Morehouse, Louisiana Catchment Area Analysis

August 2019

Commissioned by:
Drax

Conducted by:
Forisk Consulting
Athens, GA 30604
www.forisk.com

Principal investigators:
Amanda Hamsley Lang, COO/VP Client Services
ahlang@forisk.com
Andrew Copley, Analyst/Project Manager
acopley@forisk.com

Table of Contents

Executive Summary

This memo provides summary analysis of a timber market defined in cooperation with Drax and located in Northern Louisiana and Southern Arkansas. The Morehouse Market features abundant pine timber supplies and balanced hardwood supplies. Private timberland owners account for 96% of the timber inventory in the area, and over half of this area is owned by corporate owners (i.e. investment managers, REITs, and corporations) with cash flow expectations. The market has industrial, diversified mills with recent investments in sawmills and pulpwood-using facilities. Pellet producers use 6% of the roundwood used by the forest products industry in the Morehouse market; Drax uses 4% of the roundwood in the market. Roundwood pulpwood consumption is concentrated in the pulp and paper sector, which represents 75% of pulpwood demand. Prices for all pine products have declined since 2010; ample pine supplies softened prices. Hardwood prices increased over this time frame with upward pressure from tighter supplies.

Overall, bioenergy markets have not directly impacted forest management activities or forest supplies in the Morehouse Market (Figures 1 and 2). Bioenergy markets benefit timberland owners by adding outlets for wood in the region. Likewise, bioenergy plants that purchase sawmill residuals benefit solid wood markets as access to residual markets is a limiting factor to the expansion of lumber facilities.

Figure 1. Bioenergy Impacts on Markets and Forest Supplies in the Morehouse Market

Activity	Is There Evidence That Bioenergy Demand Has Caused the Following?	Explanation
Deforestation	No	
Change in Forest Management Practices	No	
Diversion from Other Markets	Possibly	Bioenergy plants compete with pulp/paper and OSB mills for pulpwood and residual feedstocks. There is no evidence that these facilities reduced production as a result of bioenergy markets, however.
Increase in Wood Prices	No	There is no evidence that bioenergy demand increased stumpage prices in the market.
Reduction in Growing Stock of Timber	No	
Reduction in Sequestration of Carbon / Growth Rate	No	
Increase in Harvesting Above the Sustainable Yield	No	

Figure 2. Bioenergy Impacts on Forests Markets in the Morehouse Market

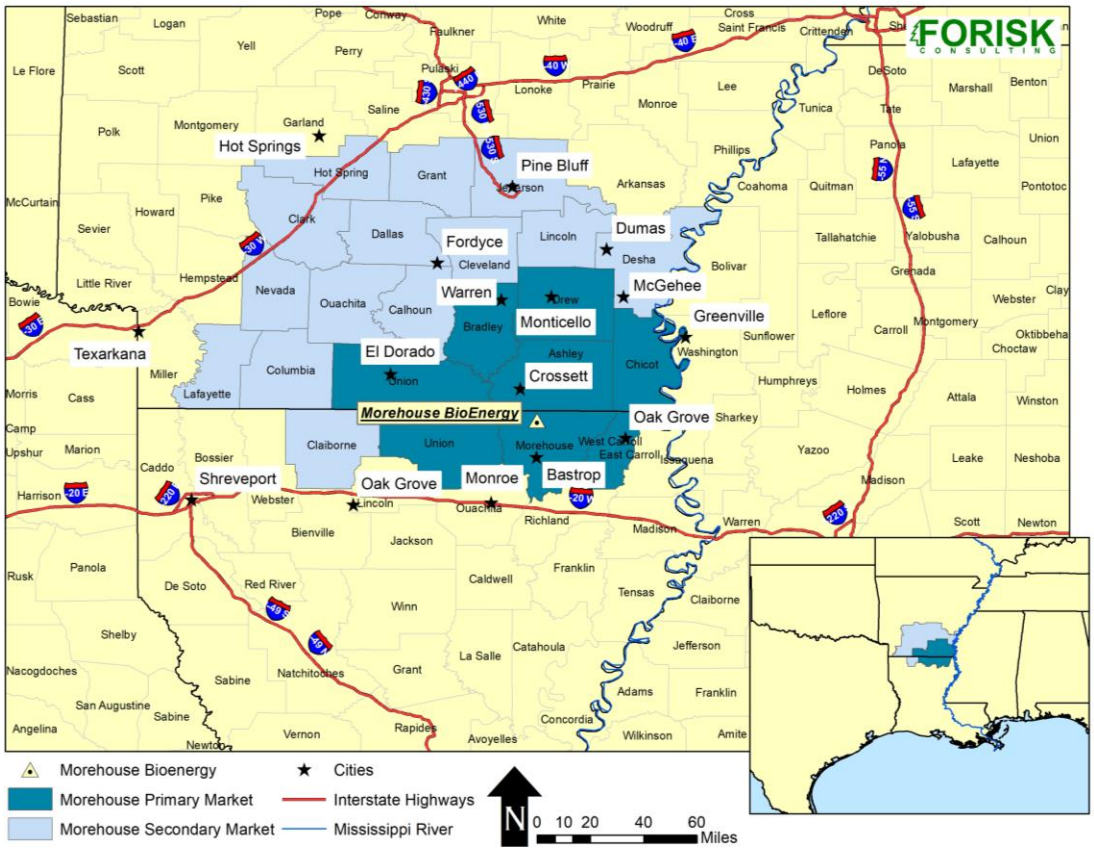
Forest Metric	Bioenergy Impact
Growing Stock	Neutral
Growth Rates	Neutral
Forest Area	Neutral
Wood Prices	Neutral
Markets for Solid Wood	Neutral to Positive*

*Access to viable residual markets benefits users of solid wood (i.e. lumber producers).

Morehouse BioEnergy Timber Market Description

Located in Northern Louisiana and Southern Arkansas, the approximate 60 air-mile radius of this timber market includes 18 counties in Arkansas and four counties in Louisiana, including the primary and secondary markets (Figure 3). This shape was derived by geo-referencing site specific data from Drax's primary feedstock supplies into the Morehouse mill. The analysis in this report pertains to the entire area (primary and secondary markets), with selected analysis for the primary market.[1]

Figure 3. Morehouse BioEnergy Timber Market



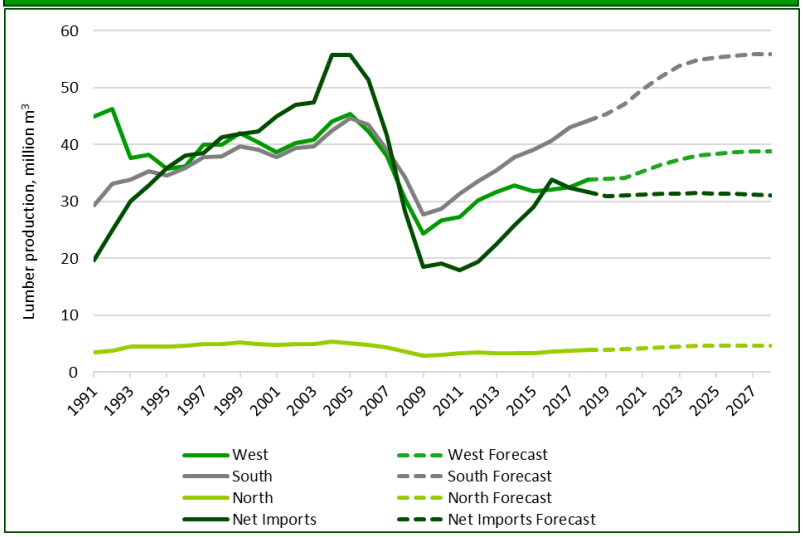
Wood Demand and Markets

The economic Recession in the U.S. from 2007-2009 impacted timber markets across the South and in the Morehouse Market. Conditions today reflect market and timber management activities that responded to the Recession. Sawtimber prices declined 28% on average in the South fom 2007-2009, and many landowners deferred final harvests, waiting for prices to recover. The decline in harvest activity and timber removals resulted in sawtimber inventory increases across the South. In the Morehouse Market, sawtimber removals declined 34% from 2005 to 2009, and sawtimber inventories increased 31% from 2009 to 2018.

[1] Unless otherwise noted, the analysis references the combination of primary and secondary markets.

Removals have increased for both softwood and hardwood sawtimber in the Morehouse Market recently. This increase is largely driven by local responses to the regional and national trends of (1) improving U.S. housing markets and (2) shifting North American lumber production. The U.S. South will likely exceed its all-time peak production levels of 45 million m³ for softwood lumber in 2019, while the U.S. West and Canada expect to face timber supply and manufacturing capacity constraints (Figure 4). Softwood lumber capacity continues to shift from the West and Canada to the South. In 2018, U.S. housing starts were 40% below 2005 highs.

Figure 4. U.S. Softwood Lumber Production Forecast

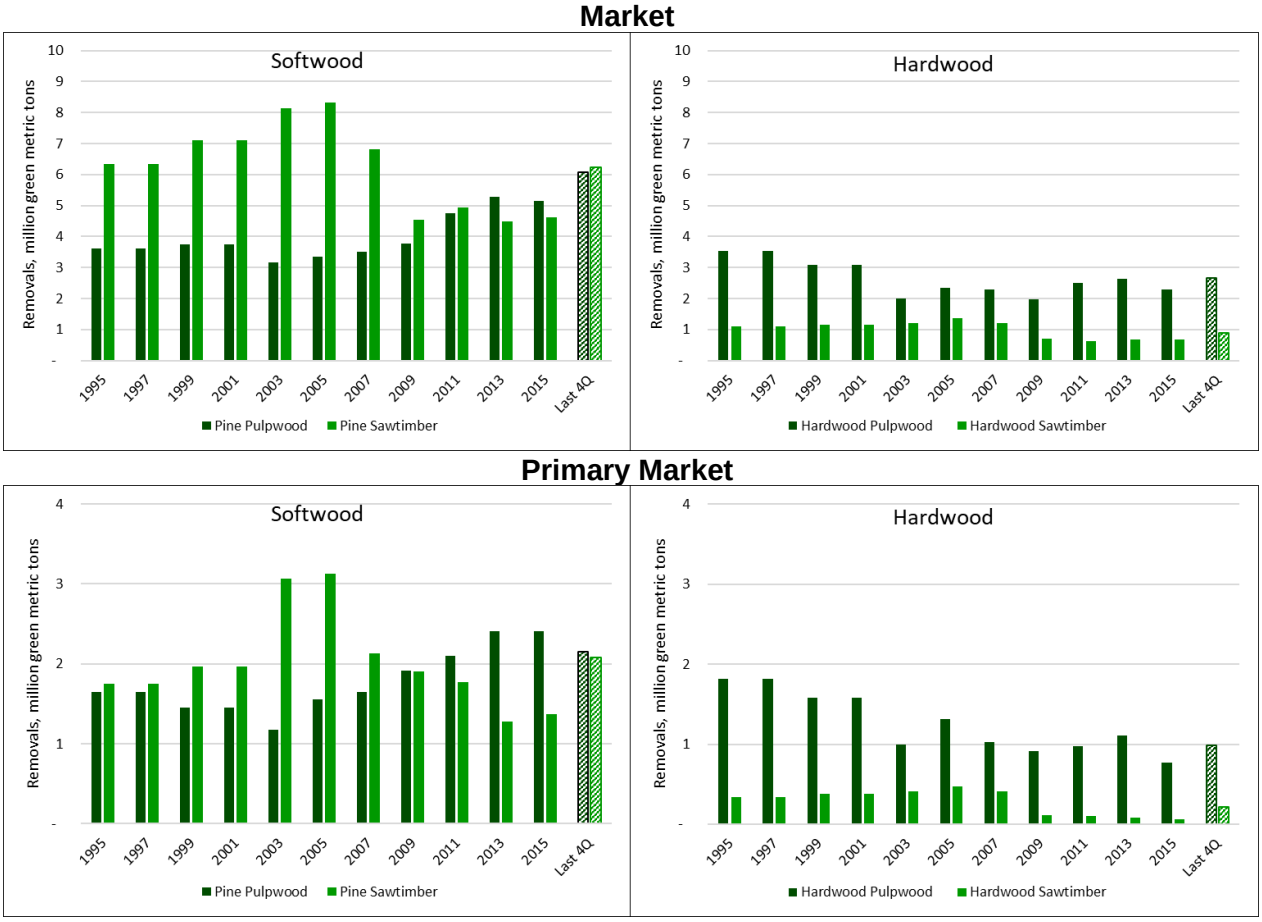


Sources: USDA, WWPA, SFPA, Forisk.
Note: Net imports primarily represent imports from Canada.

Pine sawtimber removals have increased in the Morehouse Market by 38% since 2009 (Figure 5). Despite the recent increases in sawtimber removals, the Morehouse Market is still well below 2005 highs. Pine sawtimber removals over the last four quarters were 25% below 2005 removal volumes, while softwood pulpwood removals have generally trended higher since 2003, increasing 85%. While sawmills have expanded, reopened, and increased production in the Morehouse Market since the Recession, production in the Morehouse Market has not increased at the same pace as in other local markets in the South. Hardwood sawtimber removals remained 35% below the high water mark set in 2005. Hardwood pulpwood removals have been more variable. Though up 35% from 2009 lows, hardwood pulpwood remained 21% below the average removal volume in the 1990s. With increased sawtimber production, residues are more available and are increasingly a target feedstock for pellet plants in the market. Drax has increased its use of sawmill residuals in the area at the Morehouse plant, and the company is shifting heavily to residual feedstocks at the LaSalle BioEnergy plant with the opening of LaSalle Lumber next door earlier this year.

Removals trends in the primary market mirror those of the extended market, with the recent exception of pine pulpwood (Figure 5). Pine pulpwood removals declined in the past four years in the primary market, likely due to increased sawmill residual use at pellet plants in the market.

Figure 5. Historic Roundwood Removals



Source: Forisk Consulting, USFS TPO

Sawtimber Markets

There are 68 sawmills and two plywood mills in or near the Morehouse Market (Figures 6a and 6b). After accounting for the specific locations of the mills and associated procurement activity, the sawtimber wood demand from the Morehouse Market is approximately 7.1 million metric tons per year, of which softwood demand is 6.2 million metric tons. Of the sawmills operating in or near the Morehouse Market, 25 have capacities exceeding 60 thousand m³ of annual lumber production (listed in Appendix A).

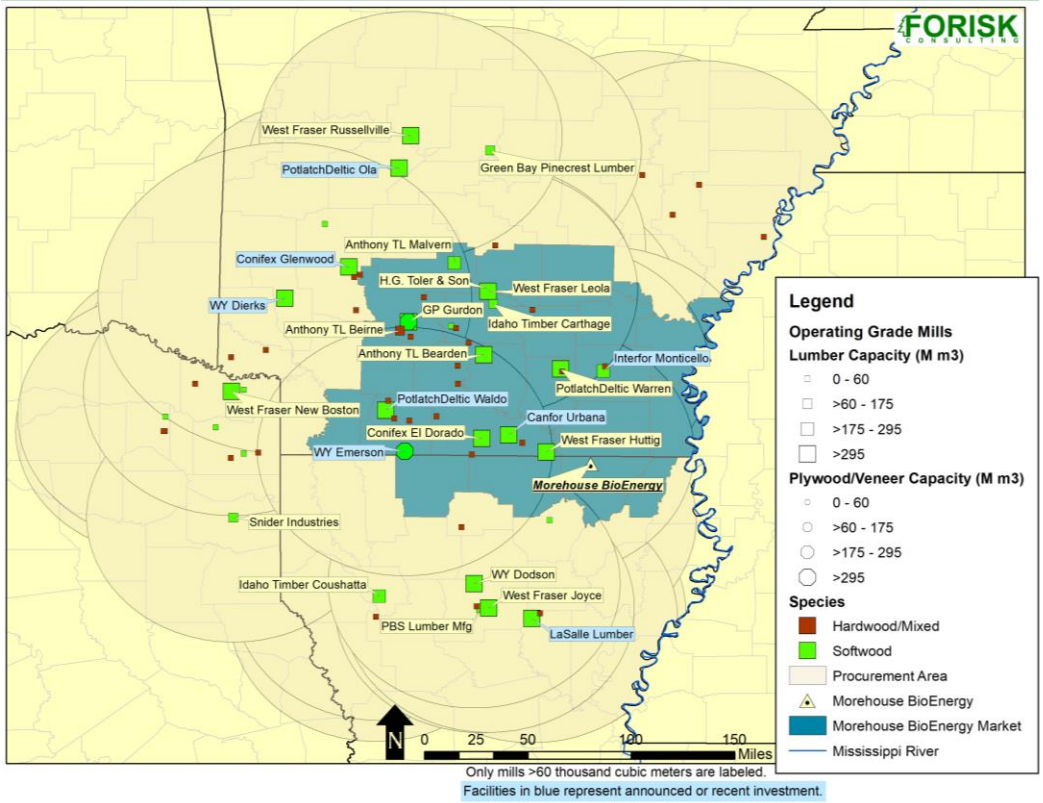
This market has attracted interest and capital investments from U.S. and international forest industry firms. An additional 1,459 thousand m³ of capacity has been announced in or near the Morehouse Market, increasing sawtimber demand within the market by over 350K metric tons annually by 2022.

These include the following:

- LaSalle Lumber Company, a joint venture between Hunt Forest Products and Tolko Industries, opened a 471 thousand m³ sawmill in Urania, LA. The $115 million facility began operations in January 2019. This is Canadian firm Tolko's first venture into the U.S. market.

- Interfor's Monticello sawmill will expand capacity by approximately 165 thousand m³ following a $46 million investment. The additional capacity is scheduled to be online by the end of 2019.
- Dragon Woodland opened a new, $10 million hardwood sawmill in May of 2019 in West Helena, AR. Capacity is estimated at 59 thousand m³.
- PolatchDeltic Waldo and Ola reflect the completed merger of Poltach and Deltic on February 20, 2018. The all-stock transaction valued Deltic at $1.16 billion and included 214K hectares of land, two sawmills (Waldo and Ola), and an MDF mill (El Dorado). Both facilities noted capacity increases after the merger.
- WY Dierks invested $190 million for upgrades to their mill, which increased capacity by 188 thousand m³ (25%). The project was completed in Q2 2018.
- Conifex Caddo River was purchased by Conifex from Blue Wolf Capital in July of 2018. The $200 million deal included the mill in Glenwood, AR, and Suwannee Lumber Company in Cross City, FL.
- Anthony TL purchased Watson Sawmill, a 28 thousand m³ hardwood sawmill in Mount Holly, AR, for an undisclosed sum in Q3 2018.
- Weyerhaeuser Emerson installed a new lathe carriage at the end of 2018.
- Canfor Urbana added a third continuous dry kiln and a second shift, increasing the mill capacity by 106 thousand m³. The $8.8 million investment in the Arkansas facility was completed in Q2 2018.

Figure 6a. Map of Sawtimber Log Mills Near Morehouse Market



Note: "grade" refers to sawtimber.

Figure 6b. Operating Sawtimber-Using Facilities Near Morehouse Timber Market

Type	Number of Mills	Capacity	Capacity Units	Consumption, million green metric tons			
				Hardwood Roundwood		Softwood Roundwood	
				At Mill	From Market	At Mill	From Market
Lumber	68	10,539	M m³	1.7	0.9	13.1	5.7
Plywood/Veneer	2	904	M m³	0.0	0.0	1.0	0.5
Total	70			1.7	0.9	14.0	6.2

Note: "At mill" sums the total wood consumption for all mills in and near the market. "From market" refers to the amount of wood that mills purchase from the counties within the primary and secondary markets (it accounts for wood procurement activity).

Pulpwood Markets

This market has 34 relevant pulpwood-using mills: 11 pulp/paper mills, 6 OSB/panel plants,17 chip mills, and 3 pellet mills (Figures 7a and 7b). Based on spatial analysis of these mills and the associated procurement activity, we estimate demand of 8.7 million metric tons of pulpwood roundwood from within the Morehouse Market, of which 6.1 million metric tons is softwood. Appendix B lists the primary pulpwood-using facilities relevant to this market.

Pulpwood-using facilities in the market have attracted material capital investments over the past several years. There have also been disinvestments. These activities speak to the robust nature of the market, in which a diverse set of forest product companies operate.

These are as follows:

- Georgia-Pacific is permanently closing its pulp mill and bleached board operations in Crossett, AR, in October 2019. Though tissue production will continue, the mill will not procure wood.
- Roseburg Forest Products completed the purchase of Del-Tin Fiber from PotlatchDeltic in Q1 2019, including an MDF plant in El Dorado, AR.
- Sun Paper (High Case) changed plans for the proposed facility in Arkadelphia, AR. The company will now make linerboard instead of dissolving pulp, which will increase their stated investment to $1.8 billion. The continually delayed project is scheduled to come online by the end of 2020.
- Highland Pellets Pine Bluff will receive $68 million from Astec, the manufacturer of Highland Pellets' Pine Bluff facility, as the mill failed to meet contractual operational milestones.
- WestRock Hodge announced plans to improve their Louisiana mill to keep it operating and competitive. The investment was secured by an incentive package from the state.
- Graphic Packaging West Monroe announced a $120 million investment in its paperboard mill over the next several years, including the installation of two headboxes on PM#6.
- Graphic Packaging Texarkana was IP Texarkana prior to the completion of the sale of International Paper's North America consumer packaging business. The transaction, valued at $1.8 billion, included two paperboard mills in Texarkana, TX, and Augusta, GA, along with four converting facilities.
- The Price Companies closed its $33.75 million purchase of Rentech's Fulghum assets in Q1 2018, which included the assumption of $20 million in debt. Price also paid an $840,000 break-up fee to terminate Rentech's original purchase agreement with Scott Davis Chips and FFI.
- Drax Biomass' Morehouse BioEnergy completed a 75 thousand metric ton capacity expansion at the end of 2017, allowing for more residual feedstock.

- Drax Biomass began production at its LaSalle BioEnergy facility on November 29, 2017. Drax Biomass purchased the Urania, Louisiana, facility for $35.4 million at auction on April 3, 2017. The mill was previously owned by German Pellets, which filed bankruptcy in February 2016.

Figure 7a. Map of Pulpwood-Using Mills Near Morehouse Timber Market

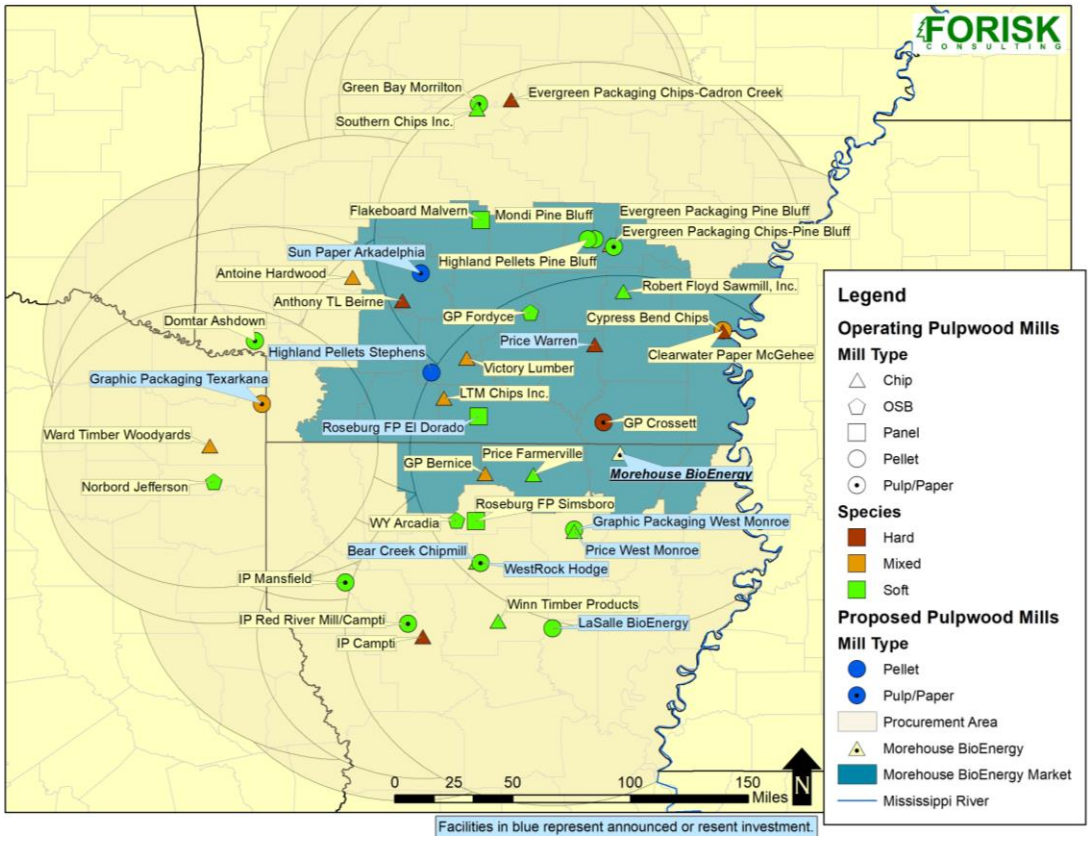


Figure 7b. Operating Pulpwood-Using Facilities Near Morehouse Timber Market

Type	Number of Mills	Capacity	Capacity Units	Consumption, million green metric tons			
				Hardwood Roundwood		Softwood Roundwood	
				At Mill	From Market	At Mill	From Market
Pulp/Paper	11	7,635	M metric tons	3.5	1.2	7.6	1.7
OSB/Panel	6	2,413	M m³	0.0	0.0	2.6	1.2
Chips	17	8,395	M metric tons	2.9	1.5	5.3	2.2
Pellets	3	1,574	M metric tons	0.0	0.0	2.1	1.0
Total	34			6.4	2.7	17.5	6.1

Note: “At mill” sums the total wood consumption for all mills in and near the market. “From market” refers to the amount of wood that mills purchase from the counties within the primary and secondary markets (it accounts for wood procurement activity).
Note: Capacity is reported as total mill output, but the wood use reported in the table is roundwood (logs) only and excludes other wood supplies such as chips/sawmill residuals.

Pellet producers use 6% of the roundwood used by the forest products industry in the Morehouse market; Drax uses 4% of the roundwood in the market (Figure 8). Roundwood pulpwood consumption is concentrated in the pulp and paper sector, which represents 75% of of pulpwood demand. Georgia-Pacific is the largest consumer of pulpwood in the market (Figure 9).

Figure 8. Roundwood Demand in Market by Sector

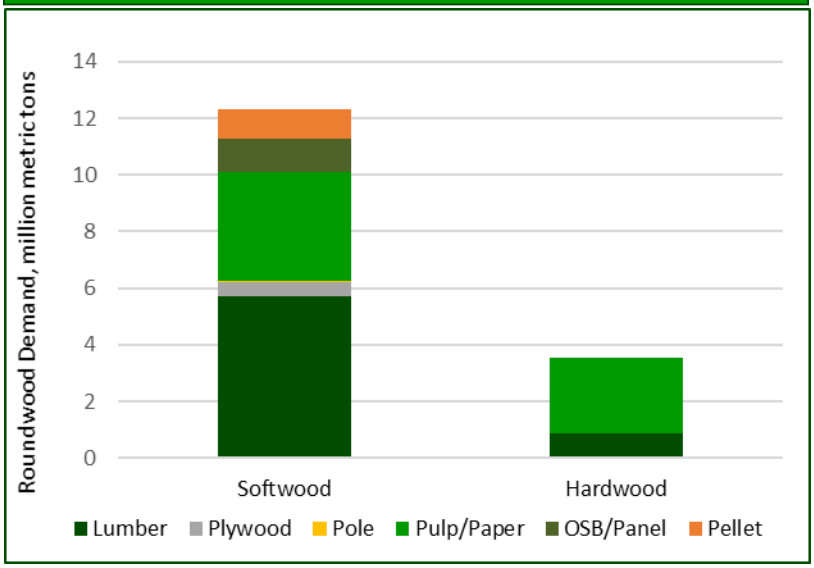
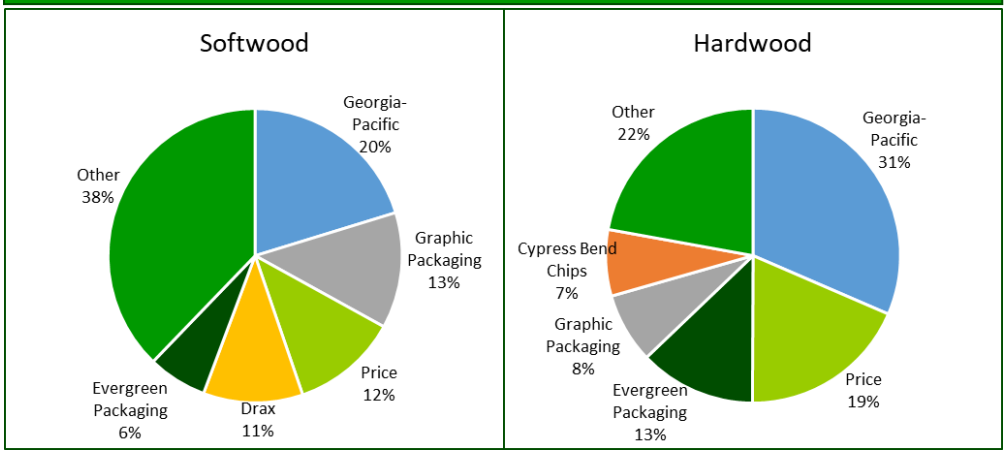


Figure 9. Pulpwood Demand in the Market by Company

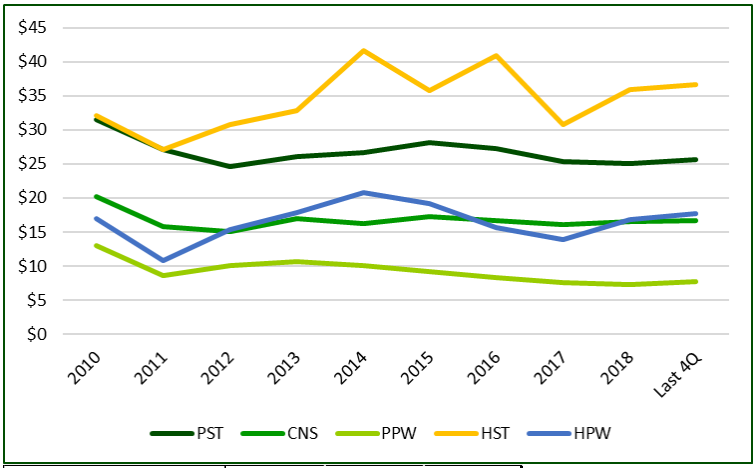


Note: percentages for Georgia-Pacific will decrease with the closure of the Crossett mill.

Timber Prices

Stumpage prices for all pine products have declined since 2010 (Figure 10). Over the past four quarters in the Morehouse Market, pine sawtimber was only 4.4% above its ten-year low, while chip-n-saw remained 11% off its low. Pulpwood also remained above its ten-year low but was down over 40% from 2010. Ample pine supplies in the market softened prices. Meanwhile, hardwood prices increased. Over the past four quarters, hardwood sawtimber was 14% higher than in 2010, while hardwood pulpwood was 4.1% higher. Hardwood supplies are tighter in the market, and hectares of hardwood timber have declined, adding pressure to prices.

Figure 10. Morehouse BioEnergy Market Historic Stumpage Prices, $/metric ton



Product	Historic		
	Last 4Q	10 yr High	10 yr Low
Pine Sawtimber	$25.71	$31.60	$24.62
Hardwood Sawtimber	$36.68	$41.75	$27.10
Pine Chip-n-Saw	$16.70	$20.22	$15.04
Pine Pulpwood	$7.75	$13.00	$7.31
Hardwood Pulpwood	$17.68	$20.86	$10.87

Source: Timber Mart-South

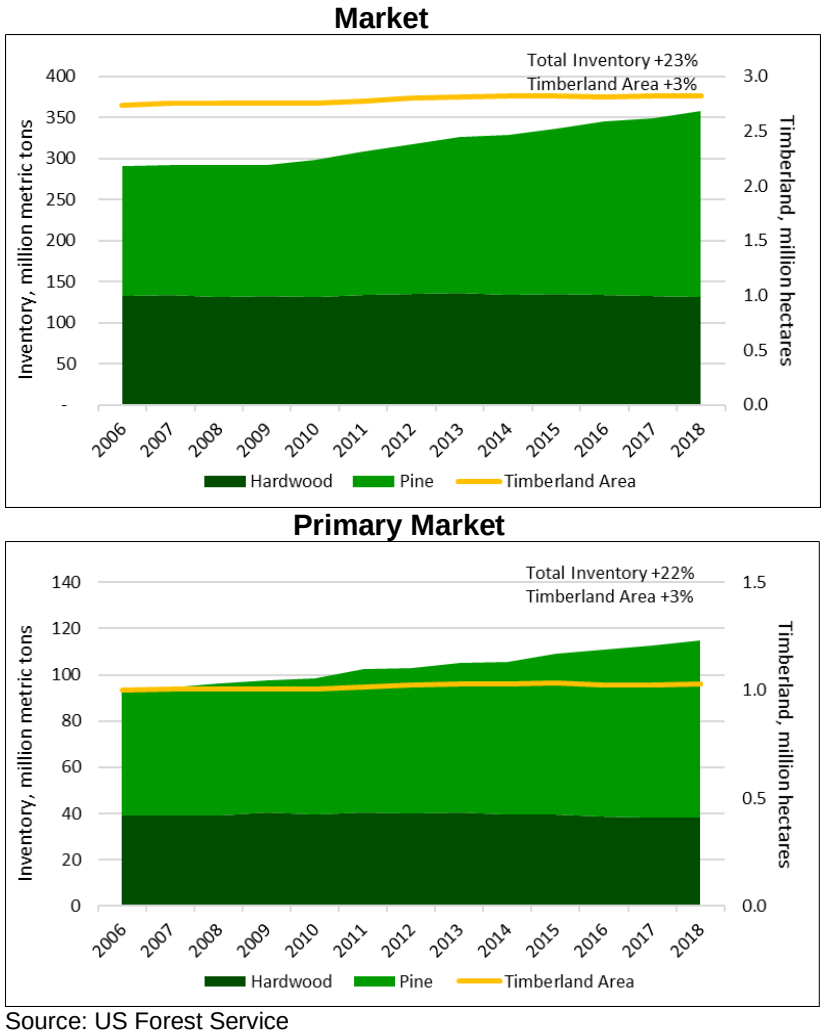
Forest Supply

The Morehouse Market has over 358 million metric tons of merchantable standing timber on 2.8 million hectares of operable timberland.[2] Inventory has increased 23% since 2006 (Figure 11). There has been a significant accumulation of pine inventory as volumes rose 43%, while hardwood inventory declined 0.5%. Operable timberland hectares in the market increased 3% over this time horizon. The increase in inventory over the past ten years is an echo of the economic Recession. Landowners deferred final harvests of sawtimber due to low prices, and the timber kept growing on the stump.

[2] Operable timberland excludes hydric sites and slopes greater than 45%. Merchantable timber is defined as 6"–24" (15 cm – 61 cm) DBH classes. The 2018 estimate includes data measured in 2018, 2017, 2016, 2015, and 2014; this represents an "average" 2016 forest. Chart labels correspond to the most recent measurement. Unless otherwise noted, supply data in this report represents public and private owners combined.

The primary market mirrors the extended market. Inventory has increased 22% since 2009, with pine volumes rising 39% and hardwood inventory declining 2.0%. Operable timberland surpassed one million hectares, gaining 2.8% since 2006.

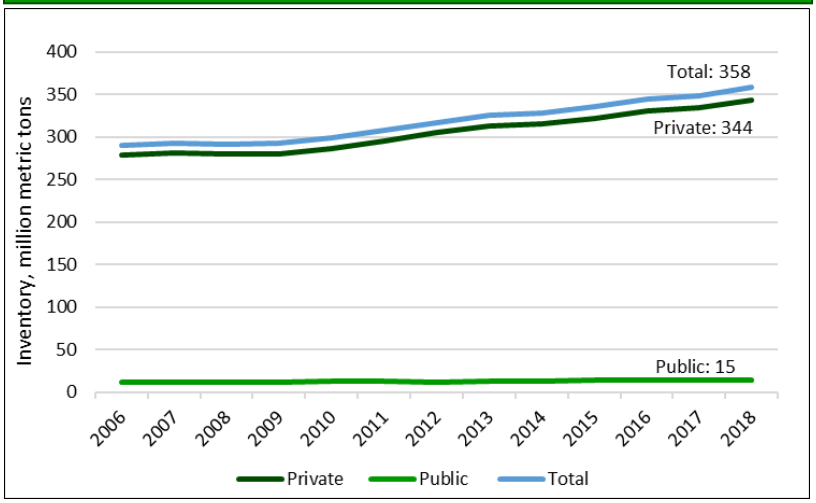
Figure 11. Historic Inventory and Timberland Area



Source: US Forest Service

The majority, 96%, of merchantable standing timber in the Morehouse Market is privately owned (Figure 12). Standing timber on private land increased 23% since 2006, adding 63 million metric tons of inventory. Inventory on public land increased by 3.0 million metric tons (+30%).

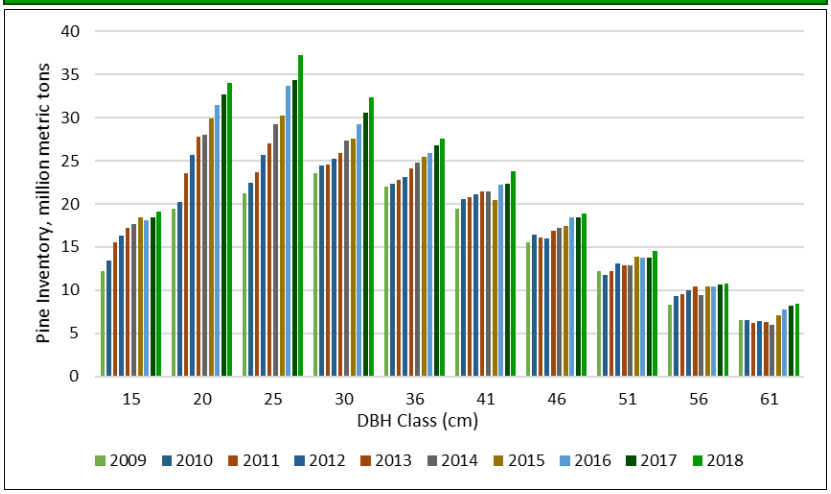
Figure 12. Historic Inventory by Ownership Type



Source: US Forest Service

The increase in pine inventory is visible in inventory volumes by size class (DBH), which increased for all classes (Figure 13). Significant accumulation of volume is noted in the 20 and 25cm size classes, which increased 74% and 75%, respectively.

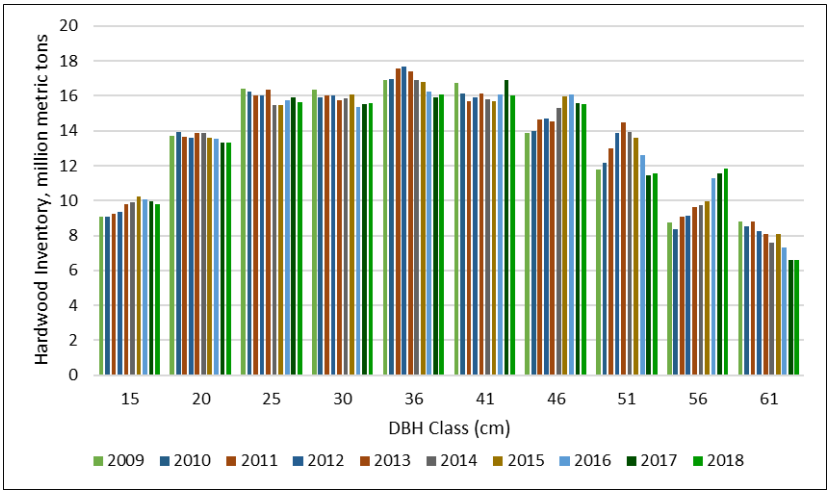
Figure 13. Historic Pine Inventory by DBH Class



Source: US Forest Service

The slight decline in hardwood inventory since 2009 can be seen in most size classes (DBH), with the exception of 15 and 56cm classes, which increased (Figure 14).

Figure 14. Historic Hardwood Inventory by DBH Class

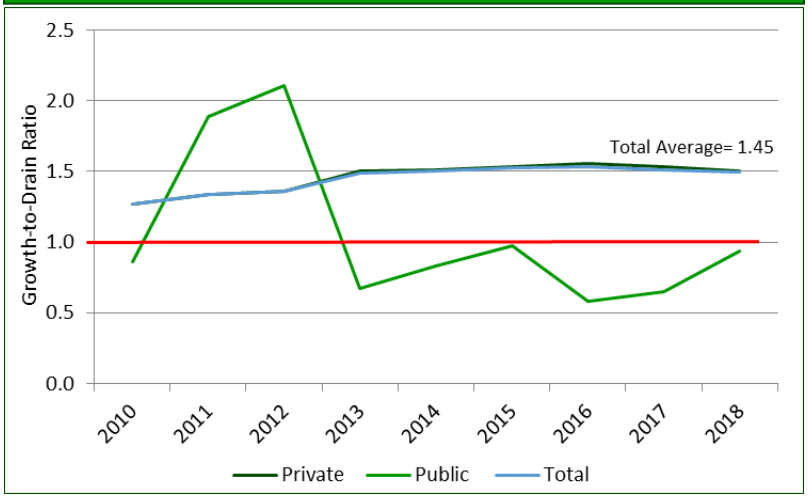


Source: US Forest Service

Since 2010, growth-to-drain (GTD) ratios have remained above one, averaging 1.45, with total growth exceeding removals (Figure 15). In 2018, the GTD was 1.50, with the GTD on private land exceeding that on public. Net growth, growth minus removals, has averaged 6.0 million metric tons annually and increased 68% since 2010, surpassing 6.9 million metric tons in 2018 (see Appendix C for additional detail).

The product-specific GTD ratios are in Appendix C. Pine growth has outpaced removals in all products since 2009. The positive GTD ratios for pine products match the growing accumulation of pine inventories. Meanwhile, the hardwood GTD ratio has trended down and is currently 0.94.

Figure 15. Growth-to-Drain Ratio by Owner Type

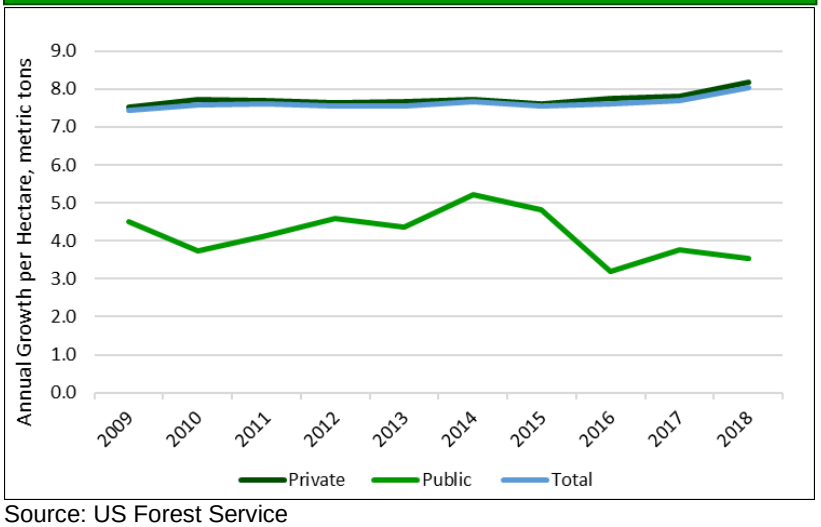


Source: US Forest Service

Timberland productivity has increased in the Morehouse Market. The annual growth per hectare, which increased 8% from 2009, reached 8.0 metric tons per hectare in 2018 (Figure 16). These gains were attributable to private landowners as productivity on public land decreased. Timberland across the South and in the Morehouse Market gained productivity from

genetic improvements and silvicultural practices (including site preparation, fertilization, and competition control), particularly on actively managed private timberlands.

Figure 16. Annual Growth per Hectare by Owner Type



Source: US Forest Service

Forest Management

Our understanding of forest management intensity in the region derives from Forisk's Southern Silviculture Surveys in 2016 and 2018, which assessed practices on 6.9 and 9.7 million hectares, respectively. The surveys examined different geographic sub-regions, with the target market grouped with different areas in each year. In 2016, the "Gulf" region included Arkansas, Louisiana, Texas, and Mississippi while the 2018 survey examined the Upper Coastal Plain, which stretches from Texas to Virginia and includes significant areas in both Alabama and Georgia, with smaller coverage in the Carolinas and Virginia (Figures 17 and 18). Despite the differing coverages, the comparative intensity of management is reasonably consistent.

Figure 17. 2016 Survey Regions

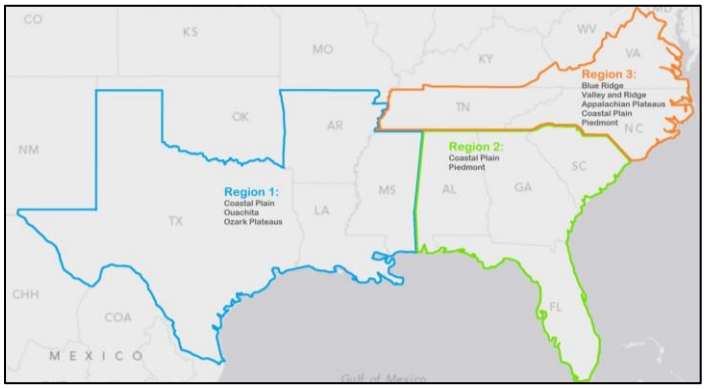
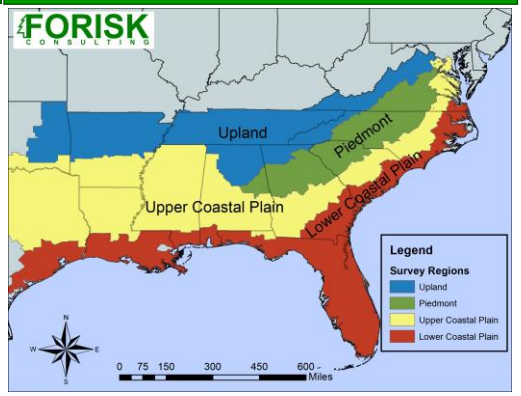


Figure 18. 2018 Survey Regions



Landowners planted advanced genetic seedlings on less than half of regenerated areas in the target market compared with 55-65% in other regions (Figure 19). Seedling survival in 2018 was on par with the south-wide average but was 5% lower in the 2016 survey. Most timberland owners plant to regenerate pine stands. Of the privately-owned hectares recently regenerated in the Morehouse Market (0-5 year age class), 87% of pine stands are planted (vs. natural

regeneration) (Appendix C). In both surveys, the region employed the greatest proportion of mid-rotation woody competition control. Fertilization was also comparatively highly utilized, with 58% of firms fertilizing hectares and averaging roughly 2.5 treatments per rotation in both surveys, compared with 55-60% of all firms in the South. Finally, clearcut ages are the highest in the South. In 2016, the Gulf region clearcut age averaged 36 years, with the lowest net revenue per hectare of any region. The Upper Coastal Plain averaged 30 years as a clearcut age, also highest in the South, with net revenue lower than both the Piedmont and Lower Coastal Plain regions. The Upper Coastal Plain also reported the highest proportion of hectares managed on a 2-thinning regime, 51% compared to 43% in other regions.

Figure 19. Silviculture Practices by Region

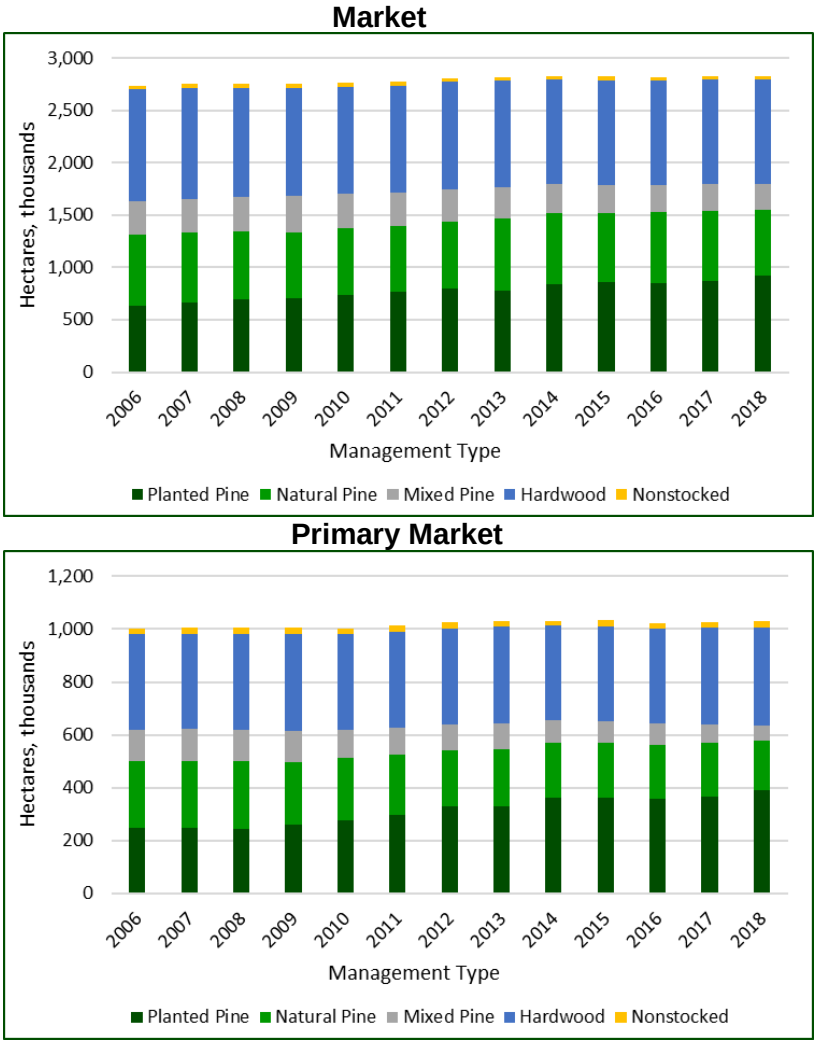
	Gulf Region	South (2016)	Upper Coastal Plain	South (2018)
Advanced Genetic Stock (% hectares)	46%	65%	49%	56%
Seedling Survival	85%	90%	89%	89%
Woody Competition Control*	5.3%	3.5%	58%	45%
Fertilization (% respondents)	57%	55%	58%	60%
Clearcut age	36	32	30	28
Avg. Clearcut Revenue (hectare)	$3,744	$3,988	$3,776	$3,862

*Survey question changed from 2016 to 2018 from total % hectares treated in a given year to total % receiving treatment in a rotation.
Source: Forisk Consulting

Timberland area in the Morehouse Market has increased by 3% since 2006 (Figure 20). Trends of forest type change in the market mirror south-wide increases in pine plantation hectares. Hectares in planted pine increased by 45% in the Morehouse Market, the most of any timber management type. Natural pine hectares decreased by 7%. Hardwood hectares also declined by 7%. Landowners in the market and in the Southern U.S. plant trees to reforest timberland. These trends indicate conversion of natural pine and hardwood hectares to planted pine. Despite some conversion, hardwood and mixed stands make up 44% of timberland hectares in the Morehouse Market today, and natural pine stands account for 22% of the hectares.

Conversion of natural and mixed pine stands to planted pine occurred within the primary market as well. Hectares of planted pine increased 56%, while natural and mixed pine stands declined 25% and 51%, respectively. Unlike the extended market, hardwood hectares increased 3%. Overall, the primary market saw timberland area increase 3%.

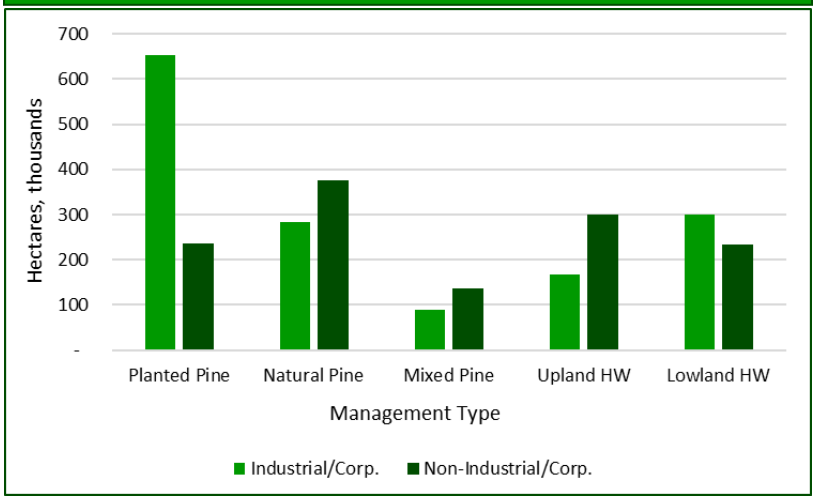
Figure 20. Timberland Area by Management Type



Source: US Forest Service

The market has a high proportion of corporate timberland ownership; 54% of private timberlands in the Morehouse Market are owned by corporate owners (i.e. TIMOs, REITs, corporations). These owners are driven by cash flow expectations more so than non-industrial owners, which influences their harvesting and replanting activity. They are more active managers of timber, in general, than non-industrial owners. Corporate owners represent 74% of the 890 thousand hectares of privately-owned planted pine in the market and only 43% of the 658 thousand hectares of natural pine stands (Figure 21).

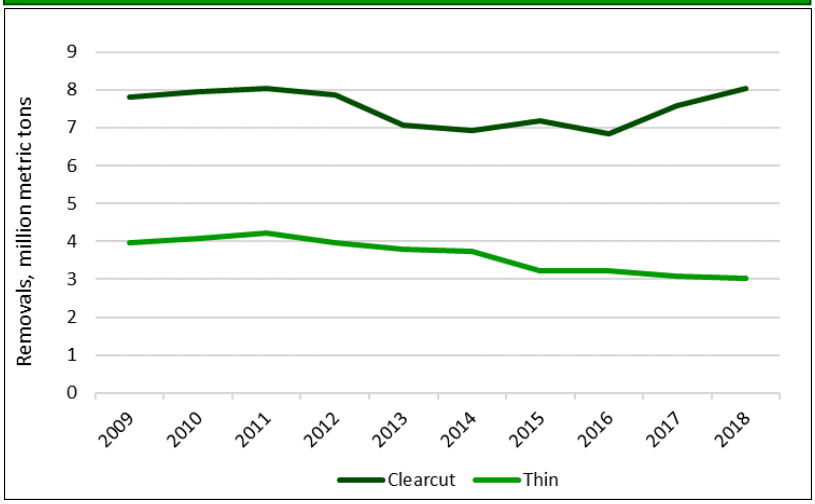
Figure 21. Current Private Timberland Area by Ownership and Management Type



Source: US Forest Service, SOFAC

Removals through clearcuts trended down following the Recession of 2007-2009 as landowners held off final harvests due to lower sawtimber prices (Figure 22). Volumes have since recovered, increasing 18% over the last three years. Clearcut removals in 2018 were 2.9% higher than in 2009, as markets recovered and landowners accepted market prices for timber. Removals from thinnings were down 24% over this same time horizon. Clearcuts represent the majority of volume removed, 73% in 2018.

Figure 22. Historic Removals by Harvest Type



Source: US Forest Service

Appendix A: Grade Mill List

Morehouse BioEnergy Timberland Market Grade-Using Facilities Greater Than 60 M m³

Name	County	State	Type	Capacity	Capacity Units	Total Wood Consumption (green metric tons)	Softwood Roundwood Consumption at Capacity (green metric tons)	Hardwood Roundwood Consumption at Capacity (green metric tons)
WY Dierks	Howard	AR	lumber	894	M m³	1,309,975	1,309,975	-
PotlatchDeltic Waldo	Columbia	AR	lumber	671	M m³	1,114,341	1,114,341	-
West Fraser Joyce	Winn	LA	lumber	612	M m³	849,125	849,125	-
PotlatchDeltic Ola	Yell	AR	lumber	541	M m³	899,292	899,292	-
West Fraser Huttig	Union	AR	lumber	541	M m³	899,292	899,292	-
WY Dodson	Winn	LA	lumber	541	M m³	899,292	899,292	-
PotlatchDeltic Warren	Bradley	AR	lumber	518	M m³	798,323	798,323	-
Anthony TL Bearden	Ouachita	AR	lumber	471	M m³	870,898	870,898	-
GP Gurdon	Clark	AR	lumber	471	M m³	781,993	781,993	-
LaSalle Lumber	LaSalle	LA	lumber	471	M m³	771,107	771,107	-
West Fraser New Boston	Bowie	TX	lumber	471	M m³	781,993	781,993	-
Canfor Urbana	Union	AR	lumber	447	M m³	742,894	742,894	-
Conifex Glenwood	Pike	AR	lumber	435	M m³	723,344	723,344	-
Conifex El Dorado	Union	AR	lumber	424	M m³	703,794	703,794	-
West Fraser Russellville	Pope	AR	lumber	400	M m³	664,694	664,694	-
West Fraser Leola	Grant	AR	lumber	353	M m³	586,495	586,495	-
Anthony TL Malvern	Hot Springs	AR	lumber	282	M m³	469,196	469,196	-
Interfor Monticello	Drew	AR	lumber	247	M m³	410,547	410,547	-
Idaho Timber Coushatta	Red River	LA	lumber	224	M m³	396,440	396,440	-
Green Bay Pinecrest Lumber	Conway	AR	lumber	153	M m³	271,248	271,248	-
Idaho Timber Carthage	Dallas	AR	lumber	141	M m³	234,598	234,598	-
Snider Industries	Harrison	TX	lumber	141	M m³	250,383	250,383	-
Anthony TL Beirne	Clark	AR	lumber	118	M m³	356,977	-	356,977
PBS Lumber Mfg	Winn	LA	lumber	82	M m³	158,757	158,757	-
H.G. Toler & Son	Grant	AR	lumber	71	M m³	136,078	136,078	-
GP Gurdon	Clark	AR	plywood/veneer	667	M m³	1,043,716	1,043,716	-
WY Emerson	Columbia	AR	plywood/veneer	237	M m³	371,492	371,492	-

Source: Forisk Consulting

Appendix B: Pulpwood Mill List

Morehouse BioEnergy Timberland Market Pulpwood-Using Facilities

Name	County	State	Type	Capacity	Capacity Units	Total Wood Consumption (green metric tons)	Hardwood Roundwood Consumption at Capacity (green metric tons)	Softwood Roundwood Consumption at Capacity (green metric tons)
IP Mansfield	De Soto	LA	pulp/paper	1,651	M metric tons	3,193,291	480,808	1,723,652
IP Red River Mill/Campti	Natchitoches	LA	pulp/paper	925	M metric tons	3,157,004	294,835	884,505
Graphic Packaging West Monroe	Ouachita	LA	pulp/paper	862	M metric tons	2,585,477	-	-
WestRock Hodge	Jackson	LA	pulp/paper	815	M metric tons	2,086,526	-	1,360,778
Domtar Ashdown	Little River	AR	pulp/paper	708	M metric tons	3,538,022	362,874	1,905,089
GP Crossett	Ashley	AR	pulp/paper	662	M metric tons	2,377,460	1,081,744	582,478
Graphic Packaging Texarkana	Bowie	TX	pulp/paper	630	M metric tons	2,494,759	1,088,622	725,748
Evergreen Packaging Pine Bluff	Jefferson	AR	pulp/paper	539	M metric tons	2,444,791	178,136	332,120
Green Bay Morrilton	Conway	AR	pulp/paper	408	M metric tons	1,733,086	273,571	547,613
Clearwater Paper McGehee	Desha	AR	pulp/paper	287	M metric tons	1,088,622	-	-
Mondi Pine Bluff	Jefferson	AR	pulp/paper	149	M metric tons	385,554	-	81,647
GP Fordyce	Dallas	AR	OSB	565	M m^3	830,074	-	830,074
WY Arcadia	Lincoln	LA	OSB	480	M m^3	705,563	-	705,563
Norbord Jefferson	Marion	TX	OSB	469	M m^3	688,962	-	688,962
Roseburg FP Simsboro	Lincoln	LA	panel	367	M m^3	362,874	-	136,078
Flakeboard Malvern	Hot Spring	AR	panel	362	M m^3	453,593	-	226,796
PotlachDeltic El Dorado	Union	AR	panel	170	M m^3	249,022	-	83,007
Price West Monroe	Union	LA	chip	1,796	M metric tons	1,796,226	-	1,796,226
Evergreen Packaging Pine Bluff	Jefferson	AR	chip	907	M metric tons	907,185	453,593	453,593
Southern Chips Inc.	Perry	AR	chip	816	M metric tons	816,467	163,293	653,173
Price Farmerville	Union	LA	chip	699	M metric tons	733,459	-	733,459
Bear Creek Chipmill	Jackson	LA	chip	635	M metric tons	666,781	-	666,781
Price Warren	Bradley	AR	chip	475	M metric tons	733,459	550,094	183,365
Cypress Bend Chips	Desha	AR	chip	454	M metric tons	453,593	272,156	181,437
Evergreen Packaging Cadron Creek	Conway	AR	chip	363	M metric tons	381,018	381,018	-
GP Bernice	Union	LA	chip	363	M metric tons	362,874	181,437	181,437
Robert Floyd Sawmill, Inc.	Lincoln	AR	chip	345	M metric tons	358,338	127,006	231,332
IP Campti	Natchitoches	LA	chip	272	M metric tons	272,156	181,437	90,719
LTM Chips Inc.	Union	AR	chip	272	M metric tons	272,156	136,078	136,078
Winn Timber Products	Winn	LA	chip	272	M metric tons	272,156	90,719	181,437
Anthony TL Beirne	Clark	AR	chip	227	M metric tons	226,796	226,796	-
Ward Timber Woodyards	Cass	TX	chip	227	M metric tons	226,796	204,117	22,680
Antoine Hardwood	Clark	AR	chip	136	M metric tons	136,078	90,719	45,359
Victory Lumber	Ouachita	AR	chip	136	M metric tons	136,078	68,039	68,039
Highland Pellets Pine Bluff	Jefferson	AR	pellet	600	M metric tons	1,319,999	-	1,319,999
Morehouse BioEnergy	Morehouse	LA	pellet	524	M metric tons	1,153,576	-	576,788
LaSalle BioEnergy	La Salle	LA	pellet	450	M metric tons	989,920	-	841,432
Fiber Resources	Jefferson	AR	pellet	73	M metric tons	72,575	-	-
BioWood LLC	Drew	AR	pellet	36	M metric tons	79,832	-	-

Source: Forisk Consulting

Appendix C: Supporting Data

Morehouse BioEnergy Timberland Market Historic Inventory by Ownership and Species

Private

	Pine			Hardwood			Total		
Year	Pulpwood	Grade	Total	Pulpwood	Grade	Total	Pulpwood	Grade	Total
	million metric tons								
2009	52	103	155	71	54	126	123	157	281
2010	55	107	162	70	54	124	125	161	286
2011	61	108	169	71	56	127	132	164	296
2012	65	112	177	72	57	128	137	168	305
2013	69	115	184	72	57	129	142	172	313
2014	71	117	188	71	56	127	142	173	316
2015	75	120	194	71	57	128	146	176	322
2016	78	126	204	71	56	127	149	182	331
2017	80	128	209	70	55	125	151	183	334
2018	84	135	219	70	55	125	154	189	344

Public

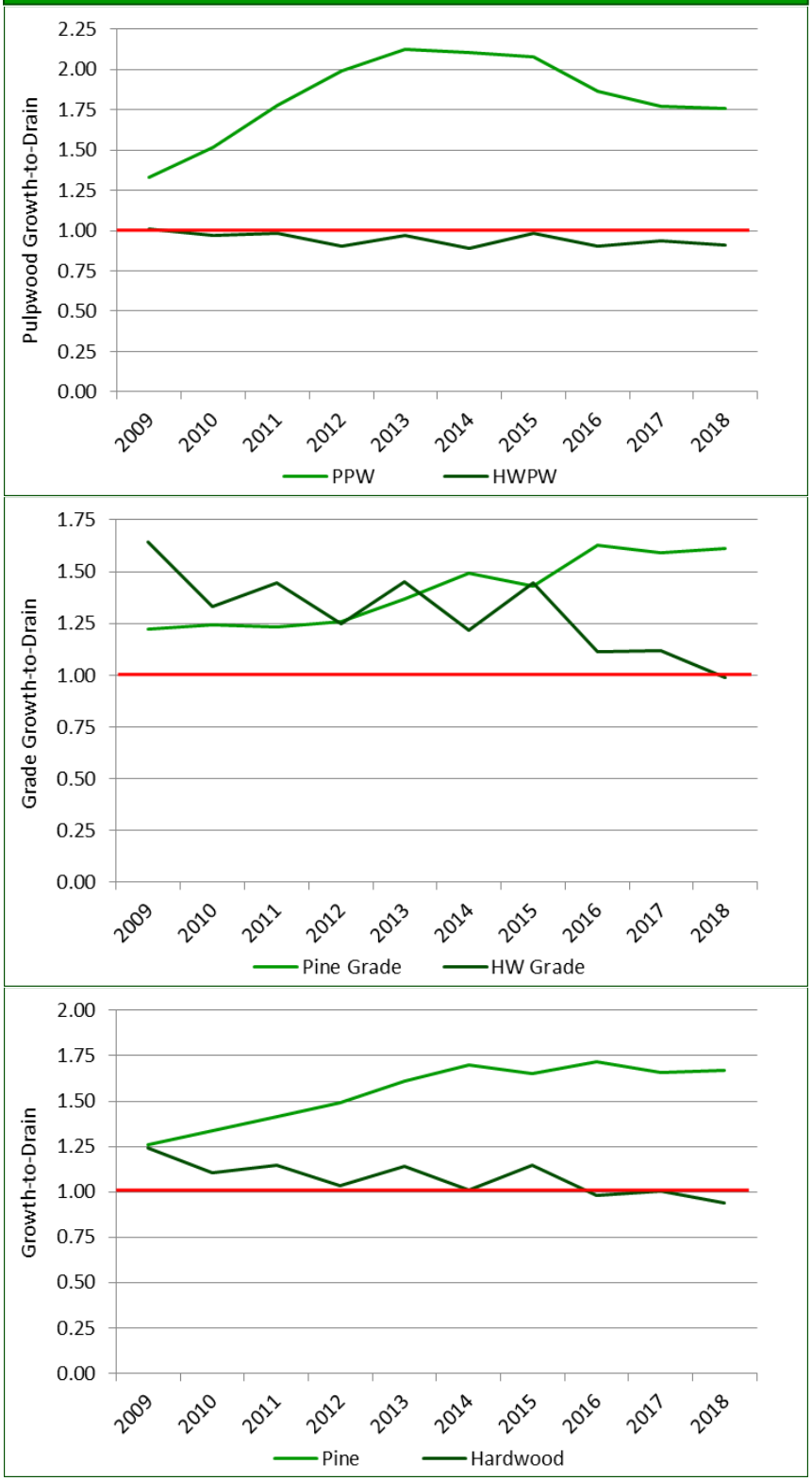
	Pine			Hardwood			Total		
Year	Pulpwood	Grade	Total	Pulpwood	Grade	Total	Pulpwood	Grade	Total
	million metric tons								
2009	1	4	5	4	3	7	5	8	12
2010	1	4	6	4	3	7	5	8	12
2011	1	5	6	4	3	7	5	8	13
2012	1	5	6	3	3	6	4	7	12
2013	1	5	6	4	3	7	5	8	12
2014	1	5	6	4	3	7	5	8	13
2015	1	6	7	4	3	7	5	9	14
2016	1	6	7	4	3	7	5	9	14
2017	1	6	7	4	3	7	5	10	15
2018	1	6	7	4	3	7	5	10	15

Total

	Pine			Hardwood			Total		
Year	Pulpwood	Grade	Total	Pulpwood	Grade	Total	Pulpwood	Grade	Total
	million metric tons								
2009	53	107	160	75	58	132	128	165	293
2010	56	111	167	74	57	131	130	168	299
2011	62	113	175	75	59	134	137	172	309
2012	66	116	183	75	60	135	141	176	317
2013	70	120	190	76	60	136	146	180	326
2014	72	122	194	75	60	134	147	181	328
2015	76	125	201	75	60	136	151	185	336
2016	79	132	211	75	60	134	154	191	345
2017	81	135	216	74	58	133	156	193	349
2018	85	141	226	74	58	132	159	199	358

Source: US Forest Service

Historic Growth-to-Drain by Species and Product



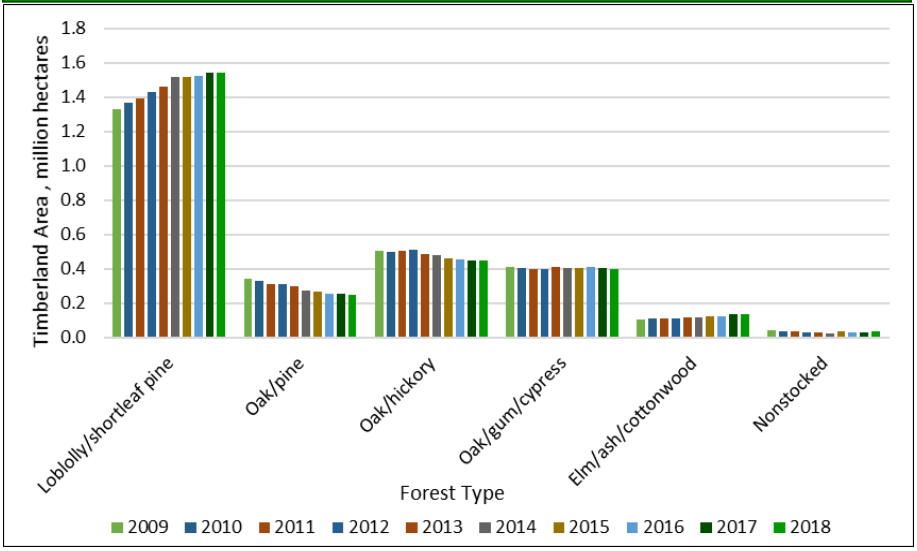
Source: US Forest Service

Morehouse BioEnergy Timberland Market Historic Growth and Removals by Species

Year	Pine				Hardwood			
	Growth	Removals	Net Growth	Growth-to-Drain	Growth	Removals	Net Growth	Growth-to-Drain
	(million metric tons)				(million metric tons)			
2009	14.11	11.19	2.93	1.26	4.96	4.00	0.96	1.24
2010	14.58	10.92	3.66	1.34	4.91	4.45	0.46	1.10
2011	15.13	10.72	4.41	1.41	4.55	3.96	0.59	1.15
2012	15.36	10.31	5.05	1.49	4.24	4.09	0.14	1.04
2013	15.64	9.70	5.94	1.61	4.02	3.52	0.50	1.14
2014	15.91	9.38	6.53	1.70	3.83	3.79	0.04	1.01
2015	15.94	9.67	6.27	1.65	3.56	3.11	0.45	1.15
2016	16.44	9.58	6.86	1.72	3.07	3.13	-0.06	0.98
2017	16.84	10.16	6.68	1.66	2.89	2.88	0.01	1.00
2018	17.77	10.66	7.11	1.67	3.05	3.25	-0.20	0.94

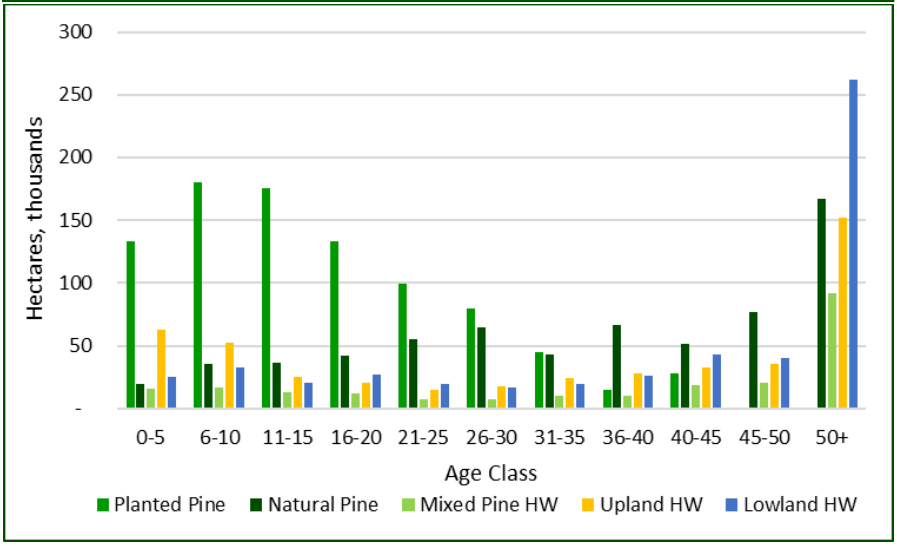
Source: US Forest Service

Historic Timberland Area by Forest Type



Source: US Forest Service

Current Private Timberland Area by Age Class and Management Type



Source: US Forest Service, SOFAC