GEORGIA FORESTRY COMMISSION

Forestry Biomass Assessment for Georgia – General Statewide Estimates, 2021

Introduction

This assessment is an update of a similar assessment of forestry biomass made during March of 2008. This assessment uses updated data sources and attempts to provide more detailed analysis of the data than the earlier assessment. The assumptions used have also been updated to reflect the current knowledge of data sources and recovery capabilities of forest practices.

Non-Merchantable Biomass

Non-merchantable biomass in standing timber is defined by the author as all biomass above stump height in standing timber less merchantable biomass in standing timber. *Potentially available* non-merchantable biomass is defined as the non-merchantable biomass less the amount of non-merchantable biomass that typically is harvested for merchantable products as a result of improved manufacturing and harvesting methods. Georgia Timber Harvest and Utilization studies (Bentley, 2015) have determined that non-merchantable biomass estimates must be reduced to the percentages shown in Table 1 to remove stump volumes and as a result of improved harvesting and utilization.

Table 1: Amount of Non-Merchantable Wood Volume (Non-growing Stock) Potentially Available in Trees after Harvest in Georgia (Bentley, 2015)

Species Group	Poletimber	Sawtimber
Softwood	42.4%	66.1%
Hardwood	56.9%	71.3%

Non-merchantable forest biomass can be recovered during traditional timber harvesting (thinning and final harvests) and during additional treatments that forest energy markets make economically feasible, such as pre-commercial thinning or stand improvement activities.

Using the above definition applied to the Forest Inventory and Analysis Georgia database, 2018 timber inventory data yields the following estimates for potentially available non-merchantable forest biomass from forest stands that are old enough to make practical a traditional commercial thinning or final harvest.

Sourced from planted stands of dominant pine type > 15 yrs. old	=	25.8 million dry tons
Sourced from all other timberland areas > 20 years old	=	134.8 million dry tons
Total from all timberland areas of merchantable age	=	**160.6 million dry tons**

Planted pine stands of dominant pine type older than 15 years and other stands using natural regeneration older than 20 years are subject to traditional thinning and other forest

practices. An average of 1.9% of Georgia's timberland receives a thinning or partial harvest and 1.4% receives a final harvest treatment each year. An estimation of available non-merchantable biomass on merchantable-aged forest stands in Georgia can be performed by assuming the biomass is distributed evenly across Georgia's forests, that 100% of the biomass can be recovered in final harvest areas, and that 50% can be recovered in partial harvest areas. This can be calculated as follows:

(partial harvest) 160.6 x 1.9% x 50%	=	1.53 million dry tons
(final harvest) 160.6 x 1.4% x 100%	=	2.25 million dry tons
Total annual estimate from commercial harvests	=	3.77 million dry tons

Pine and mixed pine/hardwood stands are often overly-dense resulting in slow tree growth and increased risk of insect and disease damage to trees. The health of these stands could benefit from early thinning that would remove material currently considered non-merchantable. This practice is termed pre-commercial thinning. The total estimated "non-merchantable" biomass on naturally regenerated pine forest stands and mixed pine/hardwood forest stands is **49,624,906 dry tons.** An average annual estimated yield of non-merchantable biomass from pre-commercial thinnings on naturally regenerated stands, excluding hardwood timber types, would be **496,249** dry tons if only 1% of the non-merchantable biomass in all these stands younger than 20 years is recoverable.

Pre-commercial thinning of planted pine stands could also provide additional biomass, especially by modifying current silvicultural systems and stocking rates. Planted stands are also often overly-dense because of natural regeneration occurring in addition to tree planting. However, it is currently difficult to assess the ability of planted stands to provide additional biomass than what is produced during the normal planned commercial thinning and final harvest. It is important to note that the biomass estimates made above do not include 2.8 million acres of planted pine timberland that is less than 15 years old.

The above estimates include only the non-merchantable portions of growing stock trees and only the non-merchantable portions of rough and rotten trees (classifications by US Forest Service FIA program). It follows that the portions of stumps in trees >5" in diameter were not included in the above estimates. It should be considered that assessments made prior to 2009 may have included all biomass in rough and rotten trees as available non-merchantable biomass.

Logging Residues and Related Biomass Removals

The Timber Product Output data published by the US Forest Service Southern Research Station provides estimates of timber removals for products, logging residue production and other removals of timber from timberland. The amounts estimated for all of Georgia as an annual average for the period

GEORGIA FORESTRY COMMISSION

2005 through 2015 is in Table 2 below. Table 3 shows the estimated amounts for logging residues and other removals, excluding timber products and excluding any biomass amounts in stumps. The green ton total is divided by 2 to derive the dry tons' amount. Then dry tons are either multiplied by 16% for softwoods and 22% for hardwoods to account for the stump volume that is left in the woods.

The non-growing stock estimates shown in Tables 2 and 3 would be included in the non-merchantable biomass from timberland estimates above. However, the "growing stock" estimates might provide an estimate of another source of forest biomass. Growing stock listed under Logging Residues in the table below includes merchantable-sized timber that is severed from the stump and not utilized. The growing stock listed in the "Other removals" section is likely the same, but may include small amounts of timber that remains growing on the land in another land use, such as trees remaining in pasturelands or in newly developed urban areas.

Table 2: Annual Timber Removals from Georgia TPO Database, Average 2005-2015

Item	All	Growing stock	Non-growing stock
Roundwood products	**Dry Tons**	**Dry Tons**	**Dry Tons**
Softwood	15,121,654	13,902,746	1,218,908
Hardwood	2,807,186	2,635,126	172,060
Subtotal	**17,928,840**	**16,537,872**	**1,390,968**
Logging Residues			
Softwood	2,660,929	778,810	1,882,119
Hardwood	1,602,085	624,776	977,309
Subtotal	**4,263,014**	**1,403,586**	**2,859,428**
Other Removals			
Softwood	891,080	669,741	221,339
Hardwood	831,872	503,898	327,974
Subtotal	**1,722,952**	**1,173,639**	**549,313**
Total Removals			
Softwoods	18,673,663	15,351,297	3,322,366
Hardwoods	5,241,143	3,763,801	1,477,343
Total	**23,914,807**	**19,115,098**	**4,799,709**

GEORGIA FORESTRY COMMISSION

Table 3: Annual Logging Residues and Other Removals, Excluding Merchantable Products and Excluding Stumps from Georgia TPO Database, Average 2005-2015

Item	All	Growing Stock	Non-Growing Stock
Logging residues	**Dry tons**	**Dry tons**	**Dry tons**
Softwood	2,660,930	778,810	1,882,119
Hardwood	1,602,086	624,776	977,309
Subtotal	**4,263,016**	**1,403,586**	**2,859,428**
Other removals			
Softwood	891,080	669,741	221,339
Hardwood	831,872	503,898	327,974
Subtotal	**1,722,952**	**1,173,639**	**549,313**
Total	**5,985,969**	**2,577,227**	**3,408,742**

Assuming that the same level of growing stock will continue to be un-utilized (i.e. 100% available for recovery) would provide an annual estimate of **1,403,586** dry tons of logging residues. A conservative estimate of biomass from trees which are severed from the stump in "other removals" would be 75%. This would yield **880,229** dry tons (**1,173,639** * .75) of growing stock currently removed from timberland and not utilized.

Forest Product Manufacturing Residues

The average estimated amount of wood residues produced annually from forest manufacturing facilities during 2005-2015 was **4,112,350** dry tons. Only **1,215** dry tons were not used as a by-product. The average annual amount of these residues used by the pulp and paper industry in the form of chips for fiber production was **2,018,000** dry tons.

Urban Wood Waste

In 2019 the U.S. Forest Service and the SUNY College of Environmental Science and Forestry produced a study regarding forest biomass amounts, which included estimates of recoverable urban waste wood. According to the SUNY study there is **2.2 million metric dry tonnes (2.42 million dry tons)** of urban wood waste available in Georgia annually. The value of the urban waste wood is between **$6.6 million - $52.7 million** per year, depending upon the products derived from the waste wood (e.g. lowest to highest value: wood chips, firewood, pallets, lumber). **This study states that Georgia has the second greatest urban wood product potential in the USA.**

GEORGIA FORESTRY COMMISSION

Additional Growth of Timber on Timberland

Between 2014 and 2018, the average annual net growth of merchantable-sized trees on timberland in Georgia has been **8,127,664** dry tons of wood and bark in merchantable stems on private and state owned timberland. This is over and above the removals of timber.

Pulp and Paper Manufacturing Use of Pulpwood

During the period from 2005 through 2015, the pulp and paper manufacturing industry in Georgia used an average **7,688,584** dry tons per year of standing round wood fiber. In addition, an average of **2,018,000** dry tons per year of residue chips was used by the pulp and paper industry in Georgia.

Summary

Table 4 and Chart 1, shown on pages 6-7, provide a summary of general estimates of biomass availability for bioenergy use in Georgia.

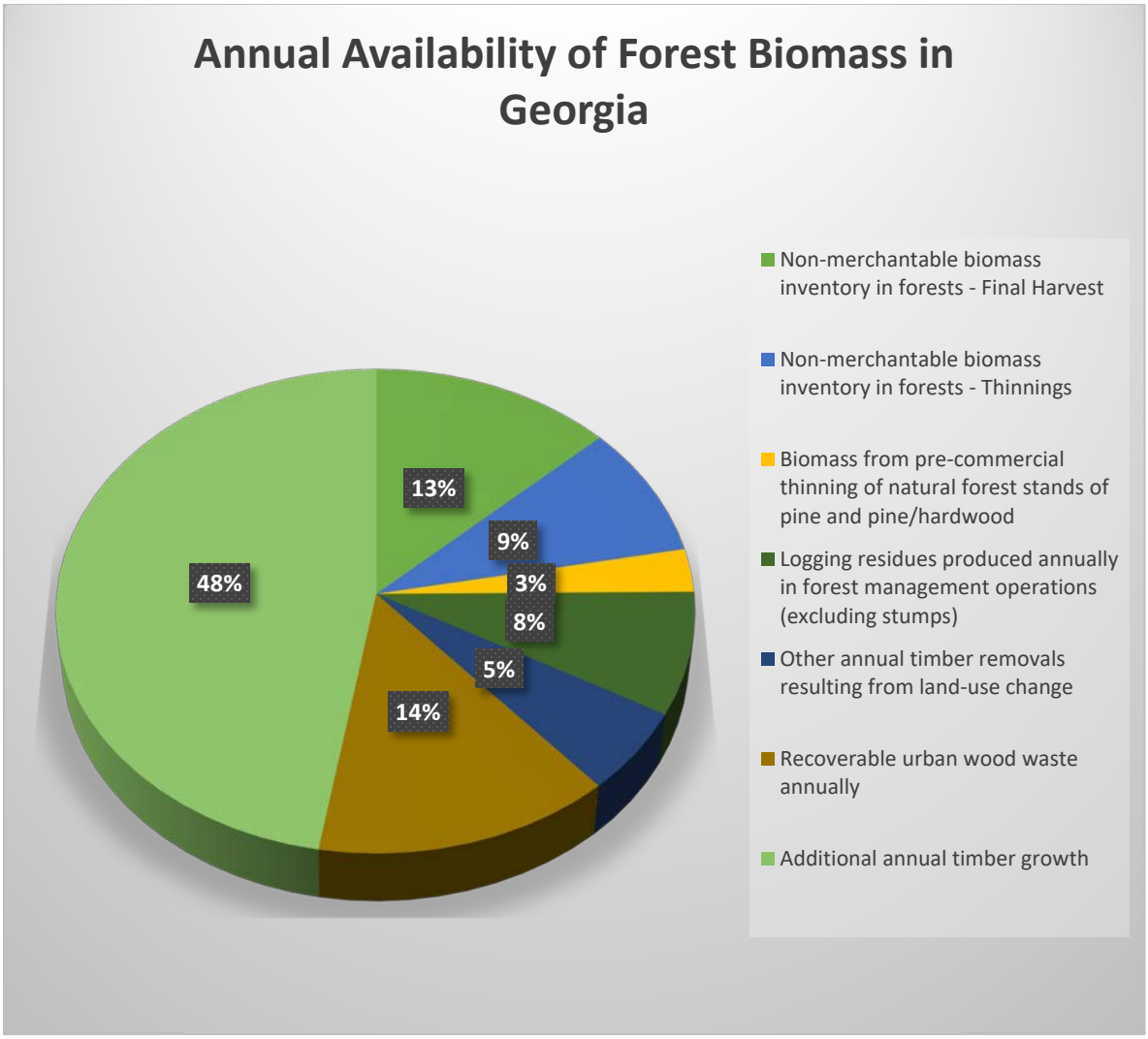
GEORGIA FORESTRY COMMISSION

Table 4: Summary of General Estimates of Annual Forestry Biomass Amounts for Bioenergy Use in Georgia

Resource	Notes	Amount (dry tons)	Estimated Recovery (%)	Amount to Recover (dry tons)	Cumulative Amount (dry tons)
"Non-merchantable" biomass inventory in forests	Recovery during (final) harvests	160,658,814	1.4%	2,249,223	2,249,223
"Non-merchantable" biomass inventory in forests	Recovery during thinning's	160,658,814	0.95%	1,526,259	3,775,482
Biomass from "pre-commercial" thinning of natural forest stands of pine and pine/hardwood	-	49,624,906	1.0%	496,249	4,271,731
Logging residues produced annually in forest management operations (excluding stumps)	From Growing Stock	1,403,586	100.00%	1,403,586	5,675,317
	From non-growing stock (included in non-merchantable biomass)	2,859,428	0%	0	5,675,317
	Total	4,263,014		0	5,675,317
Other annual timber removals resulting from land-use change	Estimate 75% recovery	1,173,639	75.0%	880,229	6,555,546
Mill residues produced annually	-	4,112,350	0.0%	0	6,555,546
Recoverable urban wood annually	-	2,425,084	100.0%	2,425,084	8,980,630
Additional annual timber growth	2005-2015 average	8,127,664	100.0%	8,127,664	17,108,294

GEORGIA FORESTRY COMMISSION

Chart 1: Annual Availability of Forest Biomass in Georgia



GEORGIA FORESTRY COMMISSION

References:

Forest Inventory and Analysis Data as listed on the Mapmaker database. Southern Research Station, US Forest Service. 2018. http://www.ncrs2.fs.fed.us/4801/fiadb/fim30/wcfim30.asp

Bentley, James, Harper, Richard. *Georgia Harvest and Utilization Study, 2015*. Southern Research Station, US Forest Service. SRS-117. 2006

Ash, Ryan M., Greenfield, Eric J., Nowak, David J. *Annual Biomass Loss and Potential Value of Urban Tree Waste in the United States.* USDA Forest Service, Northern Research Station, 5 Moon Library, SUNY-ESF, Syracuse, NY 13210, United States, SUNY College of Environmental Science and Forestry (ESF). 2019

Johnson, Tony, McClure, Nathan, Wells, John. *Georgia's Timber Industry – An Assessment of Timber Product Output and Use, 2015*. Southern Forest Research Station. US Forest Service. 2007

Johnson, Tony, Steppleton, Carolyn. *Southern Pulpwood Production, 2016*. Southern Forest Research Station. US Forest Service. 2016

Timber Product Output database as published on the Southern Research Station website. US Forest Service. 2017. http://srsfia2.fs.fed.us/php/tpo2/tpo.php

Note: The following conversion rates were used, if data did not provide appropriate conversion to weight units: 5600 lbs. per cord for hardwood, 5400 lbs. per cord for softwood, 32.5 lbs. per cubic foot of biomass (dry weight), green biomass was assumed to have 50% moisture content (green weight basis).

Report Author:

William H. Whitley
Utilization & Marketing Specialist
Georgia Forestry Commission
wwhitley@gfc.state.ga.us

May 12, 2021