tops and branches that could be removed during harvesting operations. Biomass harvesting guidelines that have been developed in other states recommend that 20 – 33% of residues be left on site (Evans and Perschell, 2009).
Restricted removal of dead trees	Mortality was assumed to be left on the site to provide habitat, snags, coarse woody debris and nutrients on site.
Accounting for wood that is harvested for other forest products.	Current harvesting levels of wood in New York forests are included in the estimates for a total amount of biomass removed for traditional forest products (veneer logs, sawtimber, pulp, fuelwood, post\poles\pilings, miscellaneous). The combination of harvests of traditional forest products and biomass for biofuels does not exceed the net annual growth in any county.
Use of a sustainable yield management (SYM) model based on Vickery *et al.* 2009.	This model was applied at the township level using road density data at the township level to address concerns related to site conditions, future demographics, or potential development that might impact long-term sustained yield management.
Modification of road density calculations in townships within the Adirondack and Catskill Parks to account for inaccessible areas classified as forest preserve.	Since large areas of the forest preserve have restricted road access and harvesting policies, this was accounted for by removing the land area in the forest preserve in each township before calculating road density, which was the main factor used in the SYM model. This resulted in a higher road density in these townships and a lower estimate of the area where SYM could occur.

1 Timberland is defined by the U.S. Forest Service as forest land producing or capable of producing crops of industrial wood (more than 20 cubic feet per acre per year) and not withdrawn from timber utilization (formerly known as commercial forest land).

2The Forest Preserve is defined as the state land within the Adirondack and Catskill Parks afforded constitutional protections that prevent the removal of timber. Lands within New York's Forest Preserve exhibit exceptional scenic, recreational, and ecological value. (http://www.dec.ny.gov/lands/5263.html.)

3Net annual growth: The change, resulting from natural causes, in growing-stock volume during the period between surveys. Components of net growth are ingrowth plus accretion, minus mortality, minus cull increment, plus cull decrement.

4Merchantable biomass: The main stem of all species > 5" DBH. (diameter at breast height) between a one-foot stump height and a 4" top diameter (outside the bark), including rough and rotten culls (same as all live merchantable biomass).

MATERIALS AND METHODS

Data Sources

New York State biomass estimates in this 2012 assessment were based on the methods detailed in the Roadmap (Woodbury *et al.*, 2010). The woody forest biomass portions were estimated from FIA and TPO datasets. The most recent FIA data were used to perform the calculations, however the TPO data have not been updated since 2006 (Table 2). The FIA data were downloaded from the internet using the new US FIA web application **EVALIDator**© version 1.5.1.2a (USDA, 2012), which was developed by the U.S. Forest Service (USFS). The **TPO** data were downloaded from the Resources Planning Act National Reports website in HTML format, then copied and pasted onto an Excel spreadsheet (USDA, 2007). Data were downloaded from the EVALIDator© web application with the following features selected: (1) data attribute, (2) geographical/temporal area, (3) page, row and column variables, and if needed (4) additional filters were selected or cleared. The page, row and columns were: Species Group- Major (softwoods, hardwoods and total); County Name and Code; and Slope, respectively. In cases where the data were expressed in volume (cubic feet), they were converted to Oven-Dried Tons with Equation 1:

$$ODT = \frac{(0.027 \times V)}{1.905} \qquad \text{(Equation 1)}$$

where
ODT are the oven-dried tons,
0.027 and *1.905* are conversion factors, and
V is the volume in cubic feet.

For this assessment, only tree biomass on timberland that had slope inclination of less than 40% was considered. Forest biomass on timberland with slopes greater than 40% was not considered because harvesting logistics are more complicated and are less cost-effective, and the potential for environmental impacts is greater.

Table 2. Data sets downloaded from the EVALIDator web application. The quantities are in dry short tons, except if otherwise specified. The most recent FIA dataset corresponds to the 2007-2011 period. The TPO data were collected in 2006 and published in 2007

FIA (Annual average)	TPO
Aboveground dry weight of all live trees	Logging residues and other residues (ft^3)
Harvest removal of the growing stock (ft^3)	
Dry weight of merchantable bole (tree trunk)	
Net growth of the growing stock	
Other removal of the growing stock	
Dry weight of all live saplings	

The biomass estimation protocol had two steps: (1) determine the Technically Available Forest Biomass (TAFB) from timberland from each county in New York State and (2) determine the potentially available biomass in each county. "Technically available" is the amount of woody biomass that is available and accessible and within the limits of a sustainable yield based on biological factors from the timberland in each county (Castellano *et al.,* 2009). Technically available does not include any assessment of socioeconomic factors that may influence the availability of biomass from forests. The amount of potentially available woody biomass that could be harvested for biofuels and bioenergy is highly dependent on socioeconomic factors associated with county or town harvesting regulations, landowner attitudes, market process and demand. In this assessment a model of sustainable yield management is used to estimate the impact of these socioeconomic factors (Vickery *et al.,* 2009).

Forest Biomass Estimation

The TAFB estimates were calculated from the timberland acreage within New York State borders. Timberland is defined by the USFS as forestland producing or capable of producing more than 20 cubic feet per year and not withdrawn from timber utilization. The majority of timberland acreage within New York State is privately owned, and is less regulated than state public lands. Woody biomass within a public forestland preserve, where harvesting is prohibited, was excluded from this assessment (Table 1). All biomass estimates were calculated for softwoods, hardwoods and a combined total for each county and then summed to calculate statewide totals.

Step 1: Determination of Technically Available Forest Biomass

1.1 Total Available Merchantable Bole Biomass

Total available merchantable biomass (TAMB) was estimated from the 'Dry weight merchantable bole of all live trees' dataset downloaded from the EVALIDator© web application. TAMB is used in the calculation of the Technically Available Remaining All Live Biomass (Step 1.5). The dry weight of the merchantable boles is expressed in short tons. The definition of merchantable biomass assumes that the tops (less than 4 inches in diameter) and branches are not harvested. Rather than adjust the amount of biomass available for biofuels with a factor to estimate the amount of biomass in tops and branches, it was assumed that most of this material from future harvesting operations would be left on site to address concerns associated with biomass harvesting, especially nutrient removals from the site, coarse and fine woody debris removal and biodiversity (Evans and Perschel, 2009). However, a small portion of this material is included in the assessment, as described in Step 1.4. In addition, a portion of the tops and limbs from current harvesting operations is included in the assessment of technically available biomass. The protocol for this material is explained in Step 1.5.

1.2 Portion of Technically Available Merchantable Biomass

The portion of merchantable biomass that is available for biofuels was calculated by determining the net annual growth of growing-stock and then subtracting the amount of biomass that is currently being harvested for traditional forest products in each county using the most recent FIA data. The result of this process is that the amount of material that is currently harvested plus a portion of all live merchantable biomass that could be removed for biofuels or other applications not exceed 70% of the net annual growth in one scenario and is less than 100% in the other scenario. The details of these scenarios are explained further in Step 2.2.

1.3 Portion of Technically Available Non-Commercial Biomass

The protocol to determine the technically available non-commercial biomass (TANCB) for this assessment was modified from the 2010 assessment. To determine the non-commercial species to be considered for this estimation, the official list of non-commercial species offered by the New York State Department of Taxation and Finance (Table 3) was consulted. Previously, this list was based on expert opinion. For this assessment, the biomass data for the official species list was obtained from the aboveground dry weight of all live trees from the FIA datasets. A species-specific filter was used to query the FIA database to obtain the biomass data for the species list in Table 3. Individual trees of non-commercial species that were less than 5 inches in diameter at breast height (DBH) were not considered for the TANCB because of the difficulties harvesting this small diameter material. Then 1% or 3%, depending on the scenario (see Step 2.2), of the non-commercial biomass was considered available to be harvested for biofuels and bioenergy.

Table 3. New York State official list of non-commercial tree species according to the Department of Finance and Taxation. Witchhazel, Mountain Ash and Mountain Maple were not included in the FIA data for 2007-2011.

NYS Non-Commercial Species	*Scientific Name*
Alder	*Alnus spp.*
Blue Beech	*Carpinus caroliniana*
Boxelder	*Acer negundo*
Chokecherry	*Prunus virginiana*
Dogwood	*Cornus spp.*
Gray Birch	*Betula populifolia*
Hawthorn	*Crataegus spp.*
Hophornbeam	*Ostrya virginiana*
Mountain Ash	*Sorbus spp.*
Mountain Maple	*Acer spicatum*
Sassafras	*Sassafras spp.*
Shadbush	*Amelanchier spp.*
Striped Maple	*Acer pensylvanicum*
Willow	*Salix spp.*
Witchhazel	*Hamamelis spp.*

1.4 Portion of Technically Available Remaining All Live Biomass

The technically available remaining all live biomass (TARALB) was calculated as detailed in the Roadmap (Woodbury *et al*., 2010). This estimate was compiled by first taking the difference between the FIA assessment of the total standing biomass on timberland in each county and all live merchantable biomass by county, which was determined in Step 1.1. Next, the amount of sapling biomass (1- 4.9 inches DBH) was subtracted because this small diameter material would be difficult to collect effectively with current harvesting systems and because of concerns with potential environmental impacts associated with its removal. Then, the amount of biomass associated with noncommercial species greater than or equal to 5 inches DBH was subtracted because it was estimated in step 1.3. A portion, 1% or 3% depending on the scenario, of the remaining biomass was assumed to be available each year for biofuels applications.

1.5 Portion of Technically Available Recoverable Logging Residues

This portion of forest biomass was estimated from the TPO data for each county. It was assumed that 65% of the logging residues reported for each county would be available for biofuels and bioenergy purposes. The other 35% of the logging residues would remain on the harvesting site. Leaving this amount of residue would exceed the 20-33% recommended by harvesting guidelines that have been developed in various regions in the United States (Evan and Perschel, 2009). The 65% figure has also been used as a standard in national assessments of woody biomass availability (USDOE, 2011). Furthermore, it was assumed that most of the tops and limbs of the merchantable bole biomass portion would remain onsite.

1.6 Portion of Technically Available Recoverable Other Removals

It was assumed that 50% of the "Other Removals" in each county, based on the TPO data, is available biomass. "Other Removal" biomass data includes biomass from land clearing and other cultural operations.

1.7 Technically Available Forest Biomass

The TAFB was determined by the sum of the biomass portions calculated in Steps 1.2 through 1.6.

Step 2: Potentially Available Forest Biomass

2.1 Sustainable Yield Management Model

The approach used to account for socio-economic factors in the 2012 assessment was the same as the 2010 assessment. The methodology is summarized here, for completeness, however, there were no changes in the way these figures were derived or applied between the two assessments. This step accounts for differences in the amount of technically available biomass from timberland and the amount of woody biomass that is likely to be available due to socio-economic and sustainability constraints under current conditions. In New York, this set of factors is complex because more than 85% of the timberland is controlled by industrial and nonindustrial private forest land owners in the State, and there is an array of different opinions about forest management among them (Munsell and Germain, 2007).

These factors were adjusted based on a sustainable yield management (SYM) model developed by Vickery *et al.* (2009). The model estimates the proportion of the forested area within a township that is expected to be available for sustainable yield management now and into the future. Sustainable yield management was defined as "the ability for an area to be managed in such a manner that would ensure a continuous supply of timber through time" (Vickery *et al.,* 2009). A number of different factors were assessed to determine what currently available parameters could be used to estimate SYM. Road density was found to be the primary variable influencing the likelihood of sustained yield management in a five-county region in central New York, and was the factor applied in the SYM model for these estimates (Vickery *et al.,* 2009).

Using townships (by county) as the base study unit, road density was calculated as the length of major roads in miles divided by the township land area in square miles using Arc Map road and civil division datasets that were acquired from the New York State Geographic Information Clearinghouse (http://www.nysgis.state.ny.us/). These datasets are maintained by the NYS Office of Cyber Security and Critical Infrastructure Coordination and are of the highest quality and accuracy. The area covered by major water bodies in each township was removed to determine the total land area. For the townships that included forest preserve as a major land us,e the land area and road mileage in the forest preserve were removed because this area was already excluded from the assessment. The road density in these townships was determined by dividing the total length of major roads by the modified land area (total area of the township minus the area of the township in the forest preserve). The calculated road density for each township was then used as input in the model developed by Vickery *et al.* (2009) to estimate the proportion of the forest land area where SYM would likely occur in that township. This SYM factor for each county was determined by taking a weighted average of the land area of each township as a proportion of the total land area of the county in which the township is found.

2.2 Potentially Available Forest Biomass Estimate

For the 2012 assessment, two scenarios and one scenario variation of potentially available forest biomass (PAFB) were considered. The three scenarios were constructed from variations of the parameters estimated in Steps 1.1 through 1.6 (Table 4), and the PAFB was estimated for each county by type of biomass (softwood, hardwood and total). The county-level SYM factor was then applied to each county.

Scenario 1 assumes 70% of the net annual growth is available to meet the demand for current harvesting for traditional products and biomass for bioenergy and other applications. This scenario assumes that 1% of non-commercial biomass and remaining all live biomass is available for bioenergy uses. The amount of logging residues is set at 65% and the amount of other removals is set at 50% for this and all other scenarios (Table 4). The results from the SYM model that were applied were directly based on the values that were calculated in the 2010 report. The parameters in 2012 Scenario 1 match Scenario 1 in the 2010 report.

Scenario 1A is the scenario variation. It assumed 100% availability of the net annual growth of the growing stock, 3% availability of non-commercial biomass and 3% of the remaining all live biomass. This scenario was not considered in the 2010 report, but components of it were included in Scenarios 2 and 3 in 2010. Scenario 1A is reported here to provide a baseline for Scenario 2, which provides insight into the impact of changing the socioeconomic factors in the SYM model.

Scenario 2 in this 2012 assessment used the same factors for the assessment of technically available biomass (100% of the net annual growth, 3% availability of the non-commercial biomass and remaining all live biomass) as Scenario 1A, but modified the results of the SYM model. For Scenario 2, the difference between the TAFB and PAFB was calculated. This difference was then multiplied by a market demand adjustment factor (⅓). Finally, the adjusted difference was added to the PAFB (Equation 2). This adjustment assumes that changes in landowner attitudes and demand for biomass will result in an increase in biomass harvesting for the bioenergy market. The factors applied to determine the technically available biomass and the modification to the SYM model used for Scenario 2 in this 2012 assessment are the same as Scenario 2 and 3 in the 2010 report.

$$B = \left((T - P) \times \frac{1}{3} \right) + P \qquad \text{(Equation 2)}$$

Where
B is the PAFB estimate for Scenario 2
T is the TAFB estimated in Step 1.6
P is the PAFD estimated in Scenario 1
and ⅓ is the market demand adjustment factor

Table 4. Description of the factors used to calculate technically available and potentially available forest biomass for the scenarios in the 2012 assessment. The corresponding scenarios and the values used in the 2010 assessment are included for comparison purposes.

2012 Assessment Step	Scenario 1	Scenario 1A	Scenario 2
Parallel 2010 Scenario	1	NA	2 & 3
1.2 Portion of technically available merchantable biomass	70%	100%	100%
1.3 Portion of technically available non-commercial biomass	1%	3%	3%
1.4 Portion of technically available remaining all live biomass	1%	3%	3%
1.5 Portion of technically available recoverable logging residues	65%	65%	65%
1.6 Portion of technically available recoverable other removals	50%	50%	50%
2.1 Sustainable Yield Management (SYM) Model	SYM factor unmodified	SYM factor unmodified	SYM with market adjustment factor

RESULTS

General Biomass Estimate

The most recent FIA survey suggests that there are approximately 19.6 million acres of forestland in New York, but not all of this acreage was considered for this assessment. For this assessment only the biomass on timberland (as defined by the U.S. Forest Service) was considered. The FIA estimates 15.9 million acres of timberland are in New York State with approximately 903.7 million short tons of live biomass of trees with a DBH of 1 inch or greater. From the total amount of live tree biomass, the FIA assessment estimates indicate that approximately 636.4 million short tons of merchantable bole biomass exist. The merchantable bole biomass portion only considers trees with 5 inches of DBH and only includes the bole to a diameter of 4 inches. The biomass of the net annual growth of the growing stock is estimated to be approximately 8.9 million tons per year.

Technically Available Forest Biomass Estimates

According to the estimates conducted in this 2012 assessment and compared with the results obtained in the 2010 assessment, the TAFB was higher in the 2012 assessment for both Scenario 1 (increase from 6.6 to 8.1 million oven-dried tons per year, ODT/yr) and Scenario 2 (increase from 9.0 million ODT/yr to 12.3 million ODT/yr, Figure 1). In both scenarios the greatest gain in biomass was in the non-commercial and remaining all live biomass portions (sum of portions calculated in step 1.2 and 1.4). A slight decrease in technically available biomass occurred in the total recoverable not used portion (Table 5).

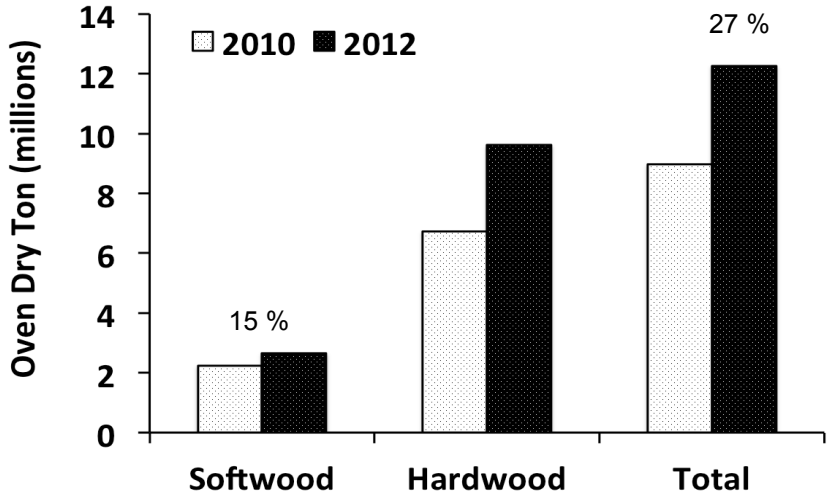

Figure 1. The amount of technically available forest biomass (TAFB) in the 2010 and 2012 assessments for Scenario 2. Overall TAFB increased by 27% from the 2010 to the 2012 assessment.

Table 5. Technically available and potentially available forest biomass (million oven dry tons per year) and their components for Scenario 1 and 2 in both the 2010 and 2012 assessments.

	Scenario 1		Scenario 2	
Biomass Estimate Steps	2010	2012	2010	2012
1.2 Portion of technically available merchantable biomass	4.77	5.35	5.15	5.84
1.3 and 1.4 Portion of technically available non-commercial biomass	0.97	1.85	2.91	5.55
1.5 and 1.6 Portion of technically available recoverable logging	0.91	0.87	0.91	0.87
1.7 Technically available forest biomass	6.6	8.1	8.97	12.3
2.2 Potentially available forest biomass	4.8	4.3	6.4	8.4

Suffolk and Nassau Counties had the greatest positive percent change in TAFB, however these two counties are located on Long Island, which is not considered a timber harvesting region. Among the counties outside the greater New York City Area, St. Lawrence (89%) and Yates (84%) counties had the greatest positive percent change, while Broome (-311 %) and Orange (-158 %) counties had the greatest decrease between the 2010 and 2012 assessments. Furthermore, if the seven counties located within the greater New York City area are excluded from the analysis, 76% of the counties had positive percent change in woody biomass when comparing the two assessments.

Potentially Available Forest Biomass

The total PAFB estimates for the different scenarios varied in the 2010 and 2012 assessments. An estimated 4.3 million ODT/yr for Scenario 1 in 2012 compared to an estimate of 4.8 million ODT/yr in 2010, a decrease of about 10%. However, for Scenario 2 in 2012 there was a 31% increase in PAFB compared to the values for Scenarios 2 and 3 in the 2010 assessment. The total PAFB increased from 6.4 million ODT/yr in the 2010 assessment to 8.4 million ODT/yr estimated in the 2012 assessment (Table 5).

The amount of potentially available biomass varied widely across the state (Figures 2 and 3) in the 2012 assessment. In Scenario 1, Cattaraugus County had the largest amount of PAFB (401,285 ODT/yr), while the counties in and around the greater New York City area had the lowest available biomass. No other county had more than 400,000 ODT/yr of PAFB and only one other county (Delaware 300,014 ODT/yr) had more than 300,000 ODT/yr of PAFB.

In general, the spatial distribution of the PAFB suggests that there are two major zones where there are significant concentrations of PAFB. The areas with the highest levels of PAFB are in southwest and southeast New York. In these areas, there are clusters of counties with 100,000 - 200,000 ODT/yr per county of PAFB. Where these counties are grouped together, the potential exists for large amounts of forest biomass to be available. The spatial patterns are similar for Scenario 2, but with higher values than in Scenario 1 (Figure 3). In addition, in Scenario 2 there are larger amounts of PAFB in the Tug Hill and northeast Adirondack regions compared to Scenario 1.

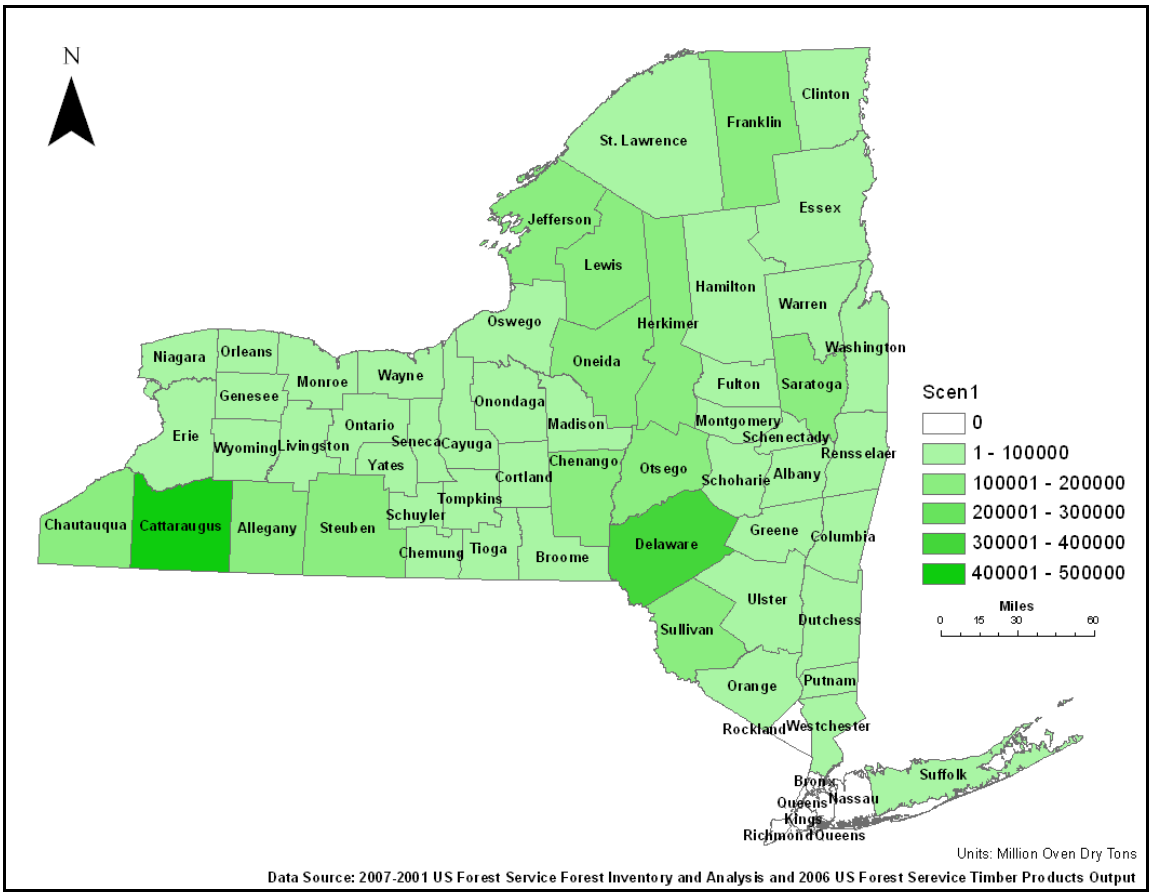

Figure 2. Spatial distribution of the potentially available forest biomass estimated in Scenario 1 for New York State. The classes are grouped in annual availability of 100,000 oven dry tons increments in each county.

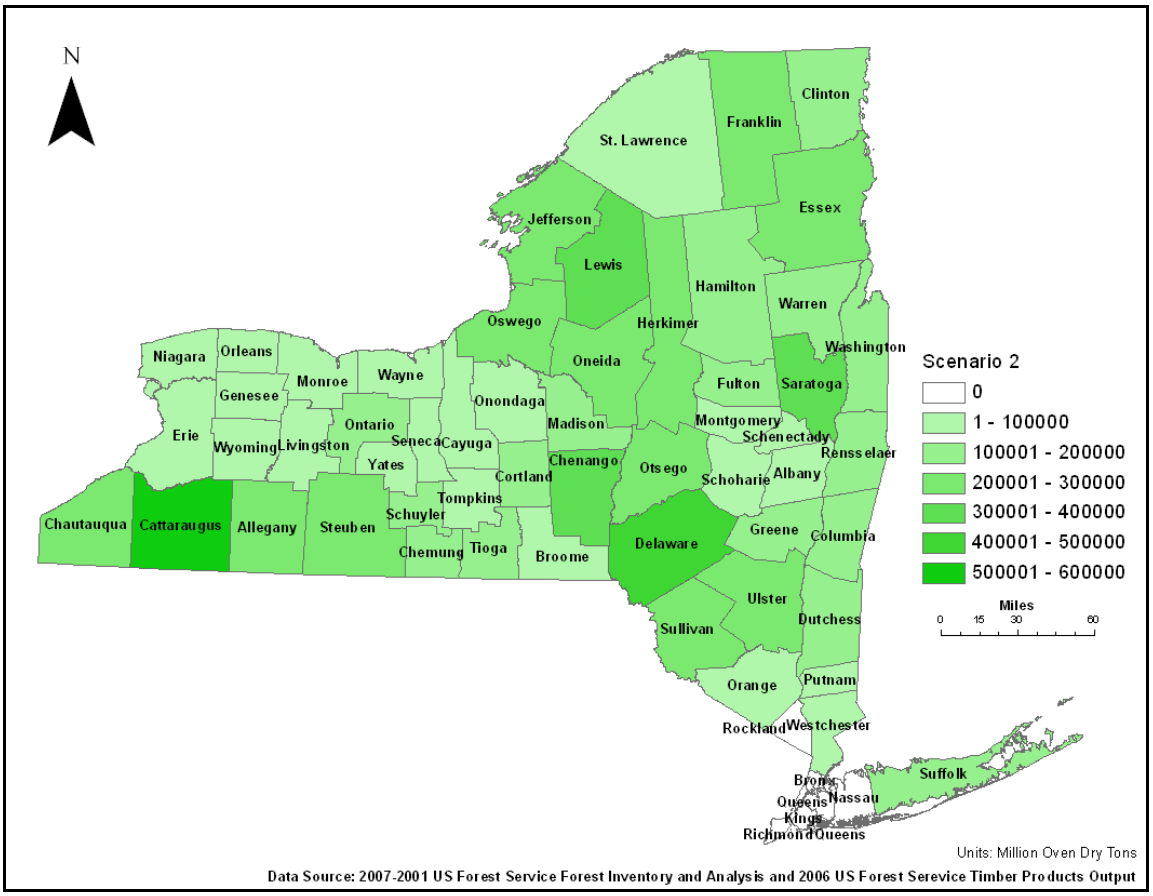

Figure 3. Spatial distribution of the potentially available forest biomass estimated in Scenario 2. The classes are grouped in annual availability of 100,000 oven dry ton increments in each county.

CONCLUSIONS

This 2012 assessment of potentially available forest biomass indicates that there are some changes in the estimates compared to the 2010 assessment, but that large amounts of forest biomass are available in New York for biofuels, bioenergy and bioproducts after demand is met for traditional forest products. The 2012 assessment of PAFB indicates that there is a slight decrease from 4.8 million to 4.3 million ODT/yr in Scenario 1. However, under Scenario 2, PAFB increased substantially from 6.4 million ODT/yr in 2010 to 8.4 million ODT/yr in 2012. Changes in the way that FIA assessments are conducted, the frequency of the sampling interval, and methods to determine forest biomass as well as changes in forestry operations and practices in recent years all contributed to these changes.

Although this 2012 assessment did improve the estimate of potentially available biomass from timberland in New York, a number of the limitations that were associated with the 2010 assessment still apply. For example, while the FIA data set has been improved, the spatial resolutions are still large (each FIA plot represents about 6,000 acres). As a result, whereas these updated values provide a general idea of the amount of forest biomass available and where in the state the largest amounts could be located, the data set does not provide enough spatial resolution to allow development of specific projects. Site-specific assessments of PAFB should be completed for each individual project to ensure that there is enough woody biomass available in that area.

The sustainable yield model that was used in both the 2010 and 2012 reports was developed in a five-county region in Central New York, so applying it to the entire state has some limitations. However, at the time it is the best model available and provides an idea of the potential impact of socioeconomic factors on the supply of woody biomass. The impact of socioeconomic factors will vary around the state, so specific assessments should be done at a finer scale before specific projects are developed. Additional details regarding the limitations of the approach that was used to assess the potentially available forest biomass in New York can be found in the 2010 report.

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