## Bioeconomy Development Opportunity Zone Risk Rating

# 'AA'

**The Toombs County, GA, BDO Zone for woody biomass is rated 'AA.' Quantities of low-risk woody biomass are available for biobased projects. The infrastructure for woody biomass harvesting and processing are well-established with a large pool of experienced labor.**

### Rating Parameters:

| Category | Rated Quantity | Delivered Cost | BDO Zone Size |
|---|---|---|---|
| Pulpwood | 800,000 bdt/yr | $65-$86/bdt | 75-mi drive distance from Lyons, GA |
| Forest Residues | 70,000 bdt/yr | $60-$68/bdt | |
| Sawmill Residues | 145,000 bdt/yr | $58-$73/bdt | |

## BDO Zone Assets

- **800,000 bdt/yr of pulpwood available at low risk**
- **A highly productive forest products industry guarantees a stable supply of biomass**
- **Forestry supply chain is well-established and efficient**
- **State and county government support of the forest products industry**
- **Industrial and transportation infrastructure is compatible with large-scale bioeconomy projects.**
- **Toombs County is a pro-business community with low operating costs and a relaxed quality of life.**

## BDO Zone Liabilities

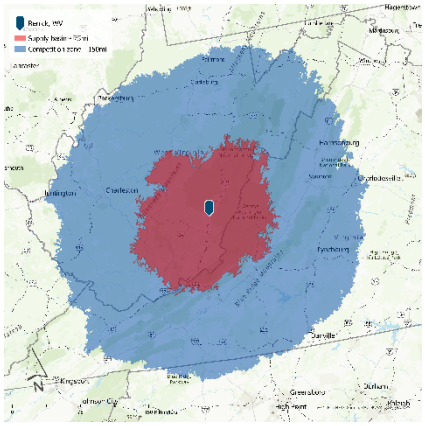
- **A growing global industrial wood pellet industry may result in increased competition for pulpwood**
- **Insurance requirements are contributing to a shortage of logging truck drivers**
- **Logging company ownership and management is aging and may face difficulties with the transfer of ownership upon retirement.**
- **Georgia enacted legislation in April 2006 (HB 1018) creating an exemption for biomass materials from the state's sales and use taxes. It is not clear how much longer this incentive will continue to be offered.**

## BDO Zone Risk Rating

**The Toombs County, Bioeconomy Development Opportunity Zone is rated 'AA,' or 'very low' risk.**

Risk Rating Grades are defined as follows: AAA (*extremely low*), AA (*very low*), A (*low*), and BBB (*low-moderate*), BB (*moderate*), B (*moderate-high*), C (*high*).

### Toombs County, GA, BDO Zone



## Scoring & Rating Methodology

In assessing the biomass supply chain risk for the Bioeconomy Development Opportunity (BDO) Zone, 72 Risk Indicators from the US Standards for Biomass Supply Chain Risk (BSCR) were applied. These BDO Zone Risk Indicators are the subset of BSCR Risk Indicators applicable to evaluating feedstock risk within a BDO Zone.

Feedstock quantities are expressed in bone dry tons per year (bdt/yr). While feedstock costs are expressed in United States (USD) dollars. Maximum transport distance is based on a 75-mile driving distance from the center point (Lyons, GA).

The BDO Zone rating is based on an aggregation of the scores assigned to each BDO Zone Risk Indicator (RI) assessed in this report. First, each BDO Zone Risk Indicator is given a **Raw Risk Likelihood (RRL)** score which denotes the likelihood of a risk to future BDO Zone projects due to the Risk Indicator. RRL Scores are scaled as either *very low* (2), *low* (4), *medium* (6), *high* (8), or *very high* (10).

Next, each BDO Zone Risk Indicator is given a **Raw Risk Impact (RRI)** score which denotes the impact on a future BDO Zone project due to

the Risk Indicator. RRI scores are scaled as either *very low* (2), *low* (4), *medium* (6), *high* (8), or *very high* (10). Impact level scores are based on the impact level of a risk on the successful development and deployment of a BDO Zone project with no mitigation measures.

Then, the **Gross Risk Indicator (GRI)** score is calculated as the product of the RRL and the RRI scores. For example, if the 'Competitor Price and Price Sensitivity' is scored at a RRL of 2 and a RRI of 9, then the GRI for this risk indicator is $2 \times 9 = 18$.

If the analyst deems that a typical bio-based project could put in place economically reasonable measures or best practices that mitigate either the likelihood (RRL) or the impact (RRI), or both, then the GRI will be notched accordingly.

Finally, the **Loaded RI** score for each Risk Indicator is calculated as the product of the Total Notch and the GRI score, which is the final score for that indicator.

Loaded RI scores of 20 or less are deemed *very low risk*; scores between 21 and 40 are deemed *low risk*; scores between 41 and 60 are deemed *medium risk*; scores between 61 and 80 are deemed *high risk*; and scores of 81 and greater are deemed *very high risk*.

The total risk rating for the BDO Zone is the average of all Loaded RI scores. The BDO Zone score for Location is ***13.72 out of 100, resulting in an 'AA' designation***.

All scoring and rationale for each Risk Indicator are provided in Appendix B.

## Analyst Notes

The Toombs County BDO Zone encompasses 12,904 square miles in the Georgia Coastal Plain adjacent to the South Carolina border. It is defined by a 75-mile drive distance from the center point of Lyons, GA. Also referred to as the Supply Basin, it is completely contained in GA, encompassing all or part of 41 counties. Biomass for a new facility will likely be sourced from this area.

The Competition Zone extends to a 150-mile driving distance from the center point. Wood-using facilities within this area will be competing for biomass for a new project. The Competition Zone extends further into Georgia, for a total of 106 counties. It also adds all or part of 19 counties in South Carolina and eight Florida counties. The total area of the Competition Zone is 47,100 square miles.

The forest products industry in the BDO Zone region is one of the most productive in the country. Total timber growth over the past 10 years has averaged about 12.7 million bdt per year. The BDO Zone includes seven of the highest producing counties in Georgia for pulpwood. Pulpwood net growth in the BDO Zone has averaged about 8.2 million bdt per year for the past decade. The forests in the region are intensively managed and a major contributor to the local and state economy.

The timberlands consist of softwoods (pine) and hardwoods. About 28% of this area is made up of pine plantations and 17% in natural pine stands.

The overwhelming majority of the timberlands in the Zone are privately owned, 91%. The size of the tracts averages 99 acres. 49% of timberland tracts are between 51-500 acres and 32% are larger than 500 acres.

### BDO Zone Assets

The forest products industry in the area has a rich history. Sawmills have operated in the region for about 200 years, while the pulp & paper industry was established in the 1930s. Modern forestry practices and methods for breeding, planting, growing, harvesting, and collection of biomass have been in place for decades within the Supply Basin.

The US Department of Energy (Billion Ton Report) indicates that the total volume of standing pulpwood inventory in the Supply Zone is approximately 1.2 million bdt/yr. Available pulpwood is defined as standing small diameter trees (between 5- and 11-inches diameter at breast height). It is estimated that approximately 67% of this amount, 800,000 bdt/yr, could be available for a new project at low risk for the rated price of $65/bdt to $86/bdt.

The US Department of Energy also estimates that approximately 280,000 bdt/yr of forest residues could also be available. Forest residues include tree branches,

bottoms, and tops normally discarded during conventional logging operations. These residues are not widely utilized in the area because of quality considerations. However, it is estimated that 70,000 bdt/yr of forest residues could be made available at low risk for the rated price of $60/bdt to $68/bdt (Appendix A).

Sixteen major sawmills operate in the Supply Zone, with a production capacity of about 1,900 million board feet of lumber and 135 million square feet of veneer/plywood per year. These mills have a combined potential production of 1,907,000 bdt of sawmill residues annually. However, the market for sawmill residues is very tight with nine pulp & paper mills, 10 wood pellet mills, and 10 biomass energy facilities competing for this resource. It is estimated that 143,000 bdt/yr of sawmill residues could be available at low risk for a weighted price range of $58-$73/bdt. About 63% of the available sawmill residues are estimated to be wood chips, 15% bark/hog fuels, 12% sawdust, and 10% wood shavings.

The region is a world leader in forestry, with high levels of timber production and an increasing volume of trees since 1953. The industry is a major economic driver for the area, with an experienced workforce for forest products.

In the BDO Zone, we found that the labor pool for logging operations is not limiting, with over 270 active logging companies in the region.

It is noteworthy that State and county governments provide support of the forest products industry through tax incentives, consular, trade, or chamber of commerce offices in the state.

### BDO Zone Liabilities

A nationwide shortage of truck drivers has made it difficult to recruit log truck drivers. Also, log truck insurance in Georgia has risen, contributing to the log truck driver shortage.

The median age for owners of logging companies is 57 years, and for logging company managers it is 53 years. Two-thirds of logging company owners predict that their companies would cease to exist upon retirement, as none expect a family member to take over the business. This trend may be offset by increasing consolidation, creating larger logging companies.

The Georgia legislature created an exemption for biomass in the state's sales and use tax in 2006. The tax incentive has been in place for 17 years. While the bill passed in Feb 2022, it is not clear how much longer this incentive will continue to be offered.

### Infrastructure Profile

Infrastructure risk was assessed with reference to a 260-acre site located at the Toombs Corporate Center located in Lyons, GA. Site assets include a 12" water main, a 4" gas main, and an 8" sewer main. Electric service on the property is provided by Altamaha EMC and telecom is available on site. This location proximity to major highways, railways, ports, airports, and markets is a significant advantage to have access to local, regional and international markets in cost-efficient manners.

The BDO Zone had good highway and rail networks along with access to the Ports of Savannah and Brunswick.

Overall, all the risks associated with the infrastructure including physical, logistical, social, workforce, and permitting are deemed to be low.

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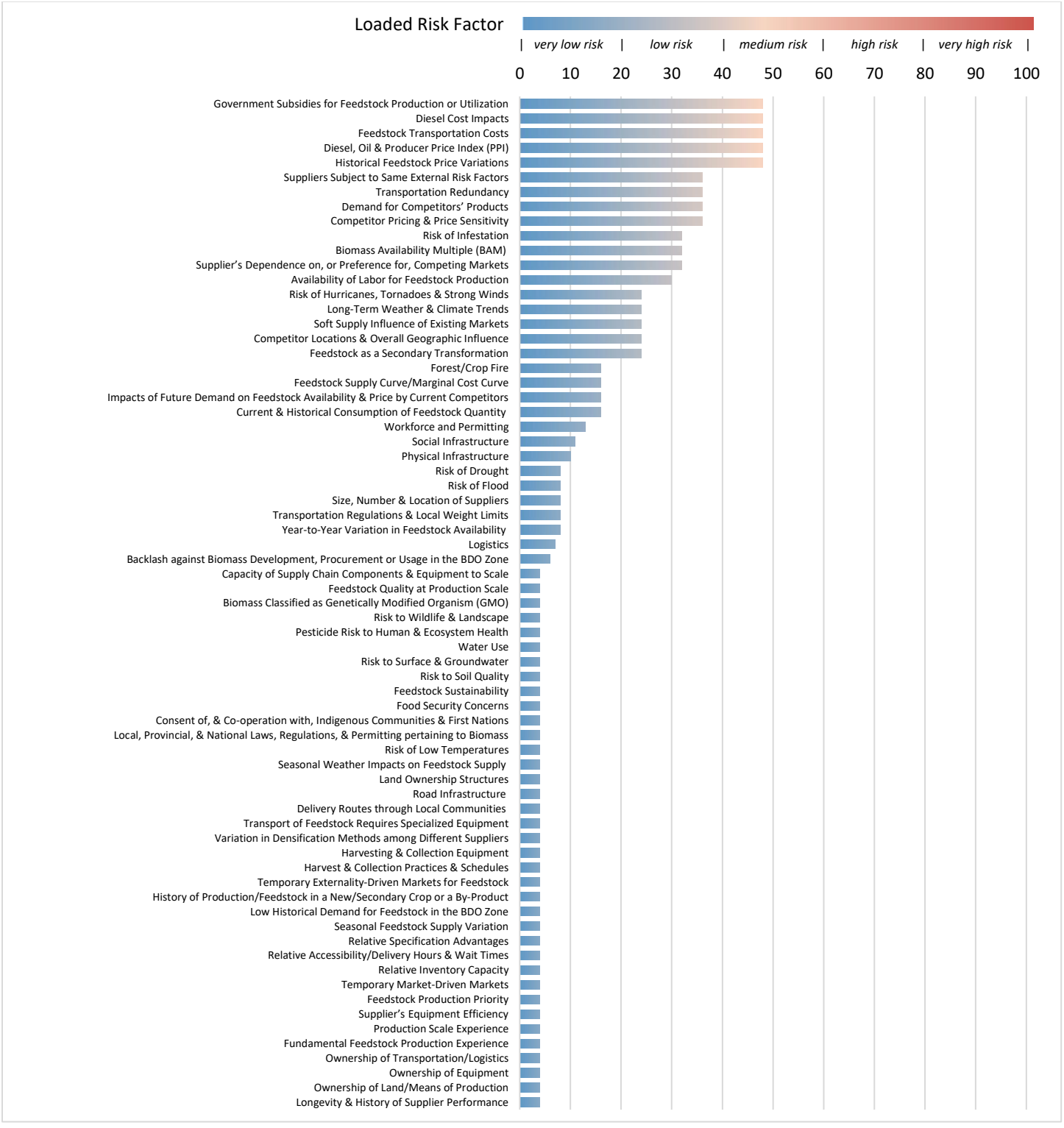
## Figure 1: Risk Indicators (Sorted by Risk Level)



## Table 1: Risk Indicators and Associated Scores

| | Feedstock Supply Chain Risk Indicators | Raw Risk Likelihood | Raw Risk Impact | Gross Risk Indicator | Mitigation /Notching | Loaded RI Score |
|---|---|---|---|---|---|---|
| | **Category 1.0: Supplier Risk** | | | | | |
| **1.1.1** | Longevity & History of Supplier Performance | 2 | 2 | 4 | NN | 4 |
| **1.2.1** | Supplier's Dependence on, or Preference for, Competing Markets | 8 | 8 | 64 | 50% | 32 |
| **1.3.1** | Ownership of Land / Means of Production | 2 | 2 | 4 | NN | 4 |
| **1.3.2** | Ownership of Equipment | 2 | 2 | 4 | NN | 4 |
| **1.3.3** | Ownership of Transportation/Logistics | 2 | 2 | 4 | NN | 4 |
| **1.3.4** | Feedstock as a Secondary Transformation | 6 | 4 | 24 | NN | 24 |
| **1.4.1** | Fundamental Feedstock Production Experience | 2 | 2 | 4 | NN | 4 |
| **1.4.2** | Production Scale Experience | 2 | 2 | 4 | NN | 4 |
| **1.5.1** | Supplier's Equipment Efficiency | 2 | 2 | 4 | NN | 4 |
| **1.6.1** | Feedstock Production Priority | 2 | 2 | 4 | NN | 4 |
| | **Category 2.0: Competitor Risk** | | | | | |
| **2.1.1** | Competitor Locations and Overall Geographic Influence | 6 | 4 | 24 | NN | 24 |
| **2.1.2** | Current and Historical Consumption of Feedstock Quantity | 4 | 4 | 16 | NN | 16 |
| **2.1.3** | Competitor Pricing and Price Sensitivity | 6 | 6 | 36 | NN | 36 |
| **2.1.4** | Impacts of Future Demand on Feedstock Availability and Price by Current Competitors | 4 | 4 | 16 | NN | 16 |
| **2.1.5** | Soft Supply Influence of Existing Markets | 8 | 6 | 48 | 50% | 24 |
| **2.1.6** | Temporary Market-Driven Markets | 2 | 2 | 4 | NN | 4 |
| **2.2.1** | Relative Inventory Capacity | 2 | 2 | 4 | NN | 4 |
| **2.2.2** | Relative Accessibility / Delivery Hours and Wait Times | 2 | 2 | 4 | NN | 4 |
| **2.2.3** | Relative Specification Advantages | 2 | 2 | 4 | NN | 4 |
| **2.2.4** | Demand for Competitors' Products | 6 | 6 | 36 | NN | 36 |
| | **Category 3.0: Supply Chain Risk** | | | | | |
| **3.1.1** | Biomass Availability Multiple (BAM) | 4 | 8 | 32 | NN | 32 |
| **3.1.2** | Feedstock Supply Curve / Marginal Cost Curve | 4 | 4 | 16 | NN | 16 |
| **3.1.3** | Seasonal Feedstock Supply Variation | 2 | 2 | 4 | NN | 4 |
| **3.1.4** | Year-to-Year Variation in Feedstock Availability | 2 | 4 | 8 | NN | 8 |
| **3.2.1** | Historical Feedstock Price Variations | 6 | 8 | 48 | NN | 48 |
| **3.2.2** | Low Historical Demand for Feedstock in the BDO Zone | 2 | 2 | 4 | NN | 4 |
| **3.2.3** | History of Production/Feedstock in a New/Secondary Crop or a By-Product | 2 | 2 | 4 | NN | 4 |
| **3.3.1** | Diesel, Oil and Producer Price Index (PPI) | 6 | 8 | 48 | NN | 48 |
| **3.3.2** | Currency Risk | NR | NR | NR | NR | NR |
| **3.3.3** | Border Risk | NR | NR | NR | NR | NR |
| **3.3.4** | Temporary Externality-Driven Markets for Feedstock | 2 | 2 | 4 | NN | 4 |
| **3.4.1** | Harvest and Collection Practices and Schedules | 2 | 2 | 4 | NN | 4 |
| **3.4.2** | Harvesting and Collection Equipment | 2 | 2 | 4 | NN | 4 |
| **3.4.3** | Variation in Densification Methods among Different Suppliers | 2 | 2 | 4 | NN | 4 |
| **3.4.4** | Availability of Labor for Feedstock Production | 8 | 8 | 64 | 37.5% | 48 |
| **3.5.1** | Feedstock Transportation Costs | 6 | 8 | 48 | NN | 48 |
| **3.5.2** | Diesel Cost Impacts | 6 | 8 | 48 | NN | 48 |
| **3.5.3** | Transport of Feedstock Requires Specialized Equipment | 2 | 2 | 4 | NN | 4 |
| **3.5.4** | Delivery Routes through Local Communities | 2 | 2 | 4 | NN | 4 |
| **3.5.5** | Transportation Regulations and Local Weight Limits | 2 | 4 | 8 | NN | 8 |
| **3.5.6** | Road Infrastructure | 2 | 2 | 4 | NN | 4 |
| **3.5.7** | Transportation Redundancy | 6 | 8 | 48 | 25% | 36 |
| **3.6.1** | Size, Number and Location of Suppliers | 4 | 2 | 8 | NN | 8 |
| **3.6.2** | Suppliers Subject to Same External Risk Factors | 6 | 6 | 36 | NN | 36 |
| **3.6.3** | Land Ownership Structures | 2 | 2 | 4 | NN | 4 |
| **3.7.1** | Seasonal Weather Impacts on Feedstock Supply | 2 | 2 | 4 | NN | 4 |
| **3.7.2** | Long-Term Weather and Climate Trends | 4 | 6 | 24 | NN | 24 |
| **3.7.3** | Forest / Crop Fire | 4 | 4 | 16 | NN | 16 |
| **3.7.4** | Risk of Infestation | 4 | 8 | 32 | NN | 32 |
| **3.7.5** | Risk of Hail | NR | NR | NR | NR | NR |
| **3.7.6** | Risk of Flood | 2 | 4 | 8 | NN | 8 |
| **3.7.7** | Risk of Drought | 4 | 2 | 8 | NN | 8 |
| **3.7.8** | Risk of Hurricanes, Tornadoes and Strong Winds | 4 | 8 | 32 | 25% | 24 |
| **3.7.9** | Risk of Low Temperatures | 2 | 2 | 4 | NN | 4 |
| **3.8.1** | Government Subsidies for Feedstock Production or Utilization | 6 | 8 | 48 | NN | 48 |
| **3.8.2** | Local, Provincial, and National Laws, Regulations, and Permitting pertaining to Biomass | 2 | 2 | 4 | NN | 4 |
| **3.8.3** | Backlash against Biomass Development, Procurement or Usage in the BDO Zone | 4 | 6 | 24 | 75% | 6 |
| **3.8.4** | Consent of, and Co-operation with, Indigenous Communities and First Nations | 2 | 2 | 4 | NN | 4 |

| | | | | | | |
|---|---|---|---|---|---|---|
| **3.8.5** | Food Security Concerns | 2 | 2 | 4 | NN | 4 |
| **3.9.1** | Feedstock Sustainability | 2 | 2 | 4 | NN | 4 |
| **3.9.2** | Risk to Soil Quality | 2 | 2 | 4 | NN | 4 |
| **3.9.3** | Risk to Surface and Groundwater | 2 | 2 | 4 | NN | 4 |
| **3.9.4** | Water Use | 2 | 2 | 4 | NN | 4 |
| **3.9.5** | Pesticide Risk to Human and Ecosystem Health | 2 | 2 | 4 | NN | 4 |
| **3.9.6** | Risk to Wildlife and Landscape | 2 | 2 | 4 | NN | 4 |
| **3.9.7** | Biomass Classified as Genetically Modified Organism (GMO) | 2 | 2 | 4 | NN | 4 |
| | **Category 4.0: Feedstock Scale-up Risk** | | | | | |
| **4.1.1** | Feedstock Quality at Production Scale | 2 | 2 | 4 | NN | 4 |
| **4.1.2** | Capacity of Supply Chain Components and Equipment to Scale | 2 | 2 | 4 | NN | 4 |
| | **Category 5.0: Infrastructure** | | | | | |
| **5.1** | Physical Infrastructure | 3.2 | 3.2 | 10 | NN | 10 |
| **5.2** | Logistics | 2.5 | 2.5 | 7 | NN | 7 |
| **5.3** | Social Infrastructure | 3.14 | 3.14 | 10.86 | NN | 10.86 |
| **5.4** | Workforce and Permitting | 3.5 | 3.5 | 13 | NN | 13 |
| | | | | | ***Average*** | **13.72** |




### Toombs County, GA, BDO Zone Independent Review Committee (IRC)

**Michele Johnson** – President, Greater Vidalia Chamber of Commerce
**Trent Williams** – Member, Toombs County Development Authority
**Vince Stanley** – General Manager, Vidalia Valley LLC
**Andy Kimbell** – President, Truax Veneer Co.
**Tommy Rollins** – President, TAR Land & Timber
**Monroe Goss** – Client Manager, F&W Forestry Services Inc
**Jason Edenfield** – County Extension Agent, Toombs County UGA Extension Office
**Travis DeLoach** – Consulting Forester
**Aries Haygood** – Member, Toombs County Development Authority
**Garrett Wilcox** – Member, Toombs County Development Authority
**Shane Harrelson** – Owner & Manager, Ohoopee Land & Timber LLC

# APPENDIX A: BIOMASS AVAILABILITY AND PRICING

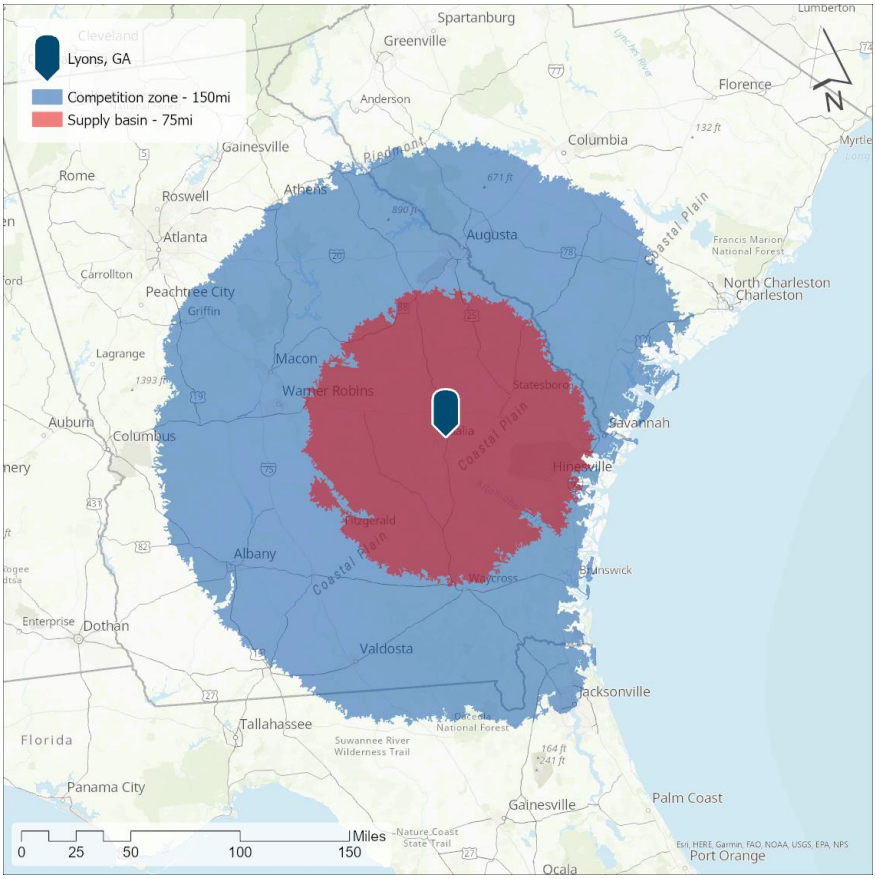
This section assesses the availability and pricing of woody biomass as feedstock for bioenergy, biofuels, and other potential bio-based products in the Toombs County, GA, BDO Zone. The center point for woody biomass availability assessment is Lyons, GA.

## SUPPLY BASIN AND COMPETITION ZONE

The supply basin and the competition zone define the areas of interest for this BDO Zone rating (Figure A-1). The supply basin defines a driving distance of 75 mi from the center point of the BDO Zone. This is where biomass will most likely be sourced for a new project. The competition zone is defined as a driving distance of 150 mi from the BDO Zone center point. This is the area where other users of biomass may be located that could compete for available biomass in the supply basin, impacting the availability of woody biomass for the future biomass projects, located in the supply basin.

The Supply Basin is completely contained in GA, encompassing all or part of 41 counties. The Competition Zone expands to a total of 106 GA counties, 19 SC counties, and eight FL counties. The detailed list of counties in the Supply Basin and Competition Zone are shown in Appendix C, Table C-1.

**Figure A-1: Supply Basin and Competition Zone – Toombs County GA BDO Zone**



## Woody Biomass Types in the Supply Basin

Three types of woody biomass are produced and available in the supply zone including pulpwood, forest residues, and sawmill residues.

Pulpwood is defined as standing small-diameter trees between 5 and 11 inches in diameter at breast height. Pulpwood is traditionally used to make paper, paperboard, oriented strand board (OSB), and medium-density fiberboard (MDF). Pulpwood is also used to produce wood pellets.

Forest residues refer to the by-products or leftover materials resulting from forestry operations, such as timber harvesting and thinning. These residues typically consist of branches, tops, stumps, bark, and other woody debris that remain on-site after the sawtimber has been harvested. Forest residues differ from whole tree chips as the roundwood, or log portion of the tree is not included.

Sawmill residues are the by-products of sawmill operations, produced from the conversion of sawlogs into finished wood products such as lumber and engineered wood. About half of sawlogs are converted to finished wood products and the remainder are sawmill residues which consists of wood chip, sawdust, shavings, and bark (also known as hog fuel).

## Woody Biomass Demand in the Competition Zone

The competition zone is an area of active timber growth as well as a well-established forest products industry.[1] There are currently 33 competitors for biomass in the competition zone for pulpwood quality timber.[2] This number has been steadily rising over the past decade. These industries consist of mills that produce oriented strand board (OSB), medium-density fiberboard (MDF), wood pellets, and pulp & paper. Table A-1 shows the number of competitors in each category along with the current total production capacity and wood demand. Figure A-2 shows the location of competitors in the Competition Zone.

**Table A-1: Summary of Competitors in the Competition Zone**

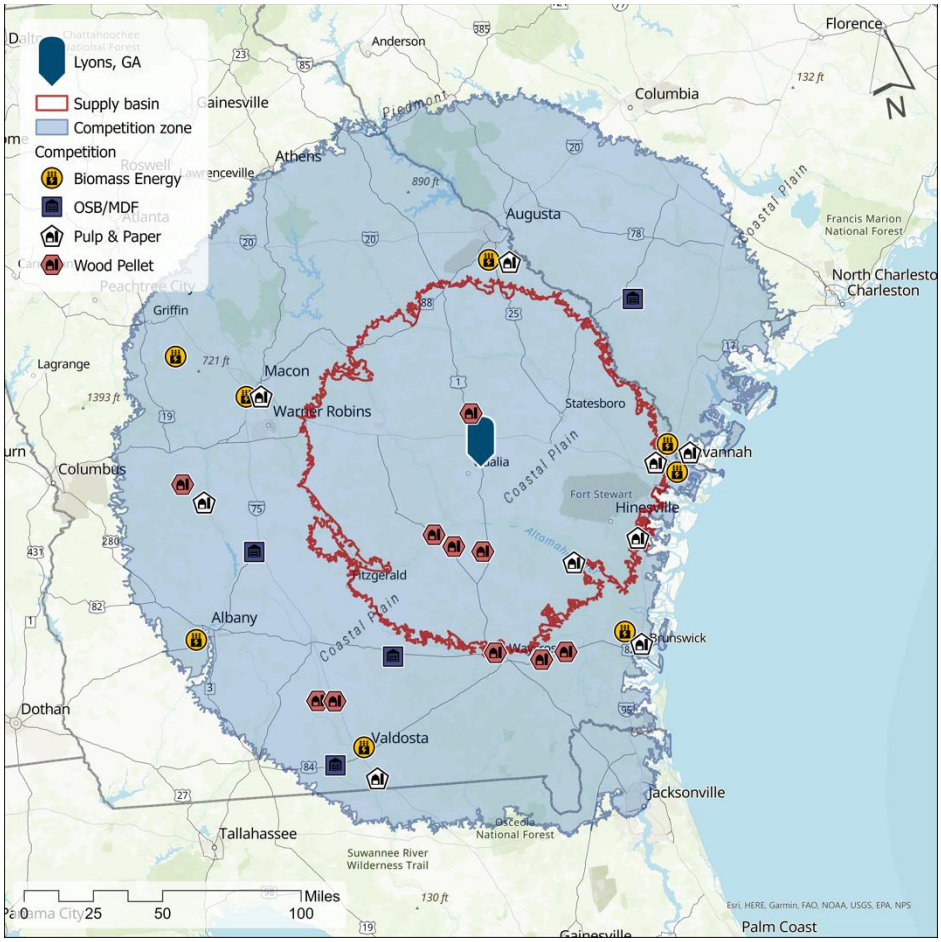
| Category | Number of Companies | Production Capacity | Wood Demand (bdt) |
|---|---|---|---|
| OSB/MDF | 4 | 2,240 MMSF[3] | 2,100,000 |
| Wood Pellets | 10 | 2,483,000 tons | 3,826,000 |
| Pulp & Paper | 9 | 6,242,000 tons | 10,585,000 |
| Biomass Energy | 10 | 651 MW | 3,654,000 |
| Totals | 33 | | 20,165,000 |

- 33 competitors currently consume 20.2 million bdt of woody biomass.
- Note that Table A-1 provides data for the entire Competition Zone which overlaps with the Supply Basin.

Also of note, is that there are nine wood-chipping facilities within the competition zone with a combined production capacity of 2,334,000 bdt.

[1] A National and Global Leader in Forestry. Georgia Forestry Association. https://gfagrow.org/about/numberone/#:~:text=A%20NATIONAL%20AND%20GLOBAL%20LEADER,and%20national%20leader%20in%20forestry.
[2] FORISK Mill Database. North American Forest Industry Capacity. August 2023
[3] MMSF stands for million square feet

**Figure A-2: Competitors for Feedstock in the Competition Zone**



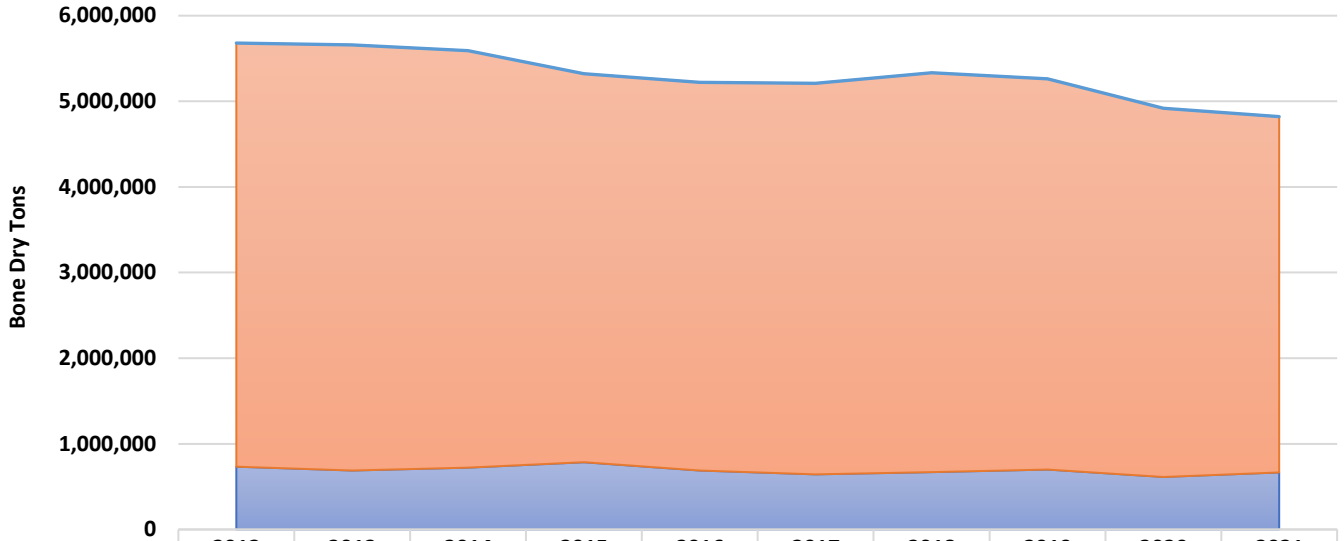

Two new pellet mills and one pellet mill expansion have been announced in the Competition Zone. These facilities will come online in 2024 and are expected to add about 1,397,000 bdt of woody biomass demand (Table A-2).

**Table A-2: Announced New Competitors in the Competition Zone**

| Industry | Category | Number of Companies | Production Capacity (t) | Biomass Demand (bdt) |
|---|---|---|---|---|
| Wood Pellets | New Facility | 2 | 992,000 | 1,375,000 |
| Wood Pellets | Expansion | 1 | 20,000 | 22,000 |
| Totals | | 3 | 1,012,000 | 1,397,000 |

Pulpwood harvest (removals) within the Supply Basin reflect on the wood biomass demand and is shown in Figure A-3. These data for the period covering 2012 to 2021 and show the removals for total pulpwood broken down by softwood and hardwood species.

**Figure A-3: Pulpwood- Average Annual Harvest Removals in Supply Basin**




| | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 |
|---|---|---|---|---|---|---|---|---|---|---|
| Softwood | 4,947,963 | 4,971,182 | 4,872,408 | 4,535,963 | 4,531,461 | 4,564,146 | 4,662,808 | 4,561,656 | 4,304,077 | 4,155,848 |
| Hardwood | 732,042 | 687,524 | 720,252 | 784,611 | 689,654 | 645,179 | 669,241 | 699,937 | 612,761 | 665,148 |
| Total pulpwood | 5,680,005 | 5,658,706 | 5,592,660 | 5,320,574 | 5,221,115 | 5,209,325 | 5,332,049 | 5,261,593 | 4,916,838 | 4,820,995 |

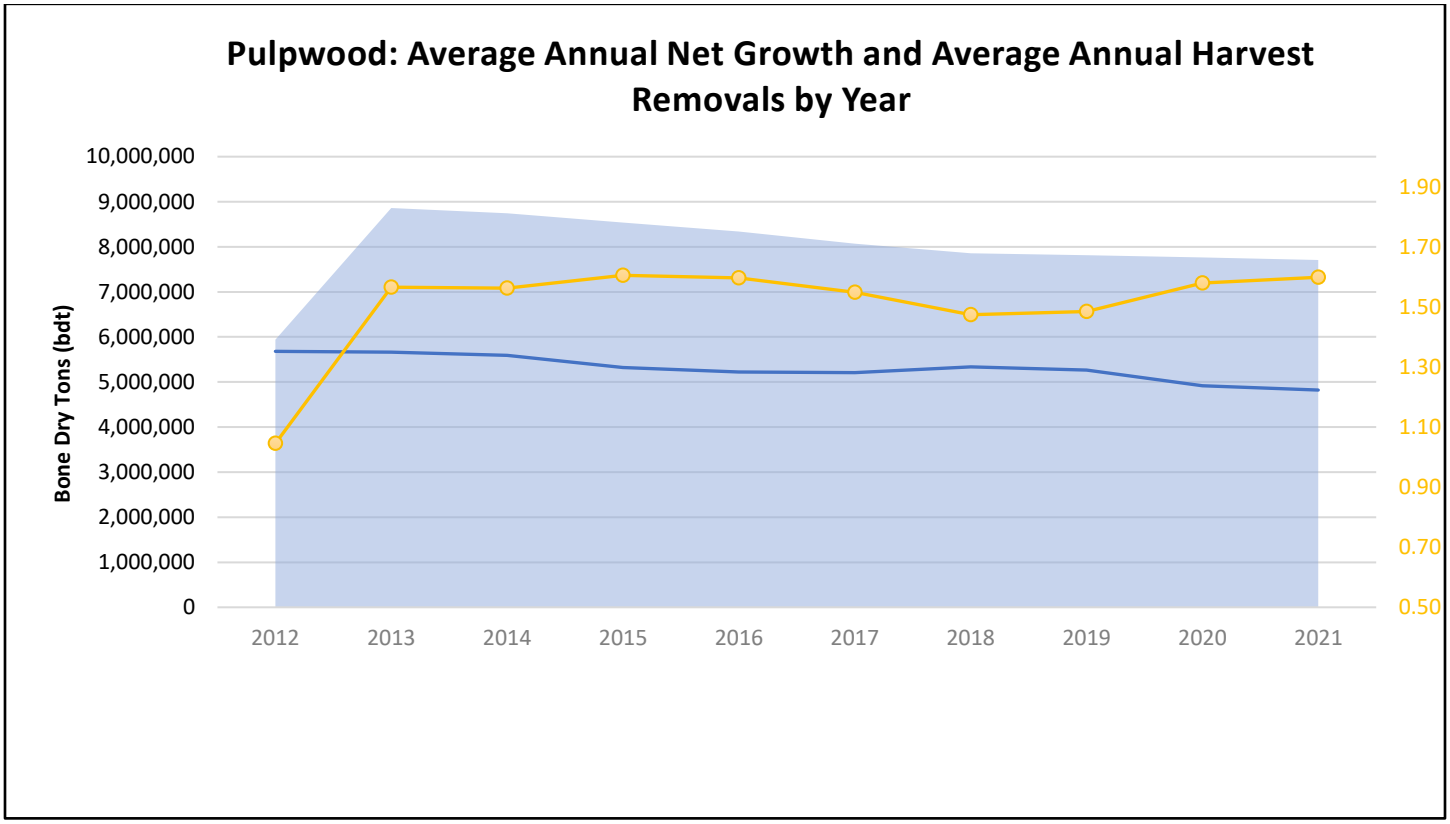
- Removals of total pulpwood since 2012 have steadily declined by approximately 838,000 dry tons, 16%
- Removals of softwood pulpwood since 2012 have steadily declined by approximately 815,000 dry tons
- Removals of hardwood since 2012 have declined by approximately 23,000 dry tons
- Some of this decline can be attributed to a decreasing demand for paper[4] as well as competition from foreign pulp producers, notably Brazil[5]
- If this trend continues, the available supply of standing pulpwood will increase.

The average net annual growth of pulpwood in the Supply Basin is shown in Figure A-4. This figure also incorporates the harvest removals from Figure A-3 to allow direct comparison of the ratio of growth to harvest, also known as growth-to-drain ratio.

The growth-to-drain ratio is important in understanding the relative abundance of standing timber inventory, and the rate of regrowth accounting for harvest. A negative ratio indicates a shrinking timber resources, as there is more wood been removed than is being grown. A positive ratio, as in the case of the Toombs County Supply Basin, indicates that wood is growing at a faster rate than is being harvested. This situation indicates that there is an opportunity for additional wood-using industries in the BDO Zone.

[4] https://www.wabe.org/georgia-pacific-announces-layoffs-says-it-will-stop-printing-office-paper/
[5] Personal communication. Dru Preston. Georgia Forestry Commission. Oct 2023.

**Figure A-4: Pulpwood: Average Annual Net Growth and Harvest Removals in Supply Basin**




- The growth-to-drain ratio for pulpwood in the supply basin has been consistent since 2013 averaging about 1.56
- Pulpwood removals have decreased steadily since 2013
- Since 2019 growth-to-drain-ratio has been increasing, suggesting an increasing standing pulpwood inventory
- Excess standing pulpwood in the Supply Basin averaged about 2.9 million bdt annually between 2013 and 2021

## Pulpwood and Forest Residue Availability In the Supply Basin

The US Department of Energy (Billion Ton Report)[6] was used to obtain high-level estimates of pulpwood and forest residue availability. The Billion Ton Report provides data on biomass availability through 2040 based on a number of assumptions of market and logistical conditions (Table A-3).

County-level estimates of the availability of pulpwood and forest residue for all available years (2020, 2025, 2030, 2040) were downloaded. Using GIS software, a polygon for the supply basin (75-mile maximum transport distance) was developed and used to estimate the percentage area of each county included in the supply basin (percentage overlap value). For each county, the percentage overlap value was then multiplied by the average annual pulpwood and forest residue availability for 2020-2040 to estimate the total quantity of pulpwood and forest residue in the supply basin available for a new entrant. To develop supply curves, the supply basin polygon was used to estimate the quantity of pulpwood and forest residue available based on the percentage overlap in each 5-mile transport distance segment, up to the 75-mile maximum transport distance.

[6] https://bioenergykdf.net/2016-billion-ton-report

**Table A-3: Billion-Ton Report Assumptions and Parameters Included in the Analysis**

| **Bioenergy – Knowledge Discovery Framework, US Department of Energy<br>Billion-Ton Report – 2016 Vol. 1 Data Download Tool[7]** | | |
|---|---|---|
| **Data retrieval** | | County level |
| | | Year 2020, 2025, 2030, 2040 |
| **Data presented as** | | Bone dry tons per year (bdt/yr)[8] |
| | | Average of the five retrieved years (2020, 2025, 2030, 2040) |
| **Resource Category** | **Forestry** | All biomass resources modeled on forestlands with commercial timber, i.e., forest residues and small-diameter trees. |
| **Demand for feedstock** | | Based on 2016 data |
| **Scenario** | **Medium housing, medium energy demands** | **1.)** Growth in housing starts returns to long-term average by 2025. The long-term average of housing starts from 1959 through 2011 is slightly less than 1.1 million housing starts per year.<br>**2.)** Growth in wood biomass demand for energy increases by 86% by 2040. Actual wood biomass production in 2010 was 58.2 million dry tons for all scenarios.<br>**3.)** New plantation management intensity in the South - Based on current FIA pine plantation growth rate. Current average FIA growth rate on pine plantations across the South (all owners, all ages) is approximately 108 cubic feet/acre per year (1.6 dry ton/acre per year). Increasing management intensity by 50% only on new plantations results in an increase in the average South-wide growth rate over time up to 140 cubic feet/ac per year in 2040 (2.1 dry tons/acre per year). |
| **Biomass price** | Specified biomass price after harvest cost as applicable but before transportation costs, in 2014 dollars per dry ton equivalent. *If these prices are used within the report, they will include inflation rates and newest transportation costs.* | |
| **Resources** | Hardwood, lowland forest residues, Hardwood, lowland whole trees, Hardwood, upland forest residues, Hardwood, upland whole trees, Mixedwood forest residues, Mixedwood whole trees, Softwood, natural forest residues, Softwood, natural whole trees, Softwood, planted forest residues, Softwood, planted whole trees – logging resides = harvest/forest residues; whole trees = only small diameter trees = pulpwood. | |
| **Class** | **RSDF** | Residues, forestry (i.e., forest residues) |
| | **TREE** | Small-diameter trees |
| **Section** | **PFRS** | Primary forestland resources including forest residues (i.e., Class RSDF) and small-diameter trees (i.e., class TREE). |
| **Diameter class** | **2** | Timberland trees with diameter at breast height 5-11 inches. |
| **Operation Type** | **Clear Cut** | Clearcut harvest of small-diameter trees or production of forest residues. |
| | **Thinning** | Thinning harvest of small-diameter trees or production of forest residues. |
| **Supply Class** | **LE40** | Timberland resources harvested from slopes less than or equal to 40 degrees. |

Biomass availability estimates based on the Billion Ton Study are shown for pulpwood and forest residues in Table A-4. These data show total potential pulpwood and forest residues availability in the Supply Zone. It is also important to note that the Billion Ton Study estimates the amount of biomass available, the excess, after accounting for current and predicted biomass use through 2040.

[7] US Department of Energy 2016 Billion Ton Report. https://bioenergykdf.net/2016-billion-ton-report
[8] Dry tons (0% moisture content) were converted to green tons using a moisture content assumption of 50% for pulpwood, 35% for forest residues.

Starting with the Billion Ton estimates, the BDO Zone rating process determines the quantity of low-risk biomass available in the Supply Basin. This amount is usually less than the total estimated availability.

In reality, not all produced biomass will be available for future biomass projects for various reasons, such as unwillingness of private landowners to sell their wood fibers for future biomass projects, lack of established road and logistics networks, lack of access to labor for harvesting and transportation operations, and unfavorable weather conditions during harvest season. In addition, assumptions are made to estimate total potential biomass availability, which may not capture the real situations.

To reflect on such uncertainties in our woody biomass availability assessment, we apply Biomass Availability Multiple (BAM) to the total potential biomass available, shown in Table A-4. The BAM indicates the degree of redundancy in the biomass supply in the BDO Zone. It is the mean ratio of biomass feedstock available to a project, in relation to delivered cost, divided by the biomass project's mean rated quantity. BAM is a strong indicator of supply chain resilience when stressed by supply shortage and/or supplier breach. The higher uncertainty on biomass available for a project, the higher the BAM factor.

In this project, BAM is applied to the total estimated quantity to ensure adequate feedstock redundancy for each feedstock type. Specifically, a BAM of 1.5 is applied to pulpwood, resulting in a rated quantity of 800,000 bdt/yr, while a BAM of 4 is applied to forest residues, resulting in a rated quantity of 70,000 bdt/yr.

**Table A-4: Estimate of Average Annual and Low-risk Quantities of Pulpwood and Forest Residues through 2040**

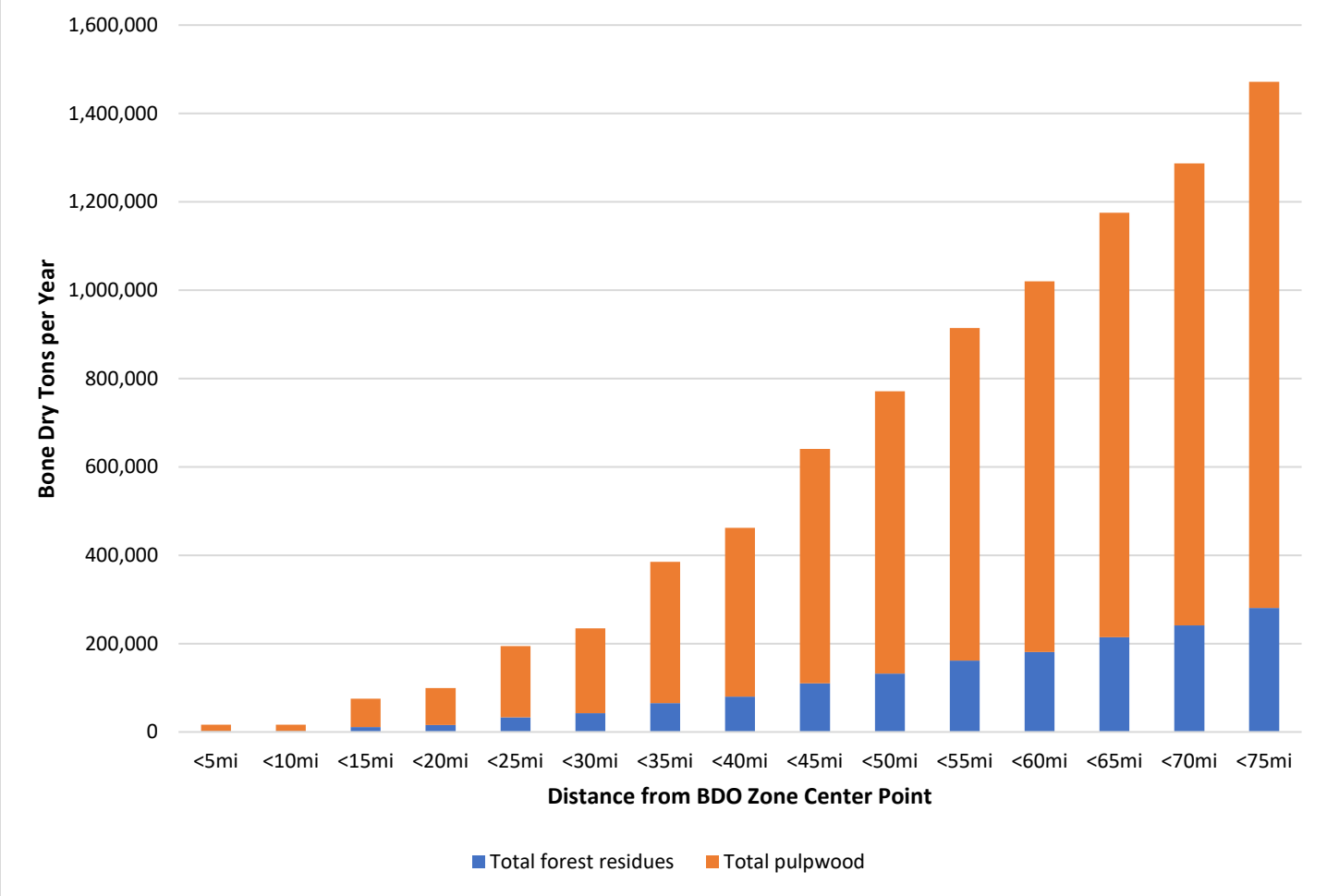
| Biomass Type | Average Annual Availability (bdt/yr) | Low-Risk Quantity after incorporating BAM factor (bdt/yr) |
|---|---|---|
| Pulpwood | 1,191,000 | 800,000 |
| Forest Residues | 280,000 | 70,000 |

Table A-4 indicates that the average total volume of pulpwood in the Supply Zone is estimated to be 1,191,000 bdt/yr assuming current timber growth rates, continuing economic conditions, and level of competition. After applying BAM, it is estimated that approximately 67% of this amount, 800,000 bdt/yr, could be available for a new project at low risk.

Likewise, the total volume of forest residues in the Supply Zone is estimated to be 280,000 bdt/yr. Applying BAM, it is estimated that approximately 25% of this amount, 70,000 bdt/yr could be available for a new project at low risk.

The volume available and price is affected by the distance of the biomass from the center point of the BDO Zone in Lyons, GA. Figure A-5 shows the effect of distance on biomass availability. Note that the availability of both pulpwood and forest residues increases with increasing distance. The price of biomass will also rise with increasing distance, as the cost of transportation is a major component of the total price.

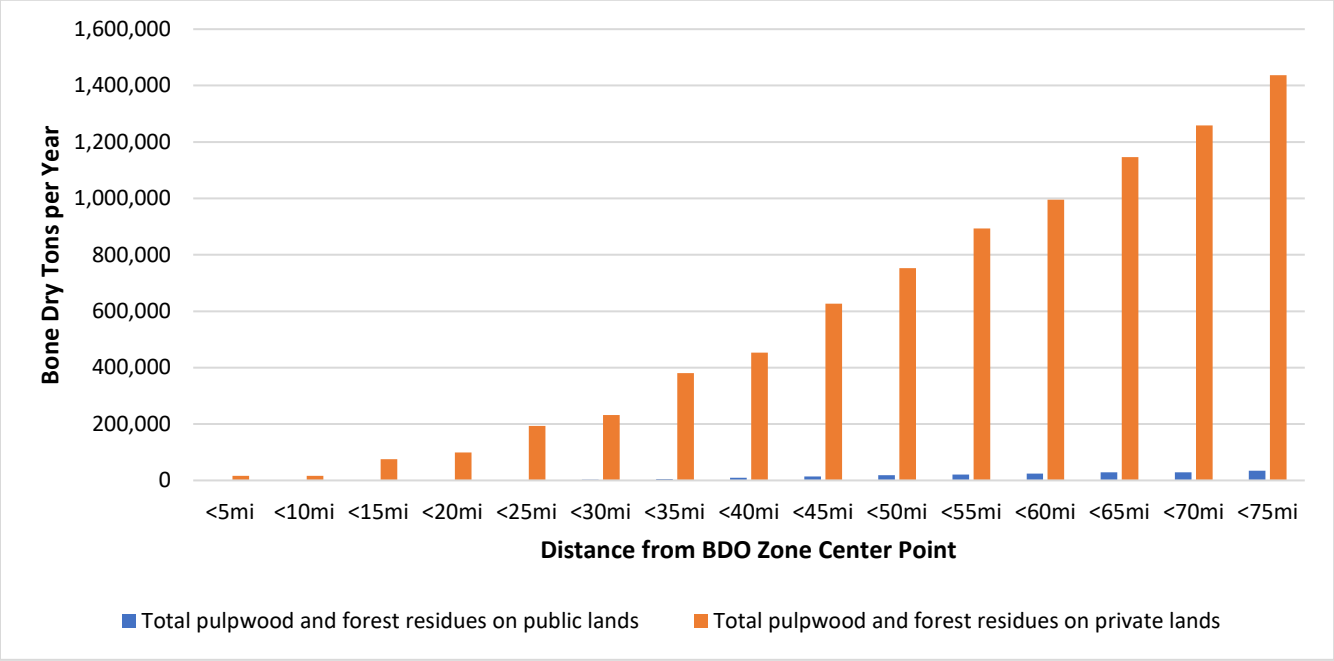
**Figure A-5: Estimated Annual Average Pulpwood and Forest Residues Availability by Driving Distance**




- Within the 75-mile driving distance supply basin, an annual average of 1,471,000 bdt of pulpwood and forest residues is estimated to be available through 2040
- Half of the total available volume is available within a 50-mile driving distance
- Of the total, 1,191,000 tons are pulpwood and 280,000 tons are forest residues

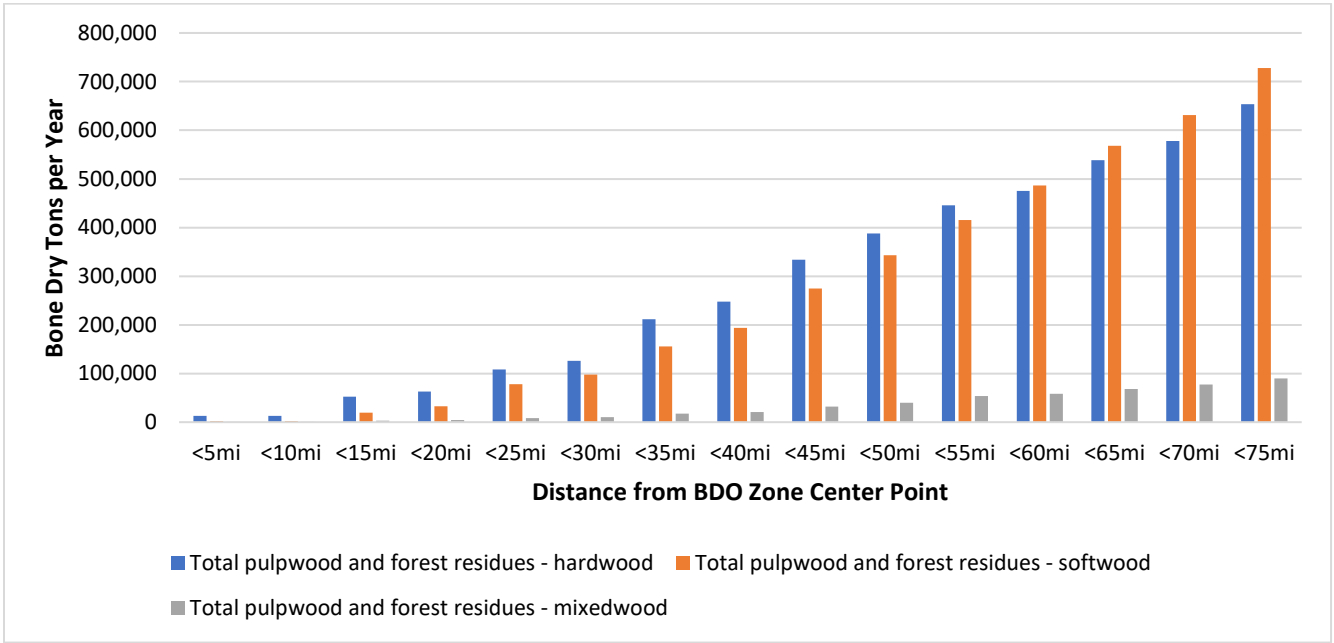
The availability of pulpwood and forest residues on private and public lands and by species are shown in Figures A-6 and A-7 respectively.

**Figure A-6: Estimated Annual Average Pulpwood and Forest Residues Availability– Private vs Public Lands**




- Over 91% of the available biomass will be sourced from private lands

**Figure A-7: Estimate of Annual Average Pulpwood and Forest Residues Availability by Species**




- Hardwood and pulpwood are slightly more prevalent than softwood within 55 miles of the center point
- At 60 miles and further, softwood pulpwood and forest residues become slightly more prevalent
- Mixedwood species makes up a very small proportion of the total available pulpwood and forest residues

## Sawmill Residues Availability In the Supply Basin

Within the Supply Basin, there are 29 potential suppliers of sawmill residues. However, 13 of these facilities have an annual production of less than 10 million board feet (MMBF) of lumber and do not produce a significant volume of residues. The remaining 16 mills are classified as large and will be included as potential sources of feedstock for the purposes of this BDO Zone rating. Fourteen of these mills produce lumber with a total annual capacity of 1,900 MMBF. The two remaining mills produce plywood and veneer. Their combined annual capacity is 135 million square feet (MMSF) of 3/8" panels. Figure A-8 shows the location of suppliers in the Supply Basin, and Table A-5 shows the sawmill capacity in the supply basin.

**Figure A-8: Supplier of Sawmill Residues in the Supply Basin**

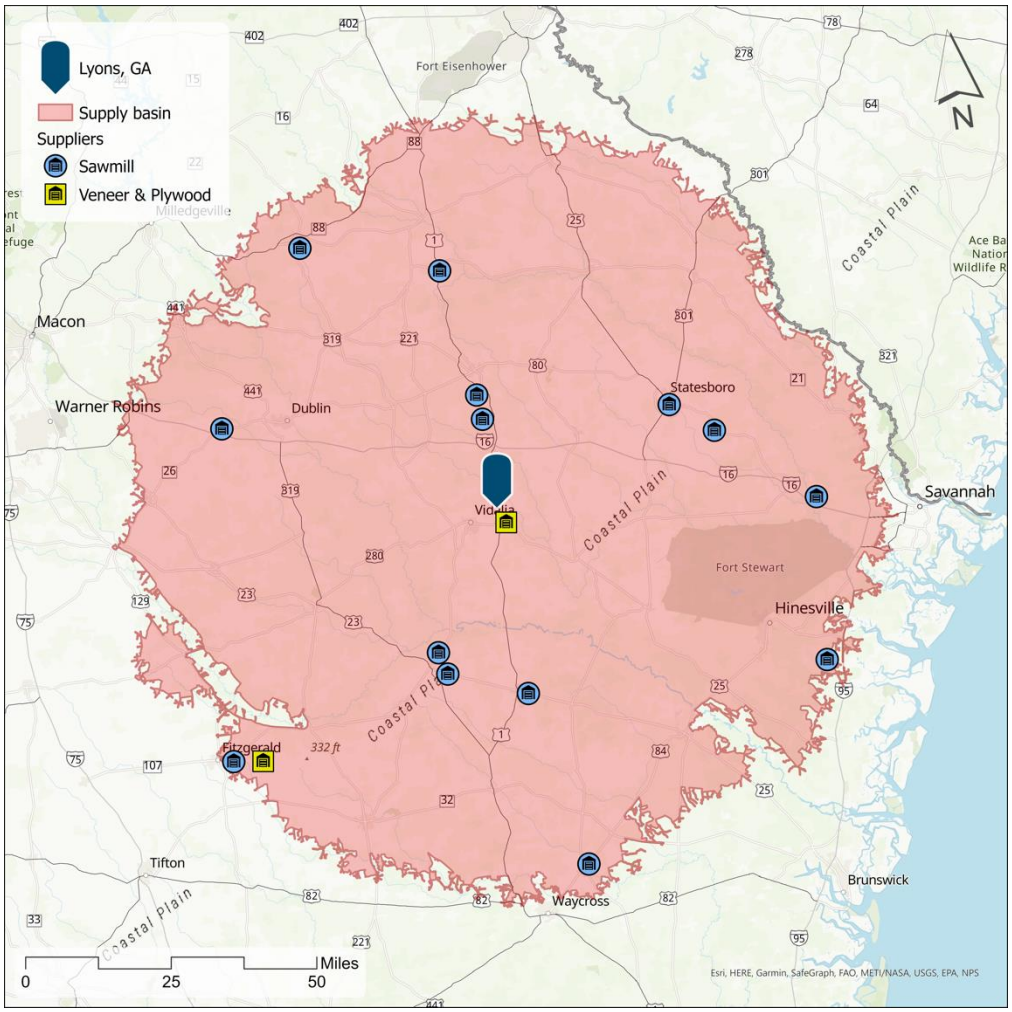


**Table A-5: Sawmill Capacity in the Supply Basin**

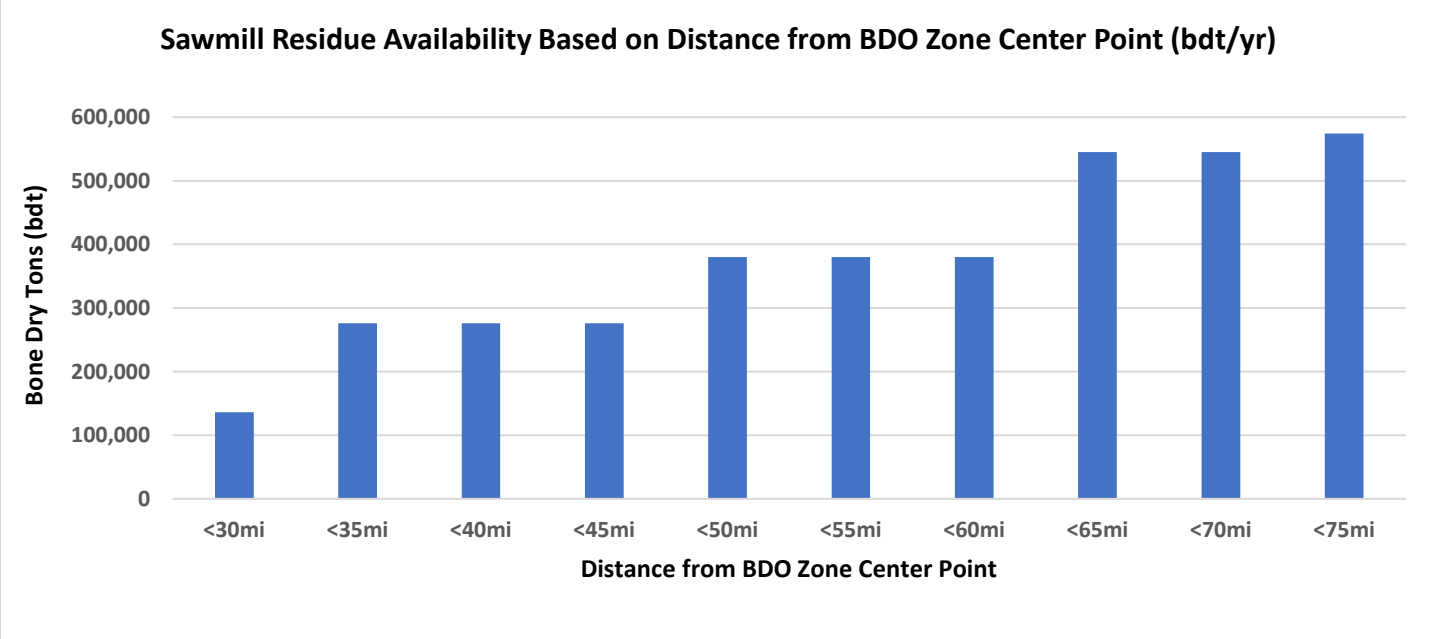
| Sawmill Type | Estimated Annual Capacity |
|---|---|
| Lumber | 1,900 MMBF |
| Veneer/Plywood | 135 MMSF |

During the process of converting roundwood to the final product, waste material is generated. These waste materials are referred to as sawmill residues and include: chips, sawdust, shavings, hog fuels (bark), log yard breakage, and finished trims. The estimated production of sawmill residues in the Supply Basin is shown in Table A-6. These data were calculated using an Ecostrat internal model, which estimates production of each residue based on the total mill capacity. Figure A-9 shows the supply of sawmill residues based on distance from the BDO Zone center point.

**Table A-6: Estimated Sawmill Residue Production in the Supply Basin**

| Biomass Type | Average Annual Generation (bdt/yr) |
|---|---|
| Residual Chips | 1,014,000 |
| Sawdust | 205,000 |
| Shavings | 323,000 |
| Hog Fuels | 309,000 |
| Log Yard Breakage | 15,000 |
| Finished Trims | 41,000 |
| Totals | 1,907,000 |

**Figure A-9: Annual Sawmill Residue Availability in the Supply Basin – Distance by Volume**




- 48 percent of available sawmill residues are within 45 miles of the BDO Zone center point

The availability of sawmill residues for future biomass projects based on outreach is less than the estimated quantities (i.e., generated sawmill residues). All 16 of the major sawmills and OSB/MDF mills were contacted to determine the availability and price of sawmill residues. Seven of these sawmills revealed that they do not have any residues available.

They are either vertically integrated with pellet mills or under long-term supply contract. Four of the mills did not respond to multiple inquiries. The remaining six sawmills provided available volumes and prices.

Given the high level of pellet production in the Supply Basin, it is likely that the unresponsive sawmills have supply contracts in place for their residue production. Other competition for sawmill residues can come from internal use by the sawmills themselves, as several operate heat and/or power generation facilities that are fired by all or part of the generated residues.

As with pulpwood and forest residues, Biomass Availability Multiple (BAM) is applied to estimate the amount of harvest residues that are low risk. Given the high degree of vertical integration between sawmill and pellet mills and the very tight market for sawmill residues, a relatively high BAM of 4.0 was applied for sawmill residues in the Supply Basin (Table A-7).

**Table A-7: Estimated Low-risk Available Quantities of Sawmill Residues**

| Biomass Type | Average Annual Availability (bdt/yr) | Low-Risk Quantity after incorporating BAM factor (bdt/yr) | Percent of Total |
|---|---|---|---|
| Residual Chips | 367,000 | 92,000 | 63% |
| Sawdust | 66,000 | 17,000 | 12% |
| Shavings | 55,000 | 14,000 | 10% |
| Bark | 86,000 | 22,000 | 15% |
| **Total** | **574,000** | **145,000** | |

## Woody Biomass Pricing

Feedstock pricing data for this project was collected from three sources including direct outreach to the sawmills and local experts in the supply zone, Timber Mart South[9] which provides average historical pricing for both pulpwood and sawmill residuals in a quarterly basis, and the published documents.

In this section, we first report the current delivered price of sawmill residues, pulpwood and forest residues provided by the local sawmills and other local experts (Table A-8). Recent and historical price of pulpwood sawmill residues estimated by Timber Mart follow in Table A-9.

It is noted that if the pricing data is acquired in dollars per green ton, it is converted to dollars per bone dry ton, assuming a 50% moisture content for all pulpwood and for other feedstock the moisture content is as indicated.

**Table A-8. Pricing Estimates for Woody Biomass in the Supply Basin Based on Outreach**

| Woody Biomass Type | Asking price delivered to the center point ($/bdt) | Comments/Assumptions |
|---|---|---|
| Pulpwood | 70.02 | Delivered moisture content 50% |
| Forest Residues | 62.00 | Not being harvested currently. |
| Residual Wood Chips | 76.36 | Price range: $67 to $84<br>Delivered moisture content 40-50% |
| Sawdust | 52.67 | Price range: $50 to $60<br>Delivered moisture content 50% |
| Wood Shavings | 53.26 | Price range: $50 to $56<br>Delivered moisture content 9-12% |
| Hog fuel/bark | 34.93 | Price range: $34 to $48<br>Delivered moisture content 35-40% |

[9] TimberMart South (TMS) is a trusted source of current and long-term trend data for stumpage and delivered wood prices and other fundamental forestry business information for the Southeastern USA. TMS publishes quarterly and annual reports used by private companies, consultants, landowners, and others to assess market prices in 11 states in the US South.

TimberMart South pricing data is shown in Table A-9. This pricing is a regional average covering roughly the southeastern half of Georgia. While not exactly overlaying the supply basin and competition zone, these prices are a good approximation of the area. A summary of price range for sawmill residues is shown in Table A-10.

**Table A-9. Recent and Historical Average Regional Price of Woody Biomass - TimberMart-South**

| Woody Biomass Type | Recent Price in Q2 2023 ($/bdt) | Historical Price (2012-2023) ($/bdt) Adjusted for Inflation | | | Comments/Assumptions |
|---|---|---|---|---|---|
| | | Average | High | Low | |
| Softwood Pulpwood | 72.82 | 79.52 | 85.88 | 72.72 | Delivered Price |
| Hardwood Pulpwood | 67.88 | 73.28 | 85.70 | 65.46 | Delivered Price |
| Residual Wood Chips | - | - | - | - | Data not available |
| Whole Tree Chip, Pine | 61.40 | 53.58 | 74.14 | 43.80 | South-Wide pricing, FOB |
| Sawdust | - | - | - | - | Data not available |
| Wood Shavings | 92.12 | 81.00 | 105.22 | 64.66 | Southeast USA pricing, FOB |
| Hog fuel/bark | 49.76 | 41.82 | 52.96 | 32.80 | South-Wide pricing, FOB |

**Table A-10 Summary of Pricing for Different Woody Biomass Available in the BDO Zone.**

| Woody Biomass Type | Delivered Price Range ($/bdt) |
|---|---|
| Pulpwood | 65 – 86 |
| Wood chips | 67 – 84 |
| Sawdust | 50 – 60 |
| Wood shavings | 51 – 105 |
| Bark/hog fuels | 34 – 53 |

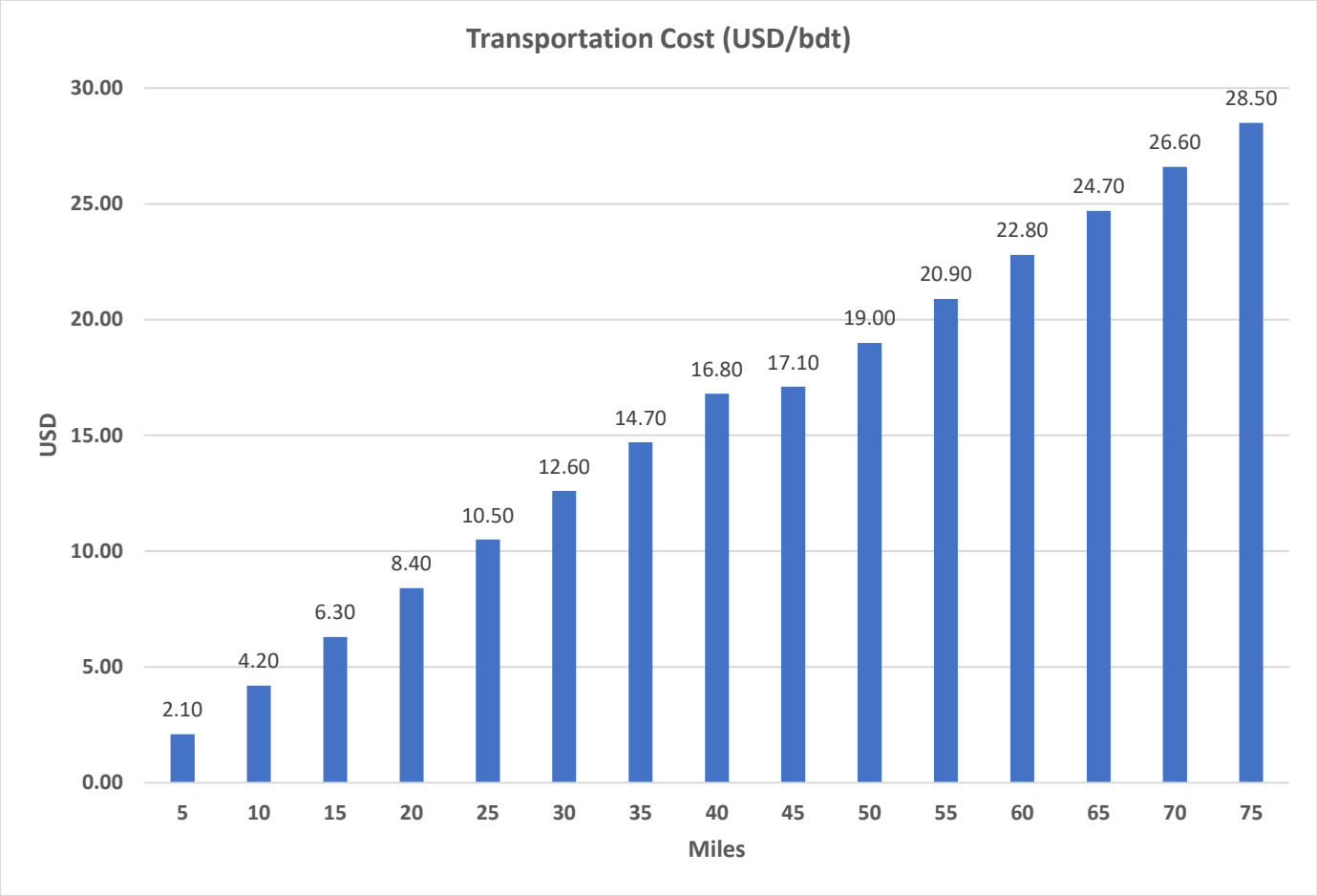
## Transportation Cost

Transportation of woody biomass from timberland to mill in the BDO Zone is carried out by trucking. Whole logs are transported by log truck. Chipped whole trees, harvest residues, and sawmill residues are transported by open bin trailers or walking floor trailers.

The cost of transportation is not included in the pricing tables above for biomass. According to TimberMart South, current haulage costs are based on USD per green ton per loaded mile. A minimum haul rate of $0.21 for the first 41 miles is charged, with an additional haul distance charge of $0.19 per mile.

Figure A-10 below shows the cost of various haul distances. These data have been converted to cost per bone dry ton to remain consistent with other data in this document.

**Figure A-10. Transportation Cost Based on Distance.**




- Transportation costs are directly proportional to the haulage rate per loaded mile
- The costs are linear with a break at 41 miles where the haulage rate decreases slightly
- Trucks in Georgia are limited to 42 tons of cargo or 21 bdt of biomass[10]

[10]Georgia Forestry Foundation. https://gffgrow.org/economy/supply-chain-transportation-efficiency/#:~:text=But%20on%20interstate%20highways%2C%20log,pounds%20per%20set%20of%20axles.

# APPENDIX B: RISK INDICATOR SCORING METRICS

## CATEGORY 1.0: SUPPLIER RISK

### *1.1 Risk Factor: Credit-Worthiness/Future Solvency of Suppliers*

#### *1.1.1 Longevity & History of Supplier Performance*

**Rationale:** Number of years in business is a positive indicator of future solvency. Historical performance is an indicator of future performance.

**Risk Information:** The Supply Basin has a rich history of forestry with sawmills operating in coastal Georgia for nearly 200 years and includes two of the largest hardwood sawmills in the US. The pulp and paper industry has an 87-year history in the Supply Basin. The area is one of the most productive timberlands in the world.

The Supply Basin has a well-established forest products industry, with a long history of timer production and management. Timber production and private ownership of timberland are among the highest in the US. The forest products industry is very well established in the Supply Basin. Private timberland ownership is approximately 91%, actively seeking new opportunities for biomass business and actively supported by local and state government.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed *very low*, therefore the RRL is 2 out of 10. | **2** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed *very low*, therefore the RRI is 2 out of 10. | **2** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL × RRI) is 4 out of 100. | **4** |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch × RRI Notch) is NN (No Notch). | **NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score (Total Notch × GRI Score) is 4 out of 100. | **4** |

### *1.2 Risk Factor: Conflicts of Interest/Vested Interest with Competing Market(s)*

#### *1.2.1 Suppliers' Dependence on, or Preference for, Competing Markets*

**Rationale:** Suppliers may have a vested interest or preference to supply to specific competitors for biomass feedstock. Preferences may be due to historical, long-term, or personal relationships, less stringent feedstock quality requirements, more flexible operating hours by competing markets, or supplier's dependences on competing markets to accept or purchase other products/by-products. During periods of feedstock shortage such suppliers may be more likely to allocate the scarce supply to a competitor resulting in supply disruptions for the Issuer.

**Risk Information:** There are 10 pellet mills in the Competition Zone that compete for sawmill residues and pulpwood. Seven of the 17 sawmills in the BDO Zone are under contract to supply 100% of their residue production to pellet mills that have the same owner as the sawmills.

At least six additional sawmills have contracts to supply pellet producers a significant portion of their residuals. Combined, these 13 sawmills create 83% of the sawmill residues produced in the BDO Zone. Speaking with sawmill and

pellet mill owners as well as local experts, confirms that the market for sawmill residues is very tight and will remain so for the foreseeable future.

Pulpwood is the feedstock for the remaining six pellet mills. The pulpwood supply is not subject to the same supply chain pressures, as there are no pulp and paper mills in the BDO Zone that own timberland.

A significant degree of vertical integration exists for the sawmill residue market, and the current supply is in demand. Two additional pellets mills are under construction in the Competition Zone and another is expanding their capacity. The worldwide demand for industrial pellets is projected to grow 5.5% CAGR according to Grand View Research and Georgia is the world leader in pellet exports according to the Georgia Department of Agriculture.

Pulpwood will likely remain available as the supply outstrips demand and this situation is projected to continue through 2040.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed *high*, therefore the RRL is 8 out of 10. | **8** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed *high*, therefore the RRI is 8 out of 10. | **8** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL × RRI) is 64 out of 100. | **64** |
| **Mitigation/Notching**<br>*RRL Mitigation (Notch)*<br>By focusing on the pulpwood as the main feedstock, future biomass projects can mitigate this risk. We consider 50% notching.<br>*RRI Mitigation (Notch)*<br>No adjustment.<br>The Total Notch (RRL Notch × RRI Notch) is 50%. | **Notch**<br>**50%** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score (Total Notch × GRI Score) is 32 out of 100. | **32** |

## *1.3 Risk Factor: Supplier Control Over Production and Transportation*

### *1.3.1 Ownership of Land/Means of Production*

**Rationale:** Suppliers that own land where feedstock is produced, or a production facility, tend to have better control of supply chains and present lower degrees of supply risk.

**Risk Information:** The timberland in the Supply Basin is overwhelmingly privately owned, 91%.[11] Approximately half of the timberland is managed by non-industrials private landowners, and the other half by Timber Management Investment Organizations (TIMOs) or by Real Estate Investment Trusts (REITs). These groups are actively seeking new opportunities for biomass business and actively supported by local and state governments.

The high level of private ownership brings stability to the supply. The trend for sawmill and pulp mill companies to maintain ownership of timberland has been falling for approximately 25 years. Only two mill operators still own land in Georgia, and neither have operations in the Supply Basin.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed *very low*, therefore the RRL is 2 out of 10. | **2** |

[11] Personal communication. Dru Preston. Georgia Forestry Commission.

| | |
|---|---|
| **Raw Risk Impact (RRI)**<br>The risk impact is deemed *very low*, therefore the RRI is 2 out of 10. | **Score**<br>**2** |
| **Gross Risk Indicator (GRI)**<br>The Gross Risk Indicator (RRL × RRI) is 4 out of 100. | **Score**<br>**4** |
| **Mitigation/Notching**<br>*RRL Mitigation (Notch)*<br>No adjustment.<br>*RRI Mitigation (Notch)*<br>No adjustment.<br>The Total Notch (RRL Notch × RRI Notch) is NN (No Notch). | **Notch**<br>**NN** |
| **Loaded RI Score**<br>The Loaded RI Score (Total Notch × GRI Score) is 4 out of 100. | **Score**<br>**4** |

### *1.3.2 Ownership of Equipment*

**Rationale:** In most cases, suppliers which own or lease equipment for harvest, collection and processing feedstock are lower risk than those who are not. For example, third-party harvesting equipment may not be available when required. Short harvest windows may be missed if a farmer and contractor cannot schedule harvest times that are convenient and quantity shortages can result. However, in some circumstances reliance on third-party equipment to harvest or produce feedstock can decrease supply chain risk. For example, when harvesting agricultural residues such as corn stover, the use of a third-party company with standard equipment specializing in harvesting, collection and transportation may decrease quality variations (e.g., ash content) of final feedstock.

**Risk Information:** Loggers in the BDO Zone are mostly independent contractors that own their own equipment, typically cutting machines, skidders, and loaders. When loggers require additional equipment, they will hire other contractors to provide the equipment and labor on a temporary basis.

Some mills will operate logging operations, although this is becoming less common. The equipment for these crews is owned by the mill.

There are approximately 270 independent logging/trucking companies in the BDO Zone. Change in equipment ownership status is unlikely to occur across the majority of these companies. Logging is a major industry and is likely to continue regardless of equipment ownership status.

| | |
|---|---|
| **Raw Risk Likelihood (RRL)**<br>The risk likelihood is deemed *very low*, therefore the RRL is 2 out of 10.<br>Equipment ownership is common for logging companies. | **Score**<br>**2** |
| **Raw Risk Impact (RRI)**<br>The risk impact is deemed *very low*, therefore the RRI is 2 out of 10. | **Score**<br>**2** |
| **Gross Risk Indicator (GRI)**<br>The Gross Risk Indicator (RRL × RRI) is 4 out of 100. | **Score**<br>**4** |
| **Mitigation/Notching**<br>*RRL Mitigation (Notch)*<br>No adjustment.<br>*RRI Mitigation (Notch)*<br>No adjustment. | **Notch**<br>**NN** |

| | |
|---|---|
| The Total Notch (RRL Notch × RRI Notch) is NN (No Notch). | |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score (Total Notch × GRI Score) is 4 out of 100. | **4** |

### *1.3.3 Ownership of Transportation/Logistics*

**Rationale:** In most cases, suppliers that own or lease transportation equipment necessary to transport biomass from forest or field are lower risk than those who do not. However, in some circumstances, reliance on third parties to transport biomass is common practice and does not contribute to risk.

**Risk Information:** Trucks and trailers used to transport biomass are generally owned by the logging and trucking companies. Biomass transport is a major employer in the BDO Zone, with over 270 logging/trucking companies certified by the state.

Biomass transport is an integral part of the local economy. A change in ownership status of trucks is unlikely to cause a meaningful impact on the industry.

| | |
|---|---|
| **Raw Risk Likelihood (RRL)** | **Score** |
| The risk likelihood is deemed *very low*, therefore the RRL is 2 out of 10. | **2** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed *very low*, therefore the RRI is 2 out of 10. | **2** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL × RRI) is 4 out of 100. | **4** |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch × RRI Notch) is NN (No Notch). | **NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score (Total Notch × GRI Score) is 4 out of 100. | **4** |

### *1.3.4 Feedstock as a Secondary Transformation*

**Rationale:** A secondary transformation dependent upon the production of primary products, e.g., forest residues, corn stover, bark, or sawmill chips (unless from a dedicated chip mill) are all secondary transformations of a primary product.

Risks are higher if feedstock is a secondary transformation of a primary, more valuable product. It may not be economical for suppliers to produce biomass on its own, in the absence of markets for the primary product. For example, a supplier may produce dimensional lumber as its primary product and wood chips as a by-product, therefore relying on the health of the housing market for production levels. If the demand for dimensional lumber drops, so can the availability of sawmill residues.

In case of agricultural feedstocks such as corn stover, the feedstock is a by-product of a primary crop. Since the primary crop is significantly more lucrative than the residue, it will be a priority for the producer. If production of the primary crop requires resources to be taken away from the production of secondary crop (e.g., in case of shorter harvesting windows due to weather), the secondary feedstock supply will suffer. In times of stretched resources, suppliers may also perceive harvesting and collection of the feedstock as a nuisance, potentially decreasing production levels.

| |
|---|
| Understanding the economic drivers for suppliers' primary product can help gauge risk levels for secondary transformation biomass products**.** |
| **Risk Information:** The main source of feedstock in the BDO Zone is pulpwood, which is not a byproduct of the forest industry. In contrast, the production of forest and sawmill residues mainly depend on the housing market, a leading indicator for the US economy. In the BDO Zone, there has been an increase in sawmill production and number of sawmills for the past decade. A contributor to this trend, aside from increased housing starts, is the migration of lumber production from Canada and the pacific northwest. |

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed *medium*, therefore the RRL is 6 out of 10. | **6** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed *low*, therefore the RRI is 4 out of 10. | **4** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL × RRI) is 24 out of 100. | **24** |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch × RRI Notch) is NN (No Notch). | **NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score (Total Notch × GRI Score) is 24 out of 100. | **24** |

### *1.4 Risk Factor: Supplier Experience*

#### *1.4.1 Fundamental Feedstock Production Experience*

| |
|---|
| **Rationale:** Risk is higher when suppliers have limited experience with planting/growing/harvesting/ processing and/or collecting biomass. Limited experience may be common for stover or forest residue supply chains where farmers or forestry producers may have no previous experience. |
| **Risk Information:** Forestry is a long-established industry in Georgia and in the Supply Basin, with over 200 years for sawmills and over 90 years for pulp and paper. The forest supply chains are well-established for pulpwood and sawmill residues. Modern forestry practices and methods for breeding, planting, growing, harvesting, and collection of biomass have been in place for decades within the Supply Basin. Georgia has the distinction of being the national leader in several forestry categories, including commercially available timberland, and annual timber harvest volume. |

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed *very low*, therefore the RRL is 2 out of 10. | **2** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed *very low*, therefore the RRI is 2 out of 10. | **2** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL × RRI) is 4 out of 100. | **4** |

| **Mitigation/Notching** | **Notch** |
|---|---|
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch × RRI Notch) is NN (No Notch). | **NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score (Total Notch × GRI Score) is 4 out of 100. | **4** |

### *1.4.2 Production Scale Experience*

**Rationale:** Scale-up entails risk. Risk is higher when suppliers have limited experience with the production of the quantity of feedstock required.

**Risk Information:** The Supply Basin historically has maintained high levels of timber production and log processing for decades. Since 2013, the Supply Basin has averaged approximately 12.7 million bdt of annual timber production. An average excess of 3.5 million bdt of all timber, pulpwood and sawtimber, have gone unharvested. There was a pulp and paper mill closure in 2019, making additional softwood pulpwood available.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed *very low*, therefore the RRL is 2 out of 10.<br>There is a long-established tradition of timber production and processing in the Supply Basin. | **2** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed *very low*, therefore the RRI is 2 out of 10. | **2** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL × RRI) is 4 out of 100. | **4** |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch × RRI Notch) is NN (No Notch). | **NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score (Total Notch × GRI Score) is 4 out of 100. | **4** |

## *1.5 Risk Factor: Supplier Harvesting/Collection/Processing Capacity*

### *1.5.1 Supplier's Equipment Efficiency*

**Rationale:** Equipment efficiency significantly influences supplier's feedstock production capacity. Understanding supplier's equipment capability enables understanding of their ability to produce feedstock of suitable quality.

**Risk Information:** Logging and trucking are well established in the BDO Zone as the forest products industry has been active for over 200 years and the suppliers have well-established knowledge of harvesting, handling, and transporting wood fibers.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed *very low*, therefore the RRL is 2 out of 10. | **2** |

| | |
|---|---|
| **Raw Risk Impact (RRI)**<br>The risk impact is deemed *very low*, therefore the RRI is 2 out of 10. | **Score**<br>**2** |
| **Gross Risk Indicator (GRI)**<br>The Gross Risk Indicator (RRL × RRI) is 4 out of 100. | **Score**<br>**4** |
| **Mitigation/Notching**<br>*RRL Mitigation (Notch)*<br>No adjustment.<br>*RRI Mitigation (Notch)*<br>No adjustment.<br>The Total Notch (RRL Notch × RRI Notch) is NN (No Notch). | **Notch**<br>**NN** |
| **Loaded RI Score**<br>The Loaded RI Score (Total Notch × GRI Score) is 4 out of 100. | **Score**<br>**4** |

### *1.6 Risk Factor: Supplier Motivation*

#### *1.6.1 Feedstock Production Priority*

**Rationale:** When biomass feedstock is a secondary or non-core line of business, or when it is a by-product or a residual from a more valuable primary product, then suppliers may not put in sufficient effort for consistent production. Risk of breach increases when production and/or delivery of feedstock compromises a supplier's ability to make a primary product.

When biomass feedstock is a by-product of another main higher margin or main product (e.g., corn stover (e.g., corn) or forest residues (e.g., pulpwood)) supply may not be a top priority for a supplier.

**Risk Information:** Sawmill residues are a by-product of the sawmill industry and their production is part of the wood processing operations. Forest residues are a by-product of pulpwood and sawtimber harvesting and are usually piled at the harvest site. The production of both sawmill and forest residues is linked to normal operations**.**

Sawmill residues are produced in high volume and are a desired feedstock by the industrial pellet industry. Forest residues are not widely harvested, but the experience level for their collection is high and equipment is available.

| | |
|---|---|
| **Raw Risk Likelihood (RRL)**<br>The risk likelihood is deemed *very low*, therefore the RRL is 2 out of 10. | **Score**<br>**2** |
| **Raw Risk Impact (RRI)**<br>The risk impact is deemed *very low*, therefore the RRI is 2 out of 10. | **Score**<br>**2** |
| **Gross Risk Indicator (GRI)**<br>The Gross Risk Indicator (RRL × RRI) is 4 out of 100. | **Score**<br>**4** |
| **Mitigation/Notching**<br>*RRL Mitigation (Notch)*<br>No adjustment.<br>*RRI Mitigation (Notch)*<br>No adjustment.<br>The Total Notch (RRL Notch × RRI Notch) is NN (No Notch). | **Notch**<br>**NN** |
| **Loaded RI Score**<br>The Loaded RI Score (Total Notch × GRI Score) is 4 out of 100. | **Score**<br>**4** |

## Category 2.0: Competitor Risk

### *2.1 Risk Factor: Influence on Feedstock Supply of Existing Markets*

#### *2.1.1 Competitor Locations and Overall Geographical Influence*

**Rationale:** Competitors' locations relative to siting locations within a BDO Zone can affect the viability of procuring feedstock and the cost of that feedstock. Accurate and detailed competitor mapping provides an understanding of the geographical influence a competitor may have on new plants within a BDO Zone, including competitive advantages such as short hauling.

**Risk Information:** Within the 150-mile Competition Zone from Lyons, GA, there are 35 competitors for woody biomass feedstock. Nine of these are within the 75 mi driving distance constitution the BDO Zone. These include nine pulp & paper mills, 10 wood pellet mills, four OSB/MDF mills, and 12 biomass energy facilities. Of this total, within the BDO Zone there are two pulp & paper mills, five pellet mills, and two biomass energy facilities. See Figure A-8 for a map showing the location of these competitors.

The combined consumption of these mills is estimated to be approximately 2.8 million bdt annually. 1.8 million bdt of this demand (65%) comes from competitors within the BDO Zone itself (Figure C-8). With regard to the total biomass demand, pulp & paper accounts for 47%, wood pellets 34%, biomass energy 15%, and OSB/MDF production 3% (Table C-2).

The woody feedstocks subject to this competition are pulpwood and sawmill residues. Forest residues are not collected in significant amounts within the Competition Zone.

The likelihood of this risk indicator is deemed to be medium, given the large proportion of total competition coming from within the BDO Zone. However, the amount of available woody biomass beyond the current use is very large, suggesting that biomass in the BDO Zone will not be limiting.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed *medium*, therefore the RRL is 6 out of 10. | **6** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed *low*, therefore the RRI is 4 out of 10. | **4** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL × RRI) is 24 out of 100. | **24** |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch × RRI Notch) is NN (No Notch). | **NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score (Total Notch × GRI Score) is 24 out of 100. | **24** |

#### *2.1.2 Current and Historical Consumption of Feedstock Quantity*

**Rationale:** Clear understanding of feedstock consumption by key competitors for each rated type of feedstock in the BDO Zone is essential to quantifying competitor risk.

Understanding current consumption and historical trends of feedstock utilization can provide valuable information about feedstock price elasticity during shortages, and insight into events that may impact future supply conditions. It

can enable more accurate estimates of the sensitivity of feedstock availability to potential future consumption levels or to the impact of external events (e.g., weather events, structural economic changes, seasonality, or policy change).

**Risk Information:** Removals of pulpwood is down about 16% in the past ten years. In the BDO Zone, this decline equals approximately 8.2 million bdt. This trend is due to decreasing demand for print media and increased competition from foreign mills. The supply of pulpwood remains high and is expected to remain high until a new competitor moves into the BDO Zone. The rated volume of pulpwood in the BDO Zone is 800,000 bdt/yr.

The market for sawmill residues is becoming more competitive with increasing demand for industrial wood pellets in Europe. Sawmill residues, particularly shavings, sawdust, and residual chips are preferred feedstocks for pellet production. This demand for sawmill residues is expected to increase as two more pellet mills are being constructed in the Competition Zone and another is expanding their capacity. The rated volume of sawmill residues in the BDO Zone is 122,000 bdt/yr.

Forest residues have historically been an underutilized resource, with only about 4% of the total available biomass being harvested. This trend is unlikely to change in the near future, as this feedstock is more expensive to harvest than pulpwood and tends to be dirty given the harvest methods. The rated volume of forest residues in the BDO Zone is 70,000 bdt/yr.

The risk likelihood and impact are deemed very low for pulpwood.
The risk likelihood and impact are deemed very high for sawmill mill residues.
The risk likelihood and impact are deemed very low for forest residues.

The overall risk likelihood and impact are deemed low.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed *low*, therefore the RRL is 4 out of 10. | **4** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed *low*, therefore the RRI is 4 out of 10. | **4** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL × RRI) is 16 out of 100. | **16** |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch × RRI Notch) is NN (No Notch). | **NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score (Total Notch × GRI Score) is 16 out of 100. | **16** |

### *2.1.3 Competitor Pricing and Price Sensitivity*

**Rationale:** Understanding how much competitors pay (or receive) for different feedstock types is an essential step to determining competitiveness of Issuer and to accurate assessment of the delivered cost range in the BDO Zone rating.

Current and historical prices paid/received by competitors provide insight into their procurement behaviors and exert pressure on suppliers in the BDO Zone. Such as ability/willingness to pay premiums for feedstock during times of feedstock shortage or reduce prices (or cut off deliveries) during gluts. Competitors that have an ability to offer higher prices for feedstock during feedstock shortages can pose significant risk to Issuer.

Knowledge of competitor pricing and price sensitivity is also an essential prerequisite to formulating a feedstock cost curve which can enable predictions of feedstock redundancy, i.e., how much feedstock could become available at different pricing levels (see Category 3–Supply Chain Risk 3.1.3).

**Risk Information:** Pulpwood actively harvested, and sawmill residues are nearly completely used in the BDO Zone. Forest residues are not widely used, with an estimate of only four percent of the total available being harvested. For the past decade, delivered pulpwood has averaged about $74 per bdt varying between a low of about $65 and a high of about $86. Wood shavings delivered prices have averaged about $81 per bdt with a low of about $64 and a high of $105. Bark/hog fuel delivered prices have averaged about $42 per bdt with a low of about $33 and a high of $53.

Price fluctuations reflect both economic indices such as CPI and the price of diesel fuel. There are also price fluctuations that arise from competitive situations, such as lower-priced sawmill residues that can be brought in via rail from areas with a surplus. Sawmill residues generated in the BDO Zone are also in short supply because of the robust export wood pellet market. A large proportion of sawmill residues are sold under contract to pellet producers.

Pulpwood prices, adjusted for inflation, have changed little over the past ten years and the associated risk is rated low. However, with the shortfall of sawmill residues in the BDO Zone region, the demand for pulpwood may increase, resulting in higher prices.

Sawmill residues are in short supply given vertical integration and existing purchase agreements, and thus they do not have an impact on the risk score.

| | |
|---|---|
| **Raw Risk Likelihood (RRL)**<br>The risk likelihood is deemed *medium*, therefore the RRL is 6 out of 10. | **Score**<br>**6** |
| **Raw Risk Impact (RRI)**<br>The risk impact is deemed *medium*, therefore the RRI is 6 out of 10. | **Score**<br>**6** |
| **Gross Risk Indicator (GRI)**<br>The Gross Risk Indicator (RRL × RRI) is 36 out of 100. | **Score**<br>**36** |
| **Mitigation/Notching**<br>*RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch × RRI Notch) is NN (No Notch). | **Notch**<br>**NN** |
| **Loaded RI Score**<br>The Loaded RI Score (Total Notch × GRI Score) is 36 out of 100. | **Score**<br>**36** |

### *2.1.4 Impacts of Future Demand on Feedstock Availability and Price by Current Competitors*

**Rationale:** Feedstock utilization in a BDO Zone can change over time. Expansion of feedstock demand by current competitors can put additional pressure on feedstock and can lead to higher prices, feedstock disruptions, shortages or supplier breach or other types of supply chain disruption.

If current markets for feedstock have been publicly signaling the potential for increased demand for feedstock (in the case of a sawmill adding a shift, or pulp mill potentially expanding into production of renewable chemicals, for example), high interest in a supply basin can make suppliers overconfident, leading to a supplier-controlled market where short-term contracting becomes the norm and supply chain reliability is compromised for the Issuer. If and when it occurs, increased demand on feedstock may decrease availability and increase cost for new plants within the BDO Zone.

| |
|---|
| **Risk Information:** Two new pellet mills and one pellet mill expansion have been announced in the Competition Zone and their expected demands have been considered in our biomass availability assessment. Research and conversations with local experts did not discover any other new planned facilities or expansions of existing facilities. |
| **Raw Risk Likelihood (RRL)** — **Score** |
| The risk likelihood is deemed *low*, therefore the RRL is 4 out of 10. — **4** |
| **Raw Risk Impact (RRI)** — **Score** |
| The risk impact is deemed *low*, therefore the RRI is 4 out of 10. — **4** |
| **Gross Risk Indicator (GRI)** — **Score** |
| The Gross Risk Indicator (RRL × RRI) is 16 out of 100. — **16** |
| **Mitigation/Notching** — **Notch** |
| *RRL Mitigation (Notch)* — **NN** |
| No adjustment. |
| *RRI Mitigation (Notch)* |
| No adjustment. |
| The Total Notch (RRL Notch × RRI Notch) is NN (No Notch). |
| **Loaded RI Score** — **Score** |
| The Loaded RI Score (Total Notch × GRI Score) is 16 out of 100. — **16** |

### *2.1.5 Soft Supply Influence of Existing Markets*

| |
|---|
| **Rationale:** In some cases, existing markets for feedstock may be able to exert high degrees of pressure over local suppliers, effectively enabling control feedstock, especially during times of shortage. This control can derive from qualitative or "soft" factors such as long previous relationships between local suppliers and existing markets for feedstock. |
| **Risk Information:** There are 10 pellet mills in the Competition Zone that compete for sawmill residues and pulpwood. Seven of the 17 sawmills in the BDO Zone are under contract to supply 100% of their residue production to pellet mills that have the same owner as the sawmills. This volume of residues accounts for 25% of the total available in the BDO Zone.<br><br>At least six additional sawmills have contracts to supply pellet producers a significant portion of their residuals. Combined, these 13 sawmills create 83% of the sawmill residues produced in the BDO Zone. Speaking with sawmill and pellet mill owners as well as local experts confirm that the market for sawmill residues is very tight and will remain so for the foreseeable future.<br><br>Pulpwood is the feedstock for the remaining six pellet mills. The pulpwood supply is not subject to the same supply chain pressures, as there are no pulp and paper mills in the BDO Zone that own timberland. |
| **Raw Risk Likelihood (RRL)** — **Score** |
| The risk likelihood is deemed *high*, therefore the RRL is 8 out of 10. — **8** |
| **Raw Risk Impact (RRI)** — **Score** |
| The risk impact is deemed *medium*, therefore the RRI is 6 out of 10. — **6** |
| **Gross Risk Indicator (GRI)** — **Score** |
| The Gross Risk Indicator (RRL × RRI) is 48 out of 100. — **48** |
| **Mitigation/Notching** — **Notch** |
| *RRL Mitigation (Notch)* — **50%** |
| No adjustment. |

| | |
|---|---|
| *RRI Mitigation (Notch)*<br>Using pulpwood as the feedstock by future biomass projects can mitigate the impact of this risk on the success of the biomass projects. We consider 50% notching.<br><br>The Total Notch (RRL Notch × RRI Notch) is 50%. | |
| **Loaded RI Score**<br>The Loaded RI Score (Total Notch × GRI Score) is 24 out of 100. | **Score**<br>**24** |

### *2.1.6 Temporary Market-Driven Markets*

**Rationale:** Alternative, non-traditional, market-driven competitors for feedstock can drive feedstock demand in unusual circumstances. A BDO Zone Rating Issuer based on corn stover as a feedstock, for example, would not typically compete with higher-end animal feed markets due to quality issues. However, in times of significant hay shortage (e.g., during drought), farmers use corn stover in place of hay, driving the price of feedstock and decreasing availability for bio-projects.[12]

**Risk Information:** Analysis of the quarterly feedstock prices for pulpwood, shavings, hog fuel and whole tree chip does not indicate any seasonal variation in pricing. In addition, no temporary markets were found for the woody biomass in the BDO Zone region.

| | |
|---|---|
| **Raw Risk Likelihood (RRL)**<br>The risk likelihood is deemed *very low*, therefore the RRL is 2 out of 10. | **Score**<br>**2** |
| **Raw Risk Impact (RRI)**<br>The risk impact is deemed *very low*, therefore the RRI is 2 out of 10. | **Score**<br>**2** |
| **Gross Risk Indicator (GRI)**<br>The Gross Risk Indicator (RRL × RRI) is 4 out of 100. | **Score**<br>**4** |
| **Mitigation/Notching**<br>*RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch × RRI Notch) is NN (No Notch). | **Notch**<br>**NN** |
| **Loaded RI Score**<br>The Loaded RI Score (Total Notch × GRI Score) is 4 out of 100. | **Score**<br>**4** |

## *2.2 Risk Factor: Specific Competitors' Competitive Advantage*

### *2.2.1 Relative Inventory Capacity*

**Rationale:** The more inventory a competing biomass facility is able to store, the more competitively pressure it can exert on supply. Ability to store large inventories allows competitors to purchase inventory when the prices are low, potentially giving it an economic advantage. Additionally, the ability to store inventory during feedstock supply surpluses can enable competitors to continue to intake feedstock when the Issuers plant (with lesser inventory capacity) may be forced to put suppliers on quota. Larger inventory capacity on the part of competing markets thereby creates supplier loyalty and can make it more difficult for new projects to secure supply without paying a significant premium.

[12] Bergtold, 2018.

| | |
|---|---|
| **Risk Information:** According to local experts, biomass users are cutting back on the amount of feedstock they are storing on site. This is being done to minimize the amount of feedstock maintenance required. Typical storage volumes being carried are for two weeks production needs. | |
| **Raw Risk Likelihood (RRL)**<br>The risk likelihood is deemed *very low*, therefore the RRL is 2 out of 10. | **Score**<br>**2** |
| **Raw Risk Impact (RRI)**<br>The risk impact is deemed *very low*, therefore the RRI is 2 out of 10. | **Score**<br>**2** |
| **Gross Risk Indicator (GRI)**<br>The Gross Risk Indicator (RRL × RRI) is 4 out of 100. | **Score**<br>**4** |
| **Mitigation/Notching**<br>*RRL Mitigation (Notch)*<br>No adjustment.<br>*RRI Mitigation (Notch)*<br>No adjustment.<br>The Total Notch (RRL Notch × RRI Notch) is NN (No Notch). | **Notch**<br>**NN** |
| **Loaded RI Score**<br>The Loaded RI Score (Total Notch × GRI Score) is 4 out of 100. | **Score**<br>**4** |

### *2.2.2 Relative Accessibility/Delivery Hours and Wait Times*

| | |
|---|---|
| **Rationale:** The value attributed by suppliers to local competing markets for biomass is often directly related to the degree of flexibility the market provides in terms of delivery hours, and the more efficiently discharge can occur. | |
| **Risk Information:** Local experts reveal that there are no facilities with significant wait times for unloading. The majority of biomass-using facilities have delivery quotas to the contracted loggers that is appropriate for their need and unloading capacity. | |
| **Raw Risk Likelihood (RRL)**<br>The risk likelihood is deemed *very low*, therefore the RRL is 2 out of 10. | **Score**<br>**2** |
| **Raw Risk Impact (RRI)**<br>The risk impact is deemed *very low*, therefore the RRI is 2 out of 10. | **Score**<br>**2** |
| **Gross Risk Indicator (GRI)**<br>The Gross Risk Indicator (RRL × RRI) is 4 out of 100. | **Score**<br>**4** |
| **Mitigation/Notching**<br>*RRL Mitigation (Notch)*<br>No adjustment.<br>*RRI Mitigation (Notch)*<br>No adjustment.<br>The Total Notch (RRL Notch × RRI Notch) is NN (No Notch). | **Notch**<br>**NN** |
| **Loaded RI Score**<br>The Loaded RI Score (Total Notch × GRI Score) is 4 out of 100. | **Score**<br>**4** |

### *2.2.3 Relative Specification Advantages*

**Rationale:** When choosing a market for biomass feedstock, suppliers not only look at price, but also at relative quality requirements or specifications. It is important to understand feedstock quality specifications for competing markets within the BDO Zone in order to accurately quantify the risk that competitors can exert on the Issuer's supply chain.

**Risk Information:** The specifications of available feedstock are uniform across pulpwood, sawmill residues, and forest residues. Biomass production methods and processing of that biomass have been following standardized techniques for decades.

| | |
|---|---|
| **Raw Risk Likelihood (RRL)**<br>The risk likelihood is deemed *very low*, therefore the RRL is 2 out of 10. | **Score**<br>**2** |
| **Raw Risk Impact (RRI)**<br>The risk impact is deemed *very low*, therefore the RRI is 2 out of 10. | **Score**<br>**2** |
| **Gross Risk Indicator (GRI)**<br>The Gross Risk Indicator (RRL × RRI) is 4 out of 100. | **Score**<br>**4** |
| **Mitigation/Notching**<br>*RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch × RRI Notch) is NN (No Notch). | **Notch**<br>**NN** |
| **Loaded RI Score**<br>The Loaded RI Score (Total Notch × GRI Score) is 4 out of 100. | **Score**<br>**4** |

### *2.2.4 Demand for Competitors' Products*

**Rationale:** Increased demand for competitor's final product can cause an increased demand for feedstock by the competitor. For example, an increased demand for wood pellets due to high energy prices in Europe or for biofuels due to a favorable clean fuels policy can cause increased pellet/biofuel production by competing markets. Thereby driving demand for feedstock within a BDO Zone.

**Risk Information:** Industrial wood pellet production is projected to increase due to worldwide demand. Two wood pellet facilities are projected to begin operations in the Competition Zone in 2024. Another pellet mill plans to increase capacity. This situation will likely further increase demand and competition for sawmill residues in the BDO Zone. It is possible that as the sawmill residue market tightens, pellet mills will start sourcing pulpwood if pellet demand continues to increase.

| | |
|---|---|
| **Raw Risk Likelihood (RRL)**<br>The risk likelihood is deemed *medium*, therefore the RRL is 6 out of 10. | **Score**<br>**6** |
| **Raw Risk Impact (RRI)**<br>The risk impact is deemed *medium*, therefore the RRI is 6 out of 10. | **Score**<br>**6** |
| **Gross Risk Indicator (GRI)**<br>The Gross Risk Indicator (RRL × RRI) is 36 out of 100. | **Score**<br>**36** |

| **Mitigation/Notching** | **Notch** |
|---|---|
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch × RRI Notch) is NN (No Notch). | **NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score (Total Notch × GRI Score) is 36 out of 100. | **36** |

## CATEGORY 3.0: SUPPLY CHAIN RISK

### *3.1 Risk Factor: Feedstock Availability*

#### *3.1.1 Biomass Availability Multiple (BAM)*

**Rationale:** Biomass Availability Multiple (BAM) indicates the degree of redundancy in an Issuer's supply chain in relation to the rated quantity in the BDO Zone. BAM is the mean ratio of biomass feedstock available to a project, in relation to delivered cost, divided by the Issuer's mean rated quantity. BAM is a strong indicator of supply chain resilience when stressed by supply shortage and/or supplier breach. BAMs of 1.5 or higher are generally signals of lower feedstock risk for new projects in BDO Zones.

**Risk Information:** The likelihood of the BAM factors being incorrect is low. The sources were consulted for the availability of pulpwood, sawmill residues, and forest residues were in agreement with regard to biomass availability. More details on our BAM estimation are provided in Appendix A.

However, assumptions of future biomass supply and demands are part of the BAM factors. Unforeseen supply and market factors such as new competitors, weather events and economic conditions can have high levels of impact on our assumptions and thus biomass availability.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed *low*, therefore the RRL is 4 out of 10. | **4** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed *high*, therefore the RRI is 8 out of 10. | **8** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL × RRI) is 32 out of 100. | **32** |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch × RRI Notch) is NN (No Notch). | **NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score (Total Notch × GRI Score) is 32 out of 100. | **32** |

#### *3.1.2 Feedstock Supply Curve/Marginal Cost Curve*

**Rationale:** The greater the feasible transport distance, the more feedstock is accessible to the Issuer, but at a higher delivered cost. The feedstock supply curve, sometimes referred to as the marginal cost curve, is a function of feedstock

availability over its cost which is primarily, but not exclusively, a function of distance. The feedstock supply curve is used to determine the availability of redundant feedstock at various price points, and the cost of replacing feedstock with substitutes located at different distances.

Feedstock cost curves are useful in determining supply chain resilience; they provide information about the cost of feedstock availability in times of supply disturbance. Biomass supply chains are prone to supply disturbances over time; suppliers can become insolvent, or weather events can temporarily disrupt feedstock availability. When a disturbance occurs, the Issuer may need to source replacement feedstock from different suppliers at different locations and costs. A biomass supply curve indicates quantities of feedstock available at various price levels from suppliers generally located further away than core supplier.

**Risk Information:** The supply of pulpwood and forest residues is roughly linear, with more biomass available with increasing distance from the center point (Figure A-5). Sawmill residues, on the other hand, are only available at a limited number of sawmills, thus the availability increases in a stairstep manner (Figure A-9).

52% of the total available pulpwood (753,000 of 469,000 bdt) are within a 50-mile driving distance.
47% of the total available forest residues (132,000 of 280,000 bdt) are within a 50-mile driving distance.
60% of the total generated sawmill residues (276,000 of 1,437,000 bdt) are within a 60-mile driving distance.

| | |
|---|---|
| **Raw Risk Likelihood (RRL)**<br>The risk likelihood is deemed *low*, therefore the RRL is 4 out of 10. | **Score**<br>**4** |
| **Raw Risk Impact (RRI)**<br>The risk impact is deemed *low*, therefore the RRI is 4 out of 10. | **Score**<br>**4** |
| **Gross Risk Indicator (GRI)**<br>The Gross Risk Indicator (RRL × RRI) is 16 out of 100. | **Score**<br>**16** |
| **Mitigation/Notching**<br>*RRL Mitigation (Notch)*<br>No adjustment.<br>*RRI Mitigation (Notch)*<br>No adjustment.<br>The Total Notch (RRL Notch × RRI Notch) is NN (No Notch). | **Notch**<br>**NN** |
| **Loaded RI Score**<br>The Loaded RI Score (Total Notch × GRI Score) is 16 out of 100. | **Score**<br>**16** |

### *3.1.3 Seasonal Feedstock Supply Variation*

**Rationale:** Biomass supply can present significant seasonal supply variations. Seasonal supply variations combined with limitations associated with longer-distance transportation and storage can lead to BDO Zone biomass supply imbalances[13] and can manifest in shortages and higher costs for Issuers.

**Risk Information:** Timber harvests occur year-round, with the winter and spring typically being wetter months. This can limit loggers' ability to move wood to the mills, though this is usually temporary and does not last for an extended period of time. During the winter and spring months, loggers sometimes are moved to "wet weather" tracts, which are usually on higher ground and/or have sandy/sandy loam soils that stand up better when wet. Fall is usually drier and that is when mills try to build up inventory for the coming winter/spring months.

[13] Golecha & Gan 2016.

| |
|---|
| Thus, seasonal limitations are managed and have been practiced for decades. The timberland base is extensive and access to harvest sites is good. |
| **Raw Risk Likelihood (RRL)** **Score** |
| The risk likelihood is deemed *very low*, therefore the RRL is 2 out of 10. **2** |
| **Raw Risk Impact (RRI)** **Score** |
| The risk impact is deemed *very low*, therefore the RRI is 2 out of 10. **2** |
| **Gross Risk Indicator (GRI)** **Score** |
| The Gross Risk Indicator (RRL × RRI) is 4 out of 100. **4** |
| **Mitigation/Notching** **Notch** |
| *RRL Mitigation (Notch)* **NN** |
| No adjustment. |
| *RRI Mitigation (Notch)* |
| No adjustment. |
| The Total Notch (RRL Notch × RRI Notch) is NN (No Notch). |
| **Loaded RI Score** **Score** |
| The Loaded RI Score (Total Notch × GRI Score) is 4 out of 100. **4** |

### *3.1.4 Year-to-Year Variation in Feedstock Availability*

| |
|---|
| **Rationale:** Biomass can have significant year-to-year supply variations due to variability in yield from biomass harvesting operations, particularly with agricultural biomass. |
| **Risk Information:** Year-to-year availability for pulpwood and sawtimber has been consistent for the past decade. Historic pulpwood removals for the BDO Zone have remained consistent from year to year (Figure A-3) with a slight drop in harvest over the past ten years as a reflection of the pulp & paper market. The growth-to-drain ration for pulpwood has been consistent, with 56% more pulpwood being grown than harvested.<br><br>Sawtimber removals (Figure C-5) have increased over this period without large year-to-year variations. Likewise, the sawmill capacity (Figure C-6) has paralleled removals. The growth-to-drain ratio for all timber has been consistent over the past 10 years averaging 1.39 indicating that 39% more timber is grown than removed each year. |
| **Raw Risk Likelihood (RRL)** **Score** |
| The risk likelihood is deemed *very low*, therefore the RRL is 2 out of 10. **2** |
| **Raw Risk Impact (RRI)** **Score** |
| The risk impact is deemed *low*, therefore the RRI is 4 out of 10. **4** |
| **Gross Risk Indicator (GRI)** **Score** |
| The Gross Risk Indicator (RRL × RRI) is 8 out of 100. **8** |
| **Mitigation/Notching** **Notch** |
| *RRL Mitigation (Notch)* **NN** |
| No adjustment. |
| *RRI Mitigation (Notch)* |
| No adjustment. |
| The Total Notch (RRL Notch × RRI Notch) is NN (No Notch). |
| **Loaded RI Score** **Score** |
| The Loaded RI Score (Total Notch × GRI Score) is 8 out of 100. **8** |

### *3.2 Risk Factor: Historical Issues*

#### *3.2.1 Historical Feedstock Price Variations*

**Rationale:** If volatility is shown in the historical feedstock price, then the risk of future price fluctuation is elevated. If feedstock prices have historically exceeded the price at which the Issuer would have to cease operations or breach a financial covenant (i.e., the "red line" feedstock cost), then mitigation measures should be put in place.

**Risk Information:** 10-year feedstock price variations are summarized in Table A-9 for pulpwood, whole tree chip, wood shavings, and hog fuel. The historic high price for all these feedstocks occurred in 2022 paralleling inflation rates. Pulpwood prices displayed the lowest degree of price fluctuation, with pine pulpwood average price trending slightly downward. Shavings, whole tree chip and hog fuel show an upward trend over the past decade**.**

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed *medium*, therefore the RRL is 6 out of 10. | **6** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed *high*, therefore the RRI is 8 out of 10. | **8** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL × RRI) is 48 out of 100. | **48** |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch × RRI Notch) is NN (No Notch). | **NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score (Total Notch × GRI Score) is 48 out of 100. | **48** |

#### *3.2.2 Low Historical Demand for Feedstock in the BDO Zone*

**Rationale:** If Issuer BDO Zone does not have history of developed, large-scale feedstock procurement, suppliers may not have sufficient expertise in feedstock production to ensure reliable supply, especially in early years. This can be particularly true for forest residues where typically the infrastructure for collection, processing and delivery is immature.

Where supply chains are not well-established, risk can be mitigated when new bio-based plants control a higher degree of feedstock processing. For example, if a BDO Zone rating is issued for clean wood chips and the historical demand in the Zone has been exclusively for pulpwood, then supply chain risk will be decreased for new bio-based plants that intake of pulpwood and manage log debarking and chipping internally. Rather than requiring inexperienced suppliers to deliver debarked wood chips.

**Risk Information:** Forestry has been a major industry in the BDO Zone for decades, and the supply chains for timber and sawmill residues are well established. While forest residues have not been harvested in large quantities, the methods used for their harvest are well established and common to forestry operations.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed *very low*, therefore the RRL is 2 out of 10. | **2** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed *very low*, therefore the RRI is 2 out of 10. | **2** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL × RRI) is 4 out of 100. | **4** |

| **Mitigation/Notching** | **Notch** |
|---|---|
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch × RRI Notch) is NN (No Notch). | **NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score (Total Notch × GRI Score) is 4 out of 100. | **4** |

### *3.2.3 History of Production/Feedstock is a New/Secondary Crop or a Byproduct*

**Rationale:** If feedstock is a new/secondary crop or a by-product, suppliers may either lack sufficient experience to mitigate risk, or be unable to react to such risk. Secondary crop or by-product producers may be less likely to prioritize production.

For new crop types, inexperience in planting, harvest, collection, and yield data may pose higher levels of risk.

If feedstock is a secondary transformation (i.e., wheat straw, corn stover, or forest residue), then production can be subject to variables beyond suppliers' control (e.g., changing demand for sawtimber, or primary crop prices).

**Risk Information:** There is a long history of forestry and use of forest products in the region. Sawmills have been operating for over 200 years. Pulp and paper mills were established about 90 years ago. Harvesting of forest residues, while feasible, is practiced only rarely.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed *very low*, therefore the RRL is 2 out of 10. | **2** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed *very low*, therefore the RRI is 2 out of 10. | **2** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL × RRI) is 4 out of 100. | **4** |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch × RRI Notch) is NN (No Notch). | **NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score (Total Notch × GRI Score) is 4 out of 100. | **4** |

## *3.3 Risk Factor: Non-Weather Based Externalities*

### *3.3.1 Diesel, Oil and Producer Price Index (PPI)*

**Rationale:** Diesel, oil, and PPI can impact feedstock cost of harvest and collection over time. Sensitivities to worst case scenarios should be run.

**Risk Information:** General economic trends can have an influence on the price of delivered feedstock. Economic indicators such as Producer Price Index or Consumer Price Index can be used to track trends in prices that can affect the biomass logistics operations and their associated costs such as the cost of fuel, labor, equipment parts and

administration. Figure C-10 shows the change in CPI over the past four years for the Southern Region of Georgia and reflects rising inflation between September 2020 until July 2022. At that point, the rate of inflation generally decreases until the present time.

Diesel fuel is a major component of biomass harvesting and delivery. Comparing diesel prices (Figure C-9) to the trend in CPI between 2020 and 2023 reveals that fuel prices have a strong response to the general economic trends. Price of delivered pulpwood also tracks the CPI.

| | |
|---|---|
| **Raw Risk Likelihood (RRL)**<br>The risk likelihood is deemed *medium*, therefore the RRL is 6 out of 10. | **Score**<br>**6** |
| **Raw Risk Impact (RRI)**<br>The risk impact is deemed *high*, therefore the RRI is 8 out of 10. | **Score**<br>**8** |
| **Gross Risk Indicator (GRI)**<br>The Gross Risk Indicator (RRL × RRI) is 48 out of 100. | **Score**<br>**48** |
| **Mitigation/Notching**<br>*RRL Mitigation (Notch)*<br>No adjustment.<br>*RRI Mitigation (Notch)*<br>No adjustment.<br>The Total Notch (RRL Notch × RRI Notch) is NN (No Notch). | **Notch**<br>**NN** |
| **Loaded RI Score**<br>The Loaded RI Score (Total Notch × GRI Score) is 48 out of 100. | **Score**<br>**48** |

### *3.3.2 Currency Risk*

**Rationale:** Where feedstock is purchased in a currency different than that which a new bio-based plant with locate in a BDO Zone, currency exchange rates and volatility can constitute risk exposure. BDO Zones that cross the US-Canada border, for example, which intake feedstock from both countries are exposed to such currency risk.

**Risk Information:** Currency risk is not a factor in the BDO Zone.

| | |
|---|---|
| **Raw Risk Likelihood (RRL)**<br>The risk likelihood is deemed *not relevant*, therefore the RRL is not rated. | **Score**<br>**NR** |
| **Raw Risk Impact (RRI)**<br>The risk impact is deemed *not relevant*, therefore the RRI is not rated. | **Score**<br>**NR** |
| **Gross Risk Indicator (GRI)**<br>The Gross Risk Indicator (RRL × RRI) is not rated. | **Score**<br>**NR** |
| **Mitigation/Notching**<br>The Total Notch (RRL Notch × RRI Notch) is not rated. | **Notch**<br>**NR** |
| **Loaded RI Score**<br>The Loaded RI Score (Total Notch × GRI Score) is not rated. | **Score**<br>**NR** |

### *3.3.3 Border Risk*

**Rationale:** Where feedstock is transported cross-border to another country, risk exposure to border closures and crossing delays becomes present. The availability of trucks willing to do cross-border runs is limited, which can decrease

| |
|---|
| supply chain flexibility and resilience. Plants near the US-Canada border which intake feedstock from both countries are exposed to these risks. |
| **Risk Information:** Border risk is not a factor in the BDO Zone. |
| **Raw Risk Likelihood (RRL)** — **Score** |
| The risk likelihood is deemed *not relevant*, therefore the RRL is not rated. — **NR** |
| **Raw Risk Impact (RRI)** — **Score** |
| The risk impact is deemed *not relevant*, therefore the RRI is not rated. — **NR** |
| **Gross Risk Indicator (GRI)** — **Score** |
| The Gross Risk Indicator (RRL × RRI) is not rated. — **NR** |
| **Mitigation/Notching** — **Notch** |
| The Total Notch (RRL Notch × RRI Notch) is not rated. — **NR** |
| **Loaded RI Score** — **Score** |
| The Loaded RI Score (Total Notch × GRI Score) is not rated. — **NR** |

### *3.3.4 Temporary Externality-Driven Markets for Feedstock*

| |
|---|
| **Rationale:** Alternative, non-traditional, externality-driven competitors for feedstock can drive feedstock demand (and cost) in unusual circumstances. For example, an Issuer using corn stover as a feedstock would not typically compete with the higher-end animal feed market. However, in times of significant hay shortage (e.g., during drought), farmers may use corn stover as hay replacement, driving the price of stover feedstock and decreasing its availability for bio-projects.[14] |
| **Risk Information:** The feedstock supply chains and manufacturing processes are well established in the BDO Zone. There is a low likelihood of temporary externalities affecting the BDO Zone**.** In addition, no history of alternative, non-traditional, externality-driven competitors for feedstock were found in the BDO Zone region**.** |
| **Raw Risk Likelihood (RRL)** — **Score** |
| The risk likelihood is deemed *very low*, therefore the RRL is 2 out of 10. — **2** |
| **Raw Risk Impact (RRI)** — **Score** |
| The risk impact is deemed *very low*, therefore the RRI is 2 out of 10. — **2** |
| **Gross Risk Indicator (GRI)** — **Score** |
| The Gross Risk Indicator (RRL × RRI) is 4 out of 100. — **4** |
| **Mitigation/Notching** — **Notch** |
| *RRL Mitigation (Notch)* — **NN** |
| No adjustment. |
| *RRI Mitigation (Notch)* |
| No adjustment. |
| The Total Notch (RRL Notch × RRI Notch) is NN (No Notch). |
| **Loaded RI Score** — **Score** |
| The Loaded RI Score (Total Notch × GRI Score) is 4 out of 100. — **4** |

[14] Bergtold, 2018.

### *3.4 Risk Factor: Risks Related to Feedstock Production, Harvest and Collection*

#### *3.4.1 Harvest & Collection Practices & Schedules*

**Rationale:** Differences in harvest timing and practices used can create risk to both the quantity and quality of feedstock. For example, feedstock harvested by different suppliers in different windows can undergo varying levels of exposure to sun, wind, and moisture, leading to variations in delivered feedstock quality.

For example, agricultural feedstocks and energy crops have optimal harvesting windows to ensure minimal moisture content. In certain BDO Zones these harvesting windows may coincide with heightened weather risk such as frost or rain.

For forestry biomass, unsightly clear cuts, and slash piles (even on plantation forests and especially when located near communities) can provoke unwanted public backlash even when suitable and sustainable replanting regimes are followed.

**Risk Information:** Forest harvesting practices have been in place for decades. The equipment for cutting pulpwood includes a feller-buncher to cut timber, a grapple-skidder to transport logs to the "logging deck" where the branches and tops are removed, and the logs loaded onto a log truck using a knuckle boom loader. Branches and tops can be stacked next to the logging deck or spread across the site to decompose. Alternately, the logs can be chipped on-site, with the chipper blowing the chips into a chip van trailer.

Forest residues (the tops and branches), can be collected in several ways. The most common method in Georgia is to collect tops (at least 20' long) and "double bunk" them on a standard logging trailer with a knuckle boom. Tops and branches can be picked up with a knuckle boom or other loading equipment and transferred, without chipping, into a chip van. Alternately, tops and branches can be chipped and blown into a chip van.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed *very low*, therefore the RRL is 2 out of 10. | **2** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed *very low*, therefore the RRI is 2 out of 10. | **2** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL × RRI) is 4 out of 100. | **4** |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch × RRI Notch) is NN (No Notch). | **NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score (Total Notch × GRI Score) is 4 out of 100. | **4** |

#### *3.4.2 Harvesting & Collection Equipment*

**Rationale:** Different types of harvesting and collection equipment used by suppliers in a BDO Zone can have a significant impact on the quality and availability of feedstock. Use of different types and combinations of harvesting, collection and processing equipment among suppliers can lead to non-homogeneous feedstock. Equipment that is not designed specifically for biomass cultivation, harvesting and collection, can increase feedstock quality risks.

Relevant equipment should be specified for the sake of product consistency and risk reduction.

**Risk Information:** More than 80 percent of Georgia's logging businesses have been fully mechanized since the early 1990s. The equipment for cutting pulpwood includes a feller-buncher to cut timber, a grapple-skidder to transport logs to the "logging deck" where the branches and tops are removed, and the logs loaded onto a 53' log truck using a knuckle boom loader. Branches and tops can be stacked next to the logging deck or spread across the site to decompose. Alternately, the logs can be chipped on-site, with the chipper blowing the chips into a 45' or 50' chip van trailer. Forest residues, be collected in several ways as discussed in risk indicator 3.4.1.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed *very low*, therefore the RRL is 2 out of 10. | **2** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed *very low*, therefore the RRI is 2 out of 10. | **2** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL × RRI) is 4 out of 100. | **4** |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch × RRI Notch) is NN (No Notch). | **NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score (Total Notch × GRI Score) is 4 out of 100. | **4** |

### *3.4.3 Variation in Densification Methods Among Different Suppliers*

**Rationale:** The shape and density of the unit in which feedstock is supplied can impact feedstock cost and quality. Standard feedstock densification modes for biomass consist of round or square bales, pellets, cubes, chips, or grindings. The size of wood fiber processed in a grinder is less homogenous than if a chipper is used.

Bales of different densities can absorb moisture at different rates. In certain cases, round bales have been viewed as problematic due to their uneven moisture content distribution.[15]

**Risk Information:** The pulpwood and sawmill residues are delivered either in the form of logs (pulpwood), chipped, or ground, depending on the end users' biomass quality specifications. The existing suppliers have the capability to provide either form.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed *very low*, therefore the RRL is 2 out of 10. | **2** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed *very low*, therefore the RRI is 2 out of 10. | **2** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL × RRI) is 4 out of 100. | **4** |

[15] Huhnke, 2018.

| **Mitigation/Notching** | **Notch** |
|---|---|
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch × RRI Notch) is NN (No Notch). | **NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score (Total Notch × GRI Score) is 4 out of 100. | **4** |

### *3.4.4 Availability of Labor for Feedstock Production*

**Rationale:** Skilled labor shortages can be difficult to remedy in the short-term. Availability of suitable labor in an area can impact the ability to procure sufficient feedstock quantities on required schedules. Labor risks are higher where supply chains are not yet active; or for Issuer's for whom large feedstock requirements, or development of new (or expanded) supply chains, demand significant additions to the local labor force.

**Risk Information:** A harvesting crew typically consists of one feller-buncher, two grapple-skidders and one knuckle boom loader. Each crew can produce a minimum of 70 to 80 truckloads per week, up to as many as 100. Each load contains 12 to 14 bdt of wood, and the number of logging trucks required depends on the distance travelled to the mill. According to TimberMart South, the average haul distance is 49 miles. Published analyses of trucking logistics indicates an average of 17.5 loads per week per truck.

For a new biomass facility in the BDO Zone, using the rated volume of 800,000 bdt per year additional logging crews, truck drivers, logging equipment, and trucks is required. Given the productivity statistics for the Georgia Coastal Plain, an additional 19 logging crews (76 people) and 66 logging truck drivers would be required. A total of 142 people would be needed.

Logging truck driver recruitment has been identified as a bottleneck. A nationwide shortage of truck drivers has made it difficult to recruit log truck drivers. Additionally, log truck insurance in Georgia has risen, contributing to the log truck driver shortage. Difficulty in hiring logging truck drivers would have a direct impact on biomass deliveries, this risk is deemed high.

Some local experts have identified a shortage of logging crews as an area of concern. While not as acute as the logging truck driver shortage, this labor pool has an impact of productivity.

The median age for owners of logging companies is 57 and for logging company managers is 53 years.[16] Two-thirds of logging company owners predict that their companies would cease to exist upon retirement, as none expect a family member to take over the business. This trend may be offset by increasing consolidation, creating larger logging companies.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed ***high***, therefore the RRL is **8 out of 10.** | **8** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed *high*, therefore the RRI is 8 out of 10. | **8** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL × RRI) is 64 out of 100. | **64** |

[16] Conrad IV, J. L., Greene, W. D., & Hiesl, P. (2018). The evolution of logging businesses in Georgia 1987–2017 and South Carolina 2012–2017. Forest Science, 64(6), 671-681.

| **Mitigation/Notching** | **Notch** |
|---|---|
| *RRL Mitigation (Notch)*<br>Permitting and construction of a new project is likely to span a two-to-four-year time frame, possibly more. During this period and the ramp up to full production, new logging truck drivers can be recruited and trained. We consider 25% notching.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch × RRI Notch) is 37.5%. | **75%** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score (Total Notch × GRI Score) is 30 out of 100. | **48** |

### *3.5 Risk Factor: Transportation*

#### *3.5.1 Feedstock Transportation Costs*

**Rationale:** Transportation can be one of the most significant cost components of biomass supply chains. The average transport cost and percentage of total feedstock cost attributable to transport should be known.

Transport distances of 80-120 km for biomass feedstocks are typical but larger distances can be common. Where average transport distance from suppliers to Issuer is high, the supply chain is subject to greater sensitivities to risks, such as increases in diesel cost, weather impacts, mechanical breakdown, and by the demand for scarce feedstock from competitors closer to the source.

Understanding average transport distance can help flag higher-risk BDO Zones where transport distance materially exceeds the average.

**Risk Information:** Biomass transport is priced by the ton per mile in the BDO Zone. According to TimberMart South, the average haul distance is 49 miles. Haul rates for bdt average $0.42 per mile for a minimum of 41 miles. Hauls of over 41 miles incur an additional charge of $0.38 per bdt per mile. The biggest impact on haul rates is fuel cost. Each $/gal increase in fuel costs for an average logging truck haul increases biomass

cost by about $0.74/ton.[17]

Based on our estimation, on average, 25% of a logging operation's revenue is attributed to cost of the fuel. Rising diesel prices can have a significant impact on costs. For example, Georgia diesel price per gallon rose from $2.99 in 2019 to $5.74 in 2022, a 143% increase.[18]

With the current diesel prices in Georgia, the percent of the cost to operate logging trucks attributed to fuel is between 35 and 40 percent of the total. When diesel price is under $3.00/gal the percentage attributed to fuel approaches 20% while price over $5.00/gal pushes this to 40% and above.

The rates for hauling biomass are competitive and consistent across the BDO Zone. During times when fuel prices are high, haulers may add a fuel surcharge. The risk likelihood is deemed medium, as all operators are subject to the same fuel impact. However, given that fuel costs are significant for all aspects of logging operations, impact for this indicator is deemed high.

[17] How to Calculate a Fuel Cost Adjustment. J. Conrad. 2022. https://www.amloggers.com/news/how-to-calculate-a-fuel-cost-adjustment-virginia-loggers-association

[18] Impact of Skyrocketing Fuel Prices on Forest Products Transportation. https://www.forest2market.com/blog/impact-of-skyrocketing-fuel-prices-on-forest-products-transportation#:~:text=As%20trucks%20are%20vital%20for,fuel%20costs%20on%20the%20economy.

| | |
|---|---|
| **Raw Risk Likelihood (RRL)**<br>The risk likelihood is deemed *medium*, therefore the RRL is 6 out of 10. | **Score**<br>**6** |
| **Raw Risk Impact (RRI)**<br>The risk impact is deemed *high*, therefore the RRI is 8 out of 10. | **Score**<br>**8** |
| **Gross Risk Indicator (GRI)**<br>The Gross Risk Indicator (RRL × RRI) is 48 out of 100. | **Score**<br>**48** |
| **Mitigation/Notching**<br>*RRL Mitigation (Notch)*<br>No adjustment.<br>*RRI Mitigation (Notch)*<br>No adjustment.<br>The Total Notch (RRL Notch × RRI Notch) is NN (No Notch). | **Notch**<br>**NN** |
| **Loaded RI Score**<br>The Loaded RI Score (Total Notch × GRI Score) is 48 out of 100. | **Score**<br>**48** |

### *3.5.2 Diesel Cost Impacts*

**Rationale:** Changes in diesel cost impact transport cost over time. Sensitivities to worst case scenarios should be run.

**Risk Information:** Diesel fuel is used through all aspects of biomass logistics. Tree harvesting equipment and logging trucks require diesel fuel. Fluctuation is diesel price is directly tied to the delivered cost of biomass. One study suggests that each increase of $2.00 in diesel price leads to an increase of approximately $2.43 per green ton of logs.[19] Increases in fuel costs get passed on to the end user of biomass through either fuel surcharges or escalators built into the contract.

Diesel fuel price in the US South has generally tracked upward for the past decade (Appendix C, Figure C-9) with a low point of just below $2.00 per gallon in 2016 and a high of $5.73 in 2022. These price fluctuations closely parallel the national average price of diesel. Changes in diesel prices could have a significant effect on the delivered cost of biomass.

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|---|---|
| **Raw Risk Likelihood (RRL)**<br>The risk likelihood is deemed *medium*, therefore the RRL is 6 out of 10. | **Score**<br>**6** |
| **Raw Risk Impact (RRI)**<br>The risk impact is deemed *high*, therefore the RRI is 8 out of 10. | **Score**<br>**8** |
| **Gross Risk Indicator (GRI)**<br>The Gross Risk Indicator (RRL × RRI) is 48 out of 100. | **Score**<br>**48** |
| **Mitigation/Notching**<br>*RRL Mitigation (Notch)*<br>No adjustment.<br>*RRI Mitigation (Notch)*<br>No adjustment.<br>The Total Notch (RRL Notch × RRI Notch) is NN (No Notch). | **Notch**<br>**NN** |
| **Loaded RI Score**<br>The Loaded RI Score (Total Notch × GRI Score) is 48 out of 100. | **Score**<br>**48** |

[19] Reflections on the current state of fuel prices in logging and transport. https://bellwetherfp.com/reflections-on-the-current-state-of-fuel-prices-in-logging-and-transport/

### *3.5.3 Transportation of Feedstock Requires Specialized Equipment*

**Rationale:** Requirements for specialized transport equipment (e.g., walking-floor trailers) can increase supply chain risk. Where there is low availability in required transportation equipment, equipment owners have increased leverage over transportation prices and supply chain resiliency can be lower.

**Risk Information:** Forest residues, when collected, do not require any specialized equipment. Three methods are employed in the BDO Zone. 1) Tops of 20' minimum are picked up with a knuckle boom and double bunked onto standard logging trucks**.** 2) Tops and branches are picked up with a knuckle boom or other grapple and loaded into chip vans. 3) Tops and branches are chipped on site and blown into a chip van.

Overall, no specialized equipment is needed for harvesting and transporting forest residues. The equipment needed for harvesting forest residues is readily available.

| | |
|---|---|
| **Raw Risk Likelihood (RRL)**<br>The risk likelihood is deemed *very low*, therefore the RRL is 2 out of 10. | **Score**<br>**2** |
| **Raw Risk Impact (RRI)**<br>The risk impact is deemed *very low*, therefore the RRI is 2 out of 10. | **Score**<br>**2** |
| **Gross Risk Indicator (GRI)**<br>The Gross Risk Indicator (RRL × RRI) is 4 out of 100. | **Score**<br>**4** |
| **Mitigation/Notching**<br>*RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch × RRI Notch) is NN (No Notch). | **Notch**<br>**NN** |
| **Loaded RI Score**<br>The Loaded RI Score (Total Notch × GRI Score) is 4 out of 100. | **Score**<br>**4** |

### *3.5.4 Delivery Routes through Local Communities*

**Rationale:** Transportation of biomass can become a nuisance to local communities, especially if a large number of trucks pass through residential and school areas. Local communities often have power to force regulations regarding truck transport, impeding the ability BDO Zone suppliers to transport feedstock.

**Risk Information:** Pulpwood is the most likely biomass to be transported in the BDO Zone, as forest residues are not being actively harvested and acquiring sawmill residues will face competition. For the rated volume of 800,000 bdt per year, a facility will need to accommodate approximately 232 deliveries by logging truck per day. Local experts in the industry state that given how important forestry and biomass are to the community, it is unlikely that there will be major opposition. Additionally, the center point of the BDO Zone is the Lyons Industrial Park, which is serviced by two four-lane highways. Also, truckers are aware of possible nuisance areas and have been trained to avoid them.

The community is supportive of biomass-based industries, and companies in Georgia have worked with local communities to mitigate nuisance issues in the past.

| | |
|---|---|
| **Raw Risk Likelihood (RRL)**<br>The risk likelihood is deemed *very low*, therefore the RRL is 2 out of 10. | **Score**<br>**2** |
| **Raw Risk Impact (RRI)**<br>The risk impact is deemed *very low*, therefore the RRI is 2 out of 10. | **Score**<br>**2** |

| **Gross Risk Indicator (GRI)** | **Score** |
|---|---|
| The Gross Risk Indicator (RRL × RRI) is 4 out of 100. | **4** |
| **Mitigation/Notching**<br>*RRL Mitigation (Notch)*<br>No adjustment.<br>*RRI Mitigation (Notch)*<br>No adjustment.<br>The Total Notch (RRL Notch × RRI Notch) is NN (No Notch). | **Notch**<br>**NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score (Total Notch × GRI Score) is 4 out of 100. | **4** |

### *3.5.5 Transportation Regulations & Local Weight Limits*

**Rationale:** In many BDO Zones, transportation is regulated based on seasonal road conditions. These regulations (e.g., "frost laws") often take the form of weight restrictions or limits on the number of trucks allowed on roads. Such regulations can impede the project's ability to source sufficient feedstock or increase the cost of doing so at certain times of the year.

**Risk Information:** In 2023, the Georgia legislature passed House Bill 189 increasing the weight limits for trucks carrying forest products from 42 tons to 44 tons. This bill will sunset July 1, 2025. However, given the importance of the forest products industry in Georgia, it is unlikely that the weight limits will be decreased.

If the weight limits are reduced to previous levels, the amount of biomass per truckload will be reduced by five percent.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed *very low*, therefore the RRL is 2 out of 10. | **2** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed *low*, therefore the RRI is 4 out of 10. | **4** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL × RRI) is 8 out of 100. | **8** |
| **Mitigation/Notching**<br>*RRL Mitigation (Notch)*<br>No adjustment.<br>*RRI Mitigation (Notch)*<br>No adjustment.<br>The Total Notch (RRL Notch × RRI Notch) is NN (No Notch). | **Notch**<br>**NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score (Total Notch × GRI Score) is 8 out of 100. | **8** |

### *3.5.6 Road Infrastructure*

**Rationale:** Feedstock cost and availability can be a function of road infrastructure, in particular the accessibility the infrastructure provides to feedstock. Issues with road networks will translate directly to risks to feedstock supply.

**Risk Information:** Generally, road access is not an issue for most timber tracts in Georgia. There is usually an adequate to good road system for most timberlands (which are 91% privately owned) in the state. Since a large portion of timberland in Georgia has experienced at least one harvest in the past century, there is at minimum an old roadbed that

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| the logger can work with. Sometimes the roads may be maintained to varying degrees, but loggers typically have a bulldozer used to improve roads and/or build new ones if needed. |
| **Raw Risk Likelihood (RRL)** **Score**<br>The risk likelihood is deemed *very low*, therefore the RRL is 2 out of 10. **2** |
| **Raw Risk Impact (RRI)** **Score**<br>The risk impact is deemed *very low*, therefore the RRI is 2 out of 10. **2** |
| **Gross Risk Indicator (GRI)** **Score**<br>The Gross Risk Indicator (RRL × RRI) is 4 out of 100. **4** |
| **Mitigation/Notching** **Notch**<br>*RRL Mitigation (Notch)* **NN**<br>No adjustment.<br>*RRI Mitigation (Notch)*<br>No adjustment.<br>The Total Notch (RRL Notch × RRI Notch) is NN (No Notch). |
| **Loaded RI Score** **Score**<br>The Loaded RI Score (Total Notch × GRI Score) is 4 out of 100. **4** |

### *3.5.7 Transportation Redundancy*

**Rationale:** Transport equipment redundancy is important for dealing with seasonally variable feedstock supplies as well as the risk of equipment breakdowns.

**Risk Information:** For a new biomass facility in the BDO Zone using the rated volume of 800,000 bdt per year, additional logging crews, truck drivers, logging equipment, and trucks would be required. Pulpwood is the most likely biomass to be transported in the BDO Zone, as forest residues are not being actively harvested and acquiring sawmill residues will face competition. For the rated volume of 800,000 bdt per year, a facility will need to accommodate approximately 232 deliveries by logging truck per week operated by an additional 66 logging truck drivers.

Insurance company regulations have impacted the number of qualified logging truck drivers as new standards dictate a minimum truck driving experience of three years before operating a logging truck. This is viewed as the main limitation to logging.

Hiring additional log truck drivers may be a challenge, but is somewhat minimized in that facility construction and ramp up to full production will likely take place over two to four years. This will give new companies time to recruit new logging truck drivers. So, we consider a medium likelihood for this risk.

If logging truck drivers cannot be recruited then it will be difficult for a new facility to acquire enough biomass to operate profitably. So, the impact can be high.

| |
|---|
| **Raw Risk Likelihood (RRL)** **Score**<br>The risk likelihood is deemed *medium*, therefore the RRL is 6 out of 10. **6** |
| **Raw Risk Impact (RRI)** **Score**<br>The risk impact is deemed *high*, therefore the RRI is 8 out of 10. **8** |
| **Gross Risk Indicator (GRI)** **Score**<br>The Gross Risk Indicator (RRL × RRI) is 48 out of 100. **48** |

| **Mitigation/Notching** | **Notch** |
|---|---|
| *RRL Mitigation (Notch)*<br>Recruiting of new logging truck drivers or sponsoring their participation in logging truck training will reduce the likelihood of a shortage of drivers for a specific project. We consider a notching of 50%.<br><br>*RRI Mitigation (Notch)*<br>Effective programs to avoid shortages of qualified logging truck drivers will reduce the impact. We consider a notching of 50%.<br><br>The Total Notch (RRL Notch × RRI Notch) is 25%. | **25%** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score (Total Notch × GRI Score) is 36 out of 100. | **36** |

### *3.6 Risk Factor: Supply Chain Resiliency*

#### *3.6.1 Size, Number and Location of Suppliers*

**Rationale:** In general, a supply portfolio involving multiple suppliers of various sizes (and from multiple BDO Zones) is important for ensuring steady and uninterrupted feedstock supply with minimal price fluctuations. If a small number of large suppliers provides a high proportion of total feedstock, a disruption or supplier breach will have greater impact on the supply chain. In such cases the risk of disruption is lower, but the impact of those disruptions is higher. Conversely, many small suppliers are less likely to have the capacity to withstand internal disruptions and thus may be more likely to breach. Here, risk of disruption is higher, but their likely impact is lower. The number of suppliers as well as the ratio of small to large suppliers should be optimized.

There is no pre-determined number or optimal ratio of suppliers, although having too many or too few can both pose higher degrees of risk.

**Risk Information:** There are 17 major sawmills in the Supply Basin. Seven of these sawmills revealed that they do not have any residues available, as they are either vertically integrated with pellet mills or under long-term supply contracts. Four of the mills did not respond to multiple inquiries and are likely to have their residues under contract. The remaining six sawmills already sell their residues to a pellet mill but do have a limited amount available for new projects.

Within the BDO Zone, there are 490 people with the current Georgia Master Timber Harvester certification. There are 273 logging and timber companies that employ these people. Participation in the program is required to deliver wood to most mills in Georgia. These companies are distributed across the entire BDO Zone.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed *low*, therefore the RRL is 4 out of 10. | **4** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed *very low*, therefore the RRI is 2 out of 10. | **2** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL × RRI) is 8 out of 100. | **8** |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch × RRI Notch) is NN (No Notch). | **NN** |

| **Loaded RI Score** | **Score** |
|---|---|
| The Loaded RI Score (Total Notch × GRI Score) is 8 out of 100. | **8** |

### *3.6.2 Suppliers Subject to Same External Risk Factors*

**Rationale:** When a single risk event can impact the feedstock production ability of all (or most) suppliers, then feedstock risk is higher and supply chain resiliency is lower. Resilience is maximized when biomass supply chains exhibit diversity in spatial location (i.e., geography), production practices and other elements of supply chain structures such that the impact of single high-risk events have varying impacts on suppliers.

**Risk Information:** Harvesting sawtimber and pulpwood have both followed a distinct trend over the past decade. Pulpwood removals (Appendix A, Figure A-3) have followed a steady decrease that parallels the downturn in paper use. Sawtimber removal increases (Appendix C, Figure C-5) have followed the increase in housing starts in the US South.

New projects that rely on pulpwood but are not related to the paper industry should be able to source pulpwood, but if there is a large decrease in the paper industry there may be large numbers of logging companies that go out of business.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed *medium*, therefore the RRL is 6 out of 10. | **6** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed *medium*, therefore the RRI is 6 out of 10. | **6** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL × RRI) is 36 out of 100. | **36** |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch × RRI Notch) is NN (No Notch). | **NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score (Total Notch × GRI Score) is 36 out of 100. | **36** |

### *3.6.3 Land Ownership Structures*

**Rationale:** The ownership (or control) of the land base on which feedstock is produced can have significant impact on Issuer's feedstock risks. Risk of long-term variation in stumpage cost for wood fiber (i.e., the cost that one pays to a landowner for the right to cut and purchase their wood fiber) for example are much higher in the US where >90% of the land is private, and thus stumpage cost is determined on a competitive auction basis. Conversely, in Canada >90% of the land is owned by the Crown and stumpage is allocated by the government.

**Risk Information:** The USDA Forest Inventory and Analysis database indicates that the land base for pulpwood and forest residues in the BDO Zone is overwhelmingly (over 91%) under private ownership. High levels of private timberland ownership (Figure A-6) reduce risk, as the biomass contracts are not subject to government programs.[20]

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed *very low*, therefore the RRL is 2 out of 10. | **2** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed *very low*, therefore the RRI is 2 out of 10. | **2** |

[20] Personal Communication. Dru Preston. Georgia Forestry Commission.

| **Gross Risk Indicator (GRI)** | **Score** |
|---|---|
| The Gross Risk Indicator (RRL × RRI) is 4 out of 100. | **4** |
| **Mitigation/Notching**<br>*RRL Mitigation (Notch)*<br>No adjustment.<br>*RRI Mitigation (Notch)*<br>No adjustment.<br>The Total Notch (RRL Notch × RRI Notch) is NN (No Notch). | **Notch**<br>**NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score (Total Notch × GRI Score) is 4 out of 100. | **4** |

## *3.7 Risk Factor: Climate and Natural Risks*

### *3.7.1 Seasonal Weather Impacts on Feedstock Supply*

**Rationale:** Seasonal weather impacts are defined as those deriving from natural weather variations (i.e., spring thaws, rainy seasons, or dry seasons – as opposed to from singular weather events like fires, droughts, or hurricanes). Seasonal weather changes can be a significant risk factor affecting feedstock availability, quality, and price.

Given the major influence that weather has on multiple aspects of growing, harvesting, and transporting biomass, it is difficult to predict the availability of biomass at a specific location at different points in the future with a high degree of certainty. However, it is still possible, using past data and statistical models, to generate reasonable upper/lower bound estimates of biomass production in any given year in a wider supply basin. Such estimates are important in assessing feedstock risk and enable accurate assessment of the efficacy of Issuer's mitigation methods.

**Risk Information:** Timber harvests occur year-round, with the winter and spring typically being wetter months. This can limit loggers' ability to move wood to the mills, though this is usually temporary and does not last for an extended period of time. During the winter and spring months, loggers sometimes are moved to "wet weather" tracts, which are usually on higher ground and/or have sandy/sandy loam soils that stand up better when wet. Fall is usually drier and that is when mills try to build up inventory for the coming winter/spring months.

Overall, procedures are in place to avoid harvesting stoppages due to seasonal weather patterns. In addition, the amount of available timber is in excess of demand and the terrain is varied enough to avoid harvest areas subject to seasonal moisture issues.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed *very low*, therefore the RRL is 2 out of 10. | **2** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed *very low*, therefore the RRI is 2 out of 10. | **2** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL × RRI) is 4 out of 100. | **4** |
| **Mitigation/Notching**<br>*RRL Mitigation (Notch)*<br>No adjustment.<br>*RRI Mitigation (Notch)*<br>No adjustment.<br>The Total Notch (RRL Notch × RRI Notch) is NN (No Notch). | **Notch**<br>**NN** |

| **Loaded RI Score** | **Score** |
|---|---|
| The Loaded RI Score (Total Notch × GRI Score) is 4 out of 100. | **4** |

### *3.7.2 Long-Term Weather and Climate Trends*

**Rationale:** In certain BDO Zones, climatic trends and significant potential changes to future weather patterns can create feedstock risk.

**Risk Information:** Climate change has the potential to disrupt agricultural operations leading to crop failure, insect or disease outbreak, or change in water availability. Georgia's agriculture and forestry researchers are taking measures to mitigate future impacts. These measures include encouraging forest management to maximize forest health, monitoring forestry operations for correct implementation of Best Management Practices, and continually developing new varieties of forest plantation stock that will resist the stresses brought about by climate change.

According to local experts, climate change is not a significant factor at this time. While the effects of climate change are hard to predict for any specific region, Georgia's agriculture and forestry is taking measures to mitigate large scale impacts.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed *low*, therefore the RRL is 4 out of 10. | **4** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed *medium*, therefore the RRI is 6 out of 10. | **6** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL × RRI) is 24 out of 100. | **24** |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch × RRI Notch) is NN (No Notch). | **NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score (Total Notch × GRI Score) is 24 out of 100. | **24** |

### *3.7.3 Forest/Crop Fire*

**Rationale:** Forest/crop fires, especially when occurring at large-scale, destroy feedstock and create shortages.

Fire-prone conditions are predicted to increase across Canada. This could potentially result in a doubling of the amount of area burned by the end of this century compared with amounts burned in recent decades. Boreal forests, which have been historically greatly influenced by fire, will likely be especially affected by this change.

Other climate change impacts that could add damaged or dead-wood to the forest fuel load (e.g., as a result of insect outbreaks, ice storms, or high winds) may increase the risk of fire activity. New research is aimed at refining these climate change estimates of fire activity, and at investigating adaptation strategies and options to deal with future fire occurrence. There is growing consensus that as wildfire activity increases, fire agency suppression efforts will be increasingly strained. However, analyses of fire history suggest that it is the effect of climate variability on precipitation regimes that is the primary reason for the decreasing fire activity in the southern BDO Zone of Canada.

**Risk Information:** Wildfires are not a major impact on harvesting. Georgia averages roughly 2,000 – 3,000 wildfires annually, with an average of seven acres per fire. This can vary, however, based on how "wet" or "dry" a year is. In recent

decades, 2007 and 2011 were outlier years as there were large wildfires in the Okefenokee Swamp, which did affect timberland in that area. Salvage harvesting operations can be conducted where the timber is determined to be damaged severely and/or at risk of insects such as the Southern Pine Beetle. Generally, though, wildfire does not have a large impact on harvesting activity and if it does, it is usually confined to a local area.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed *low*, therefore the RRL is 4 out of 10. | **4** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed *low*, therefore the RRI is 4 out of 10. | **4** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL × RRI) is 16 out of 100. | **16** |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch × RRI Notch) is NN (No Notch). | **NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score (Total Notch × GRI Score) is 16 out of 100. | **16** |

### *3.7.4 Risk of Infestation*

**Rationale:** Risk of future infestation, including its estimated consequences on feedstock supply, should be calculated into the overall risk profile.

Since forest insect populations are influenced by environmental conditions, future changes in climate can be expected to significantly alter the outbreak dynamics of certain forest insect species. In some cases, larger and more frequent insect outbreaks may occur, but in other cases recurring outbreaks may be disrupted or diminished. As climate continues to change, we can expect more situations, particularly at the margins of tree ranges, where sub-optimal conditions for tree growth and reduced tree vigor can lead to outbreaks of forest insects.

**Risk Information:** The southern pine beetle (SPB) and other pine bark beetles continue to represent the largest threat to pine timber in Georgia and the South. GFC monitors SBP activity annually and takes measures to thwart its spread. There have been no significant SPB outbreaks in Georgia in the last several years, however the IPS beetle (a less destructive bark beetle) was very active during the drought of 2016. GFC is mandated to monitor our forests for the presence of insect and disease outbreaks and is charged with taking action if warranted to suppress or limit the damage to these pests.

However**,** a significant outbreak of infestation could inflict widespread damage to the timberlands, impacting the biomass availability and price. The Georgia Forestry Commission is mandated to monitor our forests for the presence of insect and disease outbreaks, and is charged with taking action if warranted to suppress or limit the damage to these pests.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed *low*, therefore the RRL is 4 out of 10. | **4** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed *high*, therefore the RRI is 8 out of 10. | **8** |
| **Gross Risk Indicator (GRI)** | **Score** |

| | |
|---|---|
| The Gross Risk Indicator (RRL × RRI) is 32 out of 100. | **32** |
| **Mitigation/Notching**<br>*RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch × RRI Notch) is NN (No Notch). | **Notch**<br>**NN** |
| **Loaded RI Score**<br>The Loaded RI Score (Total Notch × GRI Score) is 32 out of 100. | **Score**<br>**32** |

### *3.7.5 Risk of Hail*

**Rationale:** Hail has negligible impact of forestry biomass but is one of the principal destroyers of agricultural crops in North America.

There is much uncertainty about the effects of anthropogenic climate change on the frequency and severity of extreme weather events like hailstorms and their subsequent economic losses. Some studies indicate a strong positive relationship between hailstorm activity and hailstorm damage, as predicted by minimum temperatures using simple correlations. This relationship suggests that hailstorm damage may increase in the future if global warming leads to further temperature increase.

**Risk Information:** Hail is not a relevant risk in the BDO Zone.

| | |
|---|---|
| **Raw Risk Likelihood (RRL)**<br>The risk likelihood is deemed *not relevant*, therefore the RRL is not rated. | **Score**<br>**NR** |
| **Raw Risk Impact (RRI)**<br>The risk impact is deemed *not relevant*, therefore the RRI is not rated. | **Score**<br>**NR** |
| **Gross Risk Indicator (GRI)**<br>The Gross Risk Indicator (RRL × RRI) is not rated. | **Score**<br>**NR** |
| **Mitigation/Notching**<br>The Total Notch (RRL Notch × RRI Notch) is not rated. | **Notch**<br>**NR** |
| **Loaded RI Score**<br>The Loaded RI Score (Total Notch × GRI Score) is not rated. | **Score**<br>**NR** |

### *3.7.6 Risk of Flood*

**Rationale:** Floods can cause catastrophic disruption and delay in feedstock supply. Where there is high risk of flood and thus negative impact to feedstock supply, the BDO Zone rating should account for this risk.

**Risk Information:** Flooding can affect the ability to harvest standing timber as the vehicles needed can sink into saturated soil, becoming stuck or causing soil compaction. The risk of flood is very low according to the Georgia Department of Natural Resources Flood Map. Standing timber is flood resistant to a high degree. Users of timber typically stockpiles several weeks or months of feedstock as a mitigating measure against harvesting disruptions.

| | |
|---|---|
| **Raw Risk Likelihood (RRL)**<br>The risk likelihood is deemed *very low*, therefore the RRL is 2 out of 10. | **Score**<br>**2** |
| **Raw Risk Impact (RRI)**<br>The risk impact is deemed *low*, therefore the RRI is 4 out of 10. | **Score**<br>**4** |
| **Gross Risk Indicator (GRI)** | **Score** |

| | |
|---|---|
| The Gross Risk Indicator (RRL × RRI) is 4 out of 100. | **8** |
| **Mitigation/Notching**<br>*RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch × RRI Notch) is NN (No Notch). | **Notch**<br>**NN** |
| **Loaded RI Score**<br>The Loaded RI Score (Total Notch × GRI Score) is 4 out of 100. | **Score**<br>**8** |

### *3.7.7 Risk of Drought*

**Rationale:** Droughts can cause significant disruptions to feedstock supplies across entire BDO Zones for extended periods of time, especially in case of agricultural residues and energy crops. Parts of Western Canada are experiencing more frequent and severe droughts, and scientists expect drought to affect new areas across Canada going forward.

Tree species are adapted to specific moisture conditions. Having less water available through drought has a range of negative impacts on the health of forest ecosystems. Direct impacts include reduced growth, increased tree mortality and failure to regenerate. Indirect impacts include reduced ability to defend against insects and disease, and increased fire risk. These impacts can affect the availability of wood fiber for an Issuer.

**Risk Information:** Drought can affect growth rates of agricultural crops, including trees. The risk of drought is low according to the US National Integrated Drought Information System. There are regular seasonal periods of dry conditions. Historically, severe drought events occurred in 2011-2012 and also in 2002. Trees are not as susceptible to drought conditions as agricultural crops in terms of mortality. Rather, standing timber will slow its growth rate until more favorable conditions are present.

| | |
|---|---|
| **Raw Risk Likelihood (RRL)**<br>The risk likelihood is deemed *low*, therefore the RRL is 4 out of 10. | **Score**<br>**4** |
| **Raw Risk Impact (RRI)**<br>The risk impact is deemed *very low*, therefore the RRI is 2 out of 10. | **Score**<br>**2** |
| **Gross Risk Indicator (GRI)**<br>The Gross Risk Indicator (RRL × RRI) is 8 out of 100. | **Score**<br>**8** |
| **Mitigation/Notching**<br>*RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch × RRI Notch) is NN (No Notch). | **Notch**<br>**NN** |
| **Loaded RI Score**<br>The Loaded RI Score (Total Notch × GRI Score) is 8 out of 100. | **Score**<br>**8** |

### *3.7.8 Risk of Hurricanes, Tornadoes and Strong Winds*

**Rationale:** Hurricanes, tornadoes, and strong winds can destroy timber stands, crops, and feedstock piles. They can also delay forestry and agricultural operations. Hurricanes and tornadoes can indirectly cause temporary shortages of available transportation as available trucking moves to handle higher value disaster related contracts. For example,

Katrina cleanup limited availability of live-bottom trailers in the North and South-East of the US for several months as truckers shifted operations to handle more lucrative government contracts.

Although scientists are uncertain whether climate change will lead to an increase in the number of hurricanes, warmer ocean temperatures and higher sea levels are expected to intensify their impacts.

Recent analyses conclude that the strongest hurricanes occurring in some BDO Zones including the North Atlantic have increased in intensity over the past two to three decades.

**Risk Information:** Hurricanes can affect the BDO Zone as the southeast US is regularly exposed to the possibility of these storms. Georgia is less susceptible than the other southeastern states due to its location and shorter coastline. The estimated return period of hurricanes in Georgia is 10 to 11 years. Only four major hurricanes have struck Georgia with the most recent being Michael in 2018.

A major hurricane in the BDO Zone is most likely to cause damaged trees. If the damaged trees can be salvaged then they can be sold to mills, usually at a lower price because of the sudden glut of feedstock available. If damaged trees cannot be salvaged then landowners will be forced to absorb the loss of standing timber and possibly replanting costs.

Tornados occur in Georgia with the most likely months being March to May. On average, Georgia experiences six days a year with at least one tornado.

In summary, major hurricanes can be expected to make landfall every 10 to 11 years. However, according to the National Oceanic and Atmospheric Administration, no major hurricanes have made direct landfall in Georgia for at least 30 years.

The number of tornado days is low, and they tend to have short durations. So, the likelihood is deemed to be low.

However, the BDO is adjacent to the Atlantic coast. If a major hurricane made direct landfall in the area between Brunswick and Savannah widespread damage would be expected to timberlands, very similar to the effects of Hurricane Hugo in 1989. So, the impact can be high.

| | |
|---|---|
| **Raw Risk Likelihood (RRL)**<br>The risk likelihood is deemed *low*, therefore the RRL is 4 out of 10. | **Score**<br>**4** |
| **Raw Risk Impact (RRI)**<br>The risk impact is deemed *high*, therefore the RRI is 8 out of 10. | **Score**<br>**8** |
| **Gross Risk Indicator (GRI)**<br>The Gross Risk Indicator (RRL × RRI) is 32 out of 100. | **Score**<br>**32** |
| **Mitigation/Notching**<br>*RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>Mitigation of the impact of this risk for the feedstock end user would take the form of having a plan to use damaged timber. Risk mitigation in harvesting would require having access to harvesting crews and equipment from adjacent areas unaffected by the storm. We consider a notching of 25%.<br><br>The Total Notch (RRL Notch × RRI Notch) is 25%. | **Notch**<br>**25%** |
| **Loaded RI Score**<br>The Loaded RI Score (Total Notch × GRI Score) is 24 out of 100. | **Score**<br>**24** |

### *3.7.9 Risk of Low Temperatures*

**Rationale:** Low temperatures can cause crop failure, leading to shortages of biomass. Additionally, low temperatures can have adverse impacts on the operations of feedstock processing equipment in Northern BDO Zones.

**Risk Information:** Low temperatures can damage some crop species. For woody biomass this is generally not a problem unless exotic species are planted in the hopes of achieving especially high growth rates. The timber species in the BDO Zone are native to the area.

For the center point of the BDO Zone over the course of a year, the temperature typically varies from 41°F to 93°F and is rarely below 28°F or above 98°F.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed *very low*, therefore the RRL is 2 out of 10. | **2** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed *very low*, therefore the RRI is 2 out of 10. | **2** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL × RRI) is 4 out of 100. | **4** |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch × RRI Notch) is NN (No Notch). | **NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score (Total Notch × GRI Score) is 4 out of 100. | **4** |

## *3.8 Risk Factor: Political and Social*

### *3.8.1 Government Subsidies for Feedstock Production or Utilization*

**Rationale:** Feedstock that is directly subsidized though government programs can pose greater long-term risk than feedstock that is not. Subsidies may be subject to amendment or repeal, sometimes with minimal notice.

*NOTE: This risk indicator refers to direct feedstock subsides only; it does not apply to government subsidies that pertain indirectly to the operations of the Issuer such as Loan Guarantees or to the markets for products produced by the Issuer.*

**Risk Information:** Georgia enacted legislation in April 2006 (HB 1018) creating an exemption for biomass materials from the state's sales and use taxes. The term "biomass material" is defined as "organic matter, excluding fossil fuels, including agricultural crops, plants, trees, wood, wood wastes and residues, sawmill waste, sawdust, wood chips, bark chips, and forest thinning, harvesting, or clearing residues; wood waste from pallets or other wood demolition debris; peanut shells; pecan shells; cotton plants; corn stalks; and plant matter, including aquatic plants, grasses, stalks, vegetation, and residues, including hulls, shells, or cellulose-containing fibers."

To qualify for the exemption, the biomass material must be utilized in the production of energy, including the production of electricity, steam, or both electricity and steam. Pellets and fuels derived from biomass are generally eligible. The energy produced from biomass material must be sold. The state of Georgia also provides a number of other exemptions for industries which electricity generators may qualify for.

The tax incentive has been in place for 17 years. While the bill passed in Feb 2022 it is not clear how much longer this incentive will continue to be offered. So, we consider a medium scope for the likelihood of this risk impact future biomass projects.

If a business plan is implemented based on the requirement of an incentive to be profitable, the repeal of the incentive can cause business failure. So, the impact could be high.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed *medium*, therefore the RRL is 6 out of 10. | **6** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed *high*, therefore the RRI is 8 out of 10. | **8** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL × RRI) is 48 out of 100. | **48** |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch × RRI Notch) is NN (No Notch). | **NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score (Total Notch × GRI Score) is 48 out of 100. | **48** |

### *3.8.2 Local, Provincial, & National Laws, Regulations, & Permitting Pertaining to Biomass*

**Rationale:** Feedstock whose production is directly dependent on local, provincial, or national laws or government regulations can pose greater long-term risk than feedstock that is not, since laws and regulations may be subject to amendment or repeal.

If utilization of biomass requires specific permits (i.e., percentage removal of forest residues or corn stover, allowable cut limits, air emission, storage permits, rights-of-way, overweight permits for trucks, cross-border permitting for shipment of biomass, chain of custody, or certification of sustainability) then likelihood of obtaining such permits and/or complying with permitting requirements should be examined.

**Risk Information:** A wide range of permits are administered by the Georgia Environmental Protection Division. These include air, water, brownfield construction, hazardous waste, and others. Federal permitting includes guidelines under the Clean Air Act Title V, Clean Power Plan, Clean Water Act. Many of the federal guidelines are incorporated into the state permits.

Permitting and regulations are established and clear. As a state, Georgia has many biomass projects, so the process had been developed over time. Consulting firms that specialize in permitting new projects are available.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed *very low*, therefore the RRL is 2 out of 10. | **2** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed *very low*, therefore the RRI is 2 out of 10. | **2** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL × RRI) is 4 out of 100. | **4** |

| **Mitigation/Notching** | **Notch** |
|---|---|
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch × RRI Notch) is NN (No Notch). | **NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score (Total Notch × GRI Score) is 4 out of 100. | **4** |

### *3.8.3 Backlash Against Biomass Development, Procurement or Usage in the Region*

**Rationale:** Public backlash against biomass development in the Issuer BDO Zone can directly impact Issuer's ability to procure, transport, trans-load, store, or utilize feedstock by affecting local policies, regulations, and Issuer's ability to obtain necessary permitting.

**Risk Information:** Three biomass projects in Georgia have been subject to protests and/or legal action with the past 12 years. In 2021 a proposed pellet mill in Adel faced protest due to concerns about emissions. This situation was remedied by increasing emissions controls. A railroad tie-to-energy facility in Colbert faced protests in 2020 over concerns about emissions and noise. A biomass-to power facility in Valdosta was protested in 2011 over air quality emissions. However, none of the recent protests were in the BDO Zone nor were they near the center point of Lyons and many of these protests were not specially against the biomass development but the operation management to reduce emissions and noises.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed *low*, therefore the RRL is 4 out of 10. | **4** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed *medium*, therefore the RRI is 6 out of 10. | **6** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL × RRI) is 24 out of 100. | **24** |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>Proper planning and engagement with key stakeholders, including holding public forums before project kickoff, can help address public concerns. The recent public concerns were focused on air quality, which can be addressed in the planning stages. The impact can be reduced significantly. Thus, we consider 75% notching (high mitigation effectiveness).<br><br>The Total Notch (RRL Notch × RRI Notch) is 75%. | **75%** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score (Total Notch × GRI Score) is 6 out of 100. | **6** |

### *3.8.4 Consent of, and Co-operation with, Indigenous Communities and First Nations*

**Rationale:** Where new project development on or near Indigenous or First Nation land, or where near Indigenous or First Nations exert influence over feedstock producing areas, consent of, and co-operation with, Indigenous communities and First Nations decreases Issuer risk.

| |
|---|
| **Risk Information:** There are no Indigenous reserves or federally-recognized Native American tribes in the Supply Basin. Although Georgia recognizes three Native American tribes, their recent activities are focused on cultural preservation and education. |
| **Raw Risk Likelihood (RRL)** — **Score** |
| The risk likelihood is deemed *very low*, therefore the RRL is 2 out of 10. — **2** |
| **Raw Risk Impact (RRI)** — **Score** |
| The risk impact is deemed *very low*, therefore the RRI is 2 out of 10. — **2** |
| **Gross Risk Indicator (GRI)** — **Score** |
| The Gross Risk Indicator (RRL × RRI) is 4 out of 100. — **4** |
| **Mitigation/Notching** — **Notch** |
| *RRL Mitigation (Notch)* — **NN** |
| No adjustment. |
| *RRI Mitigation (Notch)* |
| No adjustment. |
| The Total Notch (RRL Notch × RRI Notch) is NN (No Notch). |
| **Loaded RI Score** — **Score** |
| The Loaded RI Score (Total Notch × GRI Score) is 4 out of 100. — **4** |

### *3.8.5 Food Security Concerns*

| |
|---|
| **Rationale:** Despite the fact that any significant correlation between food prices and biofuel production is unclear, claims that biofuel production has driven up food prices, taken food from communities or had a negative impact on land use can fuel public backlash. For example, removal of biomass may raise public concerns relating to food security if Issuer feedstock requires the use of land that would otherwise be used for growing food. |
| **Risk Information:** While Georgia is the top producer of timber products in the US South, the state is also a leading producer of many food crops. These include number one in blueberry production, broilers, peanuts, pecans, rye, and onions. Georgia ranks second in the nation for cotton, cucumbers, pullets, and watermelon; third for bell peppers, peaches, and sweet corn. In fact, a small area of forest operations has reduced in size in recent years because of population growth and conversion to food production in parts of the BDO Zone. We do not expect the increasing demand for biomass would result in land use change and the conversion of agricultural lands to timberlands. |
| **Raw Risk Likelihood (RRL)** — **Score** |
| The risk likelihood is deemed *very low*, therefore the RRL is 2 out of 10. — **2** |
| **Raw Risk Impact (RRI)** — **Score** |
| The risk impact is deemed *very low*, therefore the RRI is 2 out of 10. — **2** |
| **Gross Risk Indicator (GRI)** — **Score** |
| The Gross Risk Indicator (RRL × RRI) is 4 out of 100. — **4** |
| **Mitigation/Notching** — **Notch** |
| *RRL Mitigation (Notch)* — **NN** |
| No adjustment. |
| *RRI Mitigation (Notch)* |
| No adjustment. |
| The Total Notch (RRL Notch × RRI Notch) is NN (No Notch). |

| **Loaded RI Score** | **Score** |
|---|---|
| The Loaded RI Score (Total Notch × GRI Score) is 4 out of 100. | **4** |

### *3.9 Risk Factor: Sustainability and Environmental Concern*

#### *3.9.1 Feedstock Sustainability*

**Rationale:** Public concerns about sustainability of feedstock production can jeopardize biomass feedstock operations. Sustainability certification schemes should be utilized where applicable to ensure that feedstock comes from sustainable sources.

Canada leads all countries with 166 million hectares of certified forests, a figure that is nearly four times more than second place United States at 47 million hectares.

**Risk Information:** The forests in the BDO Zone are well managed and subject to regular audits for BMP compliance. The state of Georgia implemented forestry best management practices (BMPs) in 1981, and continue to evaluate their implementation. BMPs are guidelines for maintaining forest health, with a focus on soil and water during forest management and harvesting. A 2021 report on BMP compliance by the Georgia Forestry Commission indicated a statewide implementation of BMPs overall was 93%. Approximately 18% of Georgia forests are certified by third parties such as the Sustainable Forestry Initiative (SFI), American Tree Farm (ATF) or Forest Stewardship Council (FSC). It is noted that third party certification is not a requirement. However, companies can seek certification if they deem it important to their customers.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed *very low*, therefore the RRL is 2 out of 10. | **2** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed *very low*, therefore the RRI is 2 out of 10. | **2** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL × RRI) is 4 out of 100. | **4** |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch × RRI Notch) is NN (No Notch). | **NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score (Total Notch × GRI Score) is 4 out of 100. | **4** |

#### *3.9.2 Risk to Soil Quality*

**Rationale:** Soil sustainability can be defined as management of soil in a way that does not exert any negative or irreparable effects either on the soil itself or any other systems. There is a diversity of approaches to soil sustainability in jurisdictional guidelines for forest biomass harvesting and production. For different feedstock types, there are also different thresholds at which feedstock removal causes significant negative consequences on soil.

Poor soil quality that negatively impacts the long-term sustainability of the feedstock can entail long-term feedstock risk. Sub-optimal soil management can leave exposed soil post residue-harvest which can lead to soil wash-off and soil carbon loss from precipitation and wind. Over-harvesting of biomass also depletes the carbon stock in the soil and creates a negative feedback loop which can degrade the soil and its nutrients.

**Risk Information:** The state of Georgia implemented forestry best management practices (BMPs) in 1981, and continue to evaluate their implementation. Mitigation of risk to soil as a result of forestry operations is one of the primary goals of BMPs. A 2021 report on BMP compliance by the Georgia Forestry Commission indicated a statewide implementation of BMPs overall was 93%. With regard to soil-related issues, BMP compliance was over 90% for practices directly related to soil quality.

The agencies responsible for BMPs policy development are the Georgia Forestry Commission, the U.S. Environmental Protection Agency and the U.S. Army Corps of Engineers.

| | |
|---|---|
| **Raw Risk Likelihood (RRL)**<br>The risk likelihood is deemed *very low*, therefore the RRL is 2 out of 10. | **Score**<br>**2** |
| **Raw Risk Impact (RRI)**<br>The risk impact is deemed *very low*, therefore the RRI is 2 out of 10. | **Score**<br>**2** |
| **Gross Risk Indicator (GRI)**<br>The Gross Risk Indicator (RRL × RRI) is 4 out of 100. | **Score**<br>**4** |
| **Mitigation/Notching**<br>*RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch × RRI Notch) is NN (No Notch). | **Notch**<br>**NN** |
| **Loaded RI Score**<br>The Loaded RI Score (Total Notch × GRI Score) is 4 out of 100. | **Score**<br>**4** |

### *3.9.3 Risk to Surface and Groundwater*

**Rationale:** Excessive nutrient runoff from biomass feedstock production can accumulate in surface waters and result in algal blooms and hypoxia which can lead to habitat loss for aquatic species higher up the food chain and alter aquatic ecosystem food webs. Damage to aquatic ecosystems can cause social and regulatory backlash. Water intake issues can also increase risk.

**Risk Information:** Mitigation of risk to water as a result of forestry operations is one of the primary goals of BMPs. A 2021 report on BMP compliance by the Georgia Forestry Commission indicated a statewide implementation of BMPs overall was 93%. With regard to water-related issues, BMP compliance was 86% for stream crossings and 91% for streamside management zones. Many of the other BMPs, such as fertilization and timber harvesting procedures, have an indirect effect on water quality.

The agencies responsible for BMPs policy development are the Georgia Forestry Commission, the U.S. Environmental Protection Agency and the U.S. Army Corps of Engineers. Georgia has an active program of monitoring compliance to BMPs. Compliance with BMPs, including water-related BMPs, was high. BMPs are implemented to comply with all state and federal regulations to prevent point-source pollution.

| | |
|---|---|
| **Raw Risk Likelihood (RRL)**<br>The risk likelihood is deemed *very low*, therefore the RRL is 2 out of 10. | **Score**<br>**2** |
| **Raw Risk Impact (RRI)**<br>The risk impact is deemed *very low*, therefore the RRI is 2 out of 10. | **Score**<br>**2** |
| **Gross Risk Indicator (GRI)**<br>The Gross Risk Indicator (RRL × RRI) is 4 out of 100. | **Score**<br>**4** |

| **Mitigation/Notching** | **Notch** |
|---|---|
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch × RRI Notch) is NN (No Notch). | **NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score (Total Notch × GRI Score) is 4 out of 100. | **4** |

### *3.9.4 Water Use*

**Rationale:** Biomass feedstock operations can have significant impacts on the hydrological flux (infiltration, groundwater recharge, interception, and transpiration) of ecosystems. This can lead to water shortages, lower yields, and backlash from regulatory bodies if management plans are not properly instituted.

**Risk Information:** Some agricultural crops, fruit trees, nut trees, and forestry species such as eucalyptus can use large amounts of water, impacting the water table. Forestry species in Georgia are not exceptionally large users of water.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed *very low*, therefore the RRL is 2 out of 10. | **2** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed *very low*, therefore the RRI is 2 out of 10. | **2** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL × RRI) is 4 out of 100. | **4** |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch × RRI Notch) is NN (No Notch). | **NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score (Total Notch × GRI Score) is 4 out of 100. | **4** |

### *3.9.5 Pesticide Risk to Human and Ecosystem Health*

**Rationale:** Application of pesticides (i.e., herbicides, fungicides, and insecticides) on agricultural and forest landscapes can result in adverse health effects for humans and ecosystems. If pesticide application is required in feedstock production, the impact must be considered in the BDO Zone rating.

**Risk Information:** Pesticides can be used to control insects in agriculture. For tree species, pesticides are most commonly used in fruit and nut operations. Pesticides are rarely used in timber production. The use of pesticides in timberlands is regulated by the state of Georgia and requires a permit and adherence to Best Management Practices.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed *very low*, therefore the RRL is 2 out of 10. | **2** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed *very low*, therefore the RRI is 2 out of 10. | **2** |
| **Gross Risk Indicator (GRI)** | **Score** |

| | |
|---|---|
| The Gross Risk Indicator (RRL × RRI) is 4 out of 100. | **4** |
| **Mitigation/Notching**<br>*RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch × RRI Notch) is NN (No Notch). | **Notch**<br>**NN** |
| **Loaded RI Score**<br>The Loaded RI Score (Total Notch × GRI Score) is 4 out of 100. | **Score**<br>**4** |

### *3.9.6 Risk to Wildlife and Landscape*

**Rationale:** Biomass production and supply chain operations with negative impacts on wildlife and landscape are at a greater long-term risk of encountering project setbacks and disruptions.

**Risk Information:** Changes to the landscape through forestry operations such as tree planting, forest management, building logging roads, and harvest operations have the potential to disruption landscapes and wildlife habitat.

Forestry in Georgia is practiced according to Best Management Practices (BMPs) prepared by the Environmental Protection Division of the Georgia Department of Natural Resources. These are a set of guidelines that dictate methods to be used in all aspects of forestry operations to protect water and soil quality, minimize impact to wildlife and landscape and to maintain diversity.

Compliance with BMPs is monitored by the Georgia Forestry Commission. In the last available report, state-wide compliance with BMPs was 93%.

| | |
|---|---|
| **Raw Risk Likelihood (RRL)**<br>The risk likelihood is deemed *very low*, therefore the RRL is 2 out of 10. | **Score**<br>**2** |
| **Raw Risk Impact (RRI)**<br>The risk impact is deemed *very low*, therefore the RRI is 2 out of 10. | **Score**<br>**2** |
| **Gross Risk Indicator (GRI)**<br>The Gross Risk Indicator (RRL × RRI) is 4 out of 100. | **Score**<br>**4** |
| **Mitigation/Notching**<br>*RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch × RRI Notch) is NN (No Notch). | **Notch**<br>**NN** |
| **Loaded RI Score**<br>The Loaded RI Score (Total Notch × GRI Score) is 4 out of 100. | **Score**<br>**4** |

### *3.9.7 Biomass Classified as Genetically Modified Organism (GMO)*

**Rationale:** There are various risks associated with GMOs such as migration or dispersion across the landscape, which can generate community backlash and create supply chain risk. GMOs can also be heavily regulated. If planning to grow or procure GMO feedstocks, especially purpose-grown energy crops, it is important to understand the risks.

**Risk Information:** In February 2023 a stand of GMO poplar trees was planted within the Supply Basin, representing the first planting of GMO trees outside a research trial or commercial fruit orchard. These trees are engineered to maximize carbon uptake and for rapid growth, which is beneficial to the health of the forest and support the security of wood fiber for the future biomass projects.

The GMO poplar trees are not a major forestry species for the southeast US and this stand will not reach maturity for approximately 10 years, so the likelihood of this risk occurring for a future biomass project is deemed to be very low.

While public reaction to GMO trees may be negative, there is little likely negative impact to forestry in the Supply Basin. These GMO trees are the first plantings and represent a fraction of a percent of all timberland in the Supply Basin. Any negative reaction to GMO trees will be a positive for non-GMO forestry, so the impact of this risk on future biomass project is deemed to be very low.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed *very low*, therefore the RRL is 2 out of 10. | **2** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed *very low*, therefore the RRI is 2 out of 10. | **2** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL × RRI) is 4 out of 100. | **4** |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch × RRI Notch) is NN (No Notch). | **NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score (Total Notch × GRI Score) is 4 out of 100. | **4** |

## Category 4.0 Feedstock Scale-Up Risk

### *4.1 Risk Factor: Feedstock Scale-Up*

#### *4.1.1 Feedstock Quality at Production Scale*

**Rationale:** The physical and chemical properties of feedstock used in lab, pilot and field testing can fail to be representative of feedstock generated by large-scale operations.

It is important to conduct tests on feedstock representative of that which will be produced by large-scale operations. Failure to adequately test the full range of parameter values can result in severe problems during scale-up.

**Risk Information:** Production, harvesting, transport, and processing of sawmill residues and pulpwood have been well established in the BDO Zone for decades. Consistent production quality is engrained in the system.

Forest residues, while not widely collected, are a by-product of sawtimber and pulpwood harvesting. Forest residue harvest begins with piling the residues at the loading site, a practice already in place. Loading and transporting the forest residues uses established methods and standard logging equipment. If the demand for forest residues increases, it is expected that the existing forest industry has the capability and experience in managing the quality of forest residues delivered to the future biomass projects.

| | |
|---|---|
| **Raw Risk Likelihood (RRL)**<br>The risk likelihood is deemed *very low*, therefore the RRL is 2 out of 10. | **Score**<br>**2** |
| **Raw Risk Impact (RRI)**<br>The risk impact is deemed *very low*, therefore the RRI is 2 out of 10. | **Score**<br>**2** |
| **Gross Risk Indicator (GRI)**<br>The Gross Risk Indicator (RRL × RRI) is 4 out of 100. | **Score**<br>**4** |
| **Mitigation/Notching**<br>*RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch × RRI Notch) is NN (No Notch). | **Notch**<br>**NN** |
| **Loaded RI Score**<br>The Loaded RI Score (Total Notch × GRI Score) is 4 out of 100. | **Score**<br>**4** |

#### *4.1.2 Capacity of Supply Chain Components & Equipment to Scale*

**Rationale:** Scale-up risk increases if supply chain components, or underlying feedstock infrastructure necessary for these components, cannot scale to handle Issuer feedstock requirements and throughput capacity. Capacity to scale should be demonstrated.

**Risk Information:** Forestry supply chains are well-established in the BDO Zone and have been operating at a professional level for decades. Forestry is a top component of the local economy and supported by the local, county and state governments. The components of the supply chain: land base, roads, equipment, labor.

Scale-up to meet the demands of a new project has occurred many times in the BDO Zone. An example of this process is the establishment of a large-scale industrial wood pellet industry, which has grown to be a major component of the BDO Zone economy.

| | |
|---|---|
| **Raw Risk Likelihood (RRL)**<br>The risk likelihood is deemed *very low*, therefore the RRL is 2 out of 10. | **Score**<br>**2** |

| | |
|---|---|
| **Raw Risk Impact (RRI)**<br>The risk impact is deemed *very low*, therefore the RRI is 2 out of 10. | **Score**<br>**2** |
| **Gross Risk Indicator (GRI)**<br>The Gross Risk Indicator (RRL × RRI) is 4 out of 100. | **Score**<br>**4** |
| **Mitigation/Notching**<br>*RRL Mitigation (Notch)*<br>No adjustment.<br>*RRI Mitigation (Notch)*<br>No adjustment.<br>The Total Notch (RRL Notch × RRI Notch) is NN (No Notch). | **Notch**<br>**NN** |
| **Loaded RI Score**<br>The Loaded RI Score (Total Notch × GRI Score) is 4 out of 100. | **Score**<br>**4** |

## CATEGORY 5.0: INFRASTRUCTURE RISKS

### *5.1 Risk Factor: Physical Infrastructure*

#### *5.1.1 Land Parcel*

**Risk Information:** Lyons, a city with population of 4200, is situated in the center of Toombs County, Georgia, and offers multiple commercial land parcels fit for industrial building with access to the vital east/west I-16 corridor and at competitive land pricing. Among these, the Toombs Corporate Center, located on U.S. Hwy. 1 in Lyons, is of particular note. This industrial park presents class A industrial and manufacturing facilities, along with prime building sites ready for development in land sizes of up to 600+ acres.

| | |
|---|---|
| **Raw Risk Likelihood (RRL)**<br>The risk likelihood is deemed *very low*, therefore the RRL is 2 out of 10. | **Score**<br>**2** |
| **Raw Risk Impact (RRI)**<br>The risk impact is deemed *very low*, therefore the RRI is 2 out of 10. | **Score**<br>**2** |
| **Gross Risk Indicator (GRI)**<br>The Gross Risk Indicator (RRL × RRI) is 4 out of 100. | **Score**<br>**4** |
| **Mitigation/Notching**<br>*RRL Mitigation (Notch)*<br>No adjustment.<br>*RRI Mitigation (Notch)*<br>No adjustment.<br>The Total Notch (RRL Notch × RRI Notch) is NN (No Notch). | **Notch**<br>**NN** |
| **Loaded RI Score**<br>The Loaded RI Score (Total Notch × GRI Score) is 4 out of 100. | **Score**<br>**4** |

#### *5.1.2 City Ownership*

**Risk Information:** The county owns the Corporate Center in Lyons. The land in the adjacent areas is privately owned and situated in relatively close proximity to other industrial parks within the county.

| | |
|---|---|
| **Raw Risk Likelihood (RRL)**<br>The risk likelihood is deemed *low*, therefore the RRL is 4 out of 10. | **Score**<br>**4** |

| **Raw Risk Impact (RRI)** | **Score** |
|---|---|
| The risk impact is deemed *low*, therefore the RRI is 4 out of 10. | **4** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL × RRI) is 16 out of 100. | **16** |
| **Mitigation/Notching**<br>*RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch × RRI Notch) is NN (No Notch). | **Notch**<br>**NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score (Total Notch × GRI Score) is 16 out of 100. | **16** |

### *5.1.3 Industrial Land Use Zone*

**Risk Information:** The County has minor zoning ordinance for light industrial purposes. This provides potential investors the opportunity to acquire land anywhere within the county's borders and set up light industrial facilities. The lack of specific zoning permits surrounding the private land adjacent to the Lyons Corporate Center presents a small risk, however, it does allow prospective developers' flexibility to choose sites that cater to unique operational needs. The City of Lyons is open to hearing proposals for heavy industrial projects within designated I-2 sites within Lyons, and is receptive to bio-based project development.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed *low*, therefore the RRL is 4 out of 10. | **4** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed *low*, therefore the RRI is 4 out of 10. | **4** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL × RRI) is 16 out of 100. | **16** |
| **Mitigation/Notching**<br>*RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch × RRI Notch) is NN (No Notch). | **Notch**<br>**NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score (Total Notch × GRI Score) is 16 out of 100. | **16** |

### *5.1.4 Natural Gas Line*

**Risk Information:** Natural gas in Toombs County is provided by Atlanta Gas Light (AGL). Operating within a deregulated framework, AGL allows customers to actively negotiate their gas rates with approved marketers, ensuring competitive pricing structures, which introduces a level of flexibility for commercial clients. Medium-large sized commercial operations can expect fixed rates between $0.70-$0.79/Therm/CCF.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed *low*, therefore the RRL is 4 out of 10. | **4** |

| | |
|---|---|
| **Raw Risk Impact (RRI)**<br>The risk impact is deemed *low*, therefore the RRI is 4 out of 10. | **Score**<br>**4** |
| **Gross Risk Indicator (GRI)**<br>The Gross Risk Indicator (RRL × RRI) is 16 out of 100. | **Score**<br>**16** |
| **Mitigation/Notching**<br>*RRL Mitigation (Notch)*<br>No adjustment.<br>*RRI Mitigation (Notch)*<br>No adjustment.<br>The Total Notch (RRL Notch × RRI Notch) is NN (No Notch). | **Notch**<br>**NN** |
| **Loaded RI Score**<br>The Loaded RI Score (Total Notch × GRI Score) is 16 out of 100. | **Score**<br>**16** |

### *5.1.5 Electrical*

**Risk Information:** Toombs County has its electricity supply network managed by Georgia Power and Altamaha Electric Membership Corporation (EMC). These entities provide both residential and commercial consumers in the county reliable electric services. Their joint endeavors have facilitated growth and continue to meet the rising demand for electricity in the county. Recent estimations at Toombs County Corporate Center place medium-large sized operations between $0.47 cents to $0.55 cents/KWH.

| | |
|---|---|
| **Raw Risk Likelihood (RRL)**<br>The risk likelihood is deemed *low*, therefore the RRL is 4 out of 10. | **Score**<br>**4** |
| **Raw Risk Impact (RRI)**<br>The risk impact is deemed *low*, therefore the RRI is 4 out of 10. | **Score**<br>**4** |
| **Gross Risk Indicator (GRI)**<br>The Gross Risk Indicator (RRL × RRI) is 16 out of 100. | **Score**<br>**16** |
| **Mitigation/Notching**<br>*RRL Mitigation (Notch)*<br>No adjustment.<br>*RRI Mitigation (Notch)*<br>No adjustment.<br>The Total Notch (RRL Notch × RRI Notch) is NN (No Notch). | **Notch**<br>**NN** |
| **Loaded RI Score**<br>The Loaded RI Score (Total Notch × GRI Score) is 16 out of 100. | **Score**<br>**16** |

### *5.1.6 Fresh Water Supply*

**Risk Information:** Toombs County's water infrastructure relies on municipal wells, with storage in a water tower and distribution via an extensive underground network. The Environmental Services Group (ESG) oversees water quality and system maintenance, ensuring continuous supply for Toombs County Corporate Center.

| | |
|---|---|
| **Raw Risk Likelihood (RRL)**<br>The risk likelihood is deemed *very low*, therefore the RRL is 2 out of 10. | **Score**<br>**2** |
| **Raw Risk Impact (RRI)**<br>The risk impact is deemed *very low*, therefore the RRI is 2 out of 10. | **Score**<br>**2** |

| | |
|---|---|
| **Gross Risk Indicator (GRI)**<br>The Gross Risk Indicator (RRL × RRI) is 4 out of 100. | **Score**<br>**4** |
| **Mitigation/Notching**<br>*RRL Mitigation (Notch)*<br>No adjustment.<br>*RRI Mitigation (Notch)*<br>No adjustment.<br>The Total Notch (RRL Notch × RRI Notch) is NN (No Notch). | **Notch**<br>**NN** |
| **Loaded RI Score**<br>The Loaded RI Score (Total Notch × GRI Score) is 4 out of 100. | **Score**<br>**4** |

### *5.1.7 Sewage Disposal Trunk Line*

**Risk Information:** Significant upgrades to the north and east wastewater treatment facilities in Lyons have been approved, integrating a connector main to increase adaptability. This enhancement is expected to boost the North plant's capacity by 250,000 gallons daily, benefiting the Toombs County Corporate Center.

| | |
|---|---|
| **Raw Risk Likelihood (RRL)**<br>The risk likelihood is deemed *very low*, therefore the RRL is 2 out of 10. | **Score**<br>**2** |
| **Raw Risk Impact (RRI)**<br>The risk impact is deemed *very low*, therefore the RRI is 2 out of 10. | **Score**<br>**2** |
| **Gross Risk Indicator (GRI)**<br>The Gross Risk Indicator (RRL × RRI) is 4 out of 100. | **Score**<br>**4** |
| **Mitigation/Notching**<br>*RRL Mitigation (Notch)*<br>No adjustment.<br>*RRI Mitigation (Notch)*<br>No adjustment.<br>The Total Notch (RRL Notch × RRI Notch) is NN (No Notch). | **Notch**<br>**NN** |
| **Loaded RI Score**<br>The Loaded RI Score (Total Notch × GRI Score) is 4 out of 100. | **Score**<br>**4** |

### *5.1.8 Drainage and Stormwater Management*

**Risk Information:** In Lyons, there are modern stormwater and drainage management systems in place. These facilities manage the water quality treatment of runoff, providing both environmental preservation and public health of the region. For the primary runoff basins, large-scale capital improvement costs have approved.

| | |
|---|---|
| **Raw Risk Likelihood (RRL)**<br>The risk likelihood is deemed *low*, therefore the RRL is 4 out of 10. | **Score**<br>**4** |
| **Raw Risk Impact (RRI)**<br>The risk impact is deemed *low*, therefore the RRI is 4 out of 10. | **Score**<br>**4** |
| **Gross Risk Indicator (GRI)**<br>The Gross Risk Indicator (RRL × RRI) is 16 out of 100. | **Score**<br>**16** |

| **Mitigation/Notching** | **Notch** |
|---|---|
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch × RRI Notch) is NN (No Notch). | **NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score (Total Notch × GRI Score) is 16 out of 100. | **16** |

### *5.1.9 Available ICT (Information & Communication Technology) Services*

**Risk Information:** Toombs County's broadband and telecommunications services are provided by multiple companies, including AT&T, ATC, Coastal Fibernet, HUB Electronics, Northland Communications, Pineland Telephone Cooperative, and Vyve Broadband. These corporations offer regionally competitive packages for internet, cloud accessible services, and 5G network cellular coverage for the Toombs County Corporate Center.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed *very low*, therefore the RRL is 2 out of 10. | **4** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed *very low*, therefore the RRI is 2 out of 10. | **4** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL × RRI) is 4 out of 100. | **4** |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch × RRI Notch) is NN (No Notch). | **NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score (Total Notch × GRI Score) is 4 out of 100. | **4** |

### *5.1.10 Infrastructure – Landfill/Alternative Markets for Waste Disposal*

**Risk Information:** Toombs County's Solid Waste Collection Centers are specifically designed to cater to the disposal needs of its residents, offering a no-charge service for residential waste management. Additionally, for businesses and commercial entities, the landfill is equipped to manage and process commercial waste, ensuring that the county's commercial sector is also supported in its waste management requirements.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed *very low*, therefore the RRL is 2 out of 10. | **2** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed *very low*, therefore the RRI is 2 out of 10. | **2** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL × RRI) is 4 out of 100. | **4** |

| **Mitigation/Notching** | **Notch** |
|---|---|
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch × RRI Notch) is NN (No Notch). | **NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score (Total Notch × GRI Score) is 4 out of 100. | **4** |

### *5.2 Risk Factor: Logistics*

#### *5.2.1 Road and Highway Access and Intersection*

**Risk Information:** Toombs County is well located for transportation; it is situated within a 3.5-hour drive of major cities such as Atlanta and Jacksonville. Moreover, cities like Savannah, Augusta, and Macon are less than 90 minutes away. Both I-95 and I-75 are accessible within this 90-minute range. The Corporate Center is strategically located just south of Interstate 16, where it intersects with US Highway 280 (running east-west) and US Highway 1 (running north-south). Both of these US Highways are currently being upgraded to multi-lane roads.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed *very low*, therefore the RRL is 2 out of 10. | **2** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed *very low*, therefore the RRI is 2 out of 10. | **2** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL × RRI) is 4 out of 100. | **4** |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch × RRI Notch) is NN (No Notch). | **NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score (Total Notch × GRI Score) is 4 out of 100. | **4** |

#### *5.2.2 Ocean/River Access*

**Risk Information:** Toombs County benefits from Georgia's coastal ports, especially the Port of Savannah, which plays a pivotal role for businesses in and around Toombs County. As one of the largest container ports in the United States, the Port of Savannah handles millions of twenty-foot equivalent (TEUs) containers annually. Its advanced infrastructure and extensive trade routes provide Toombs County businesses with a significant conduit for international shipping and trade via trucking and rail intermodal services. The port is approximately 86 miles away from the Toombs County Corporate Center.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed *very low*, therefore the RRL is 2 out of 10. | **2** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed *very low*, therefore the RRI is 2 out of 10. | **2** |

| **Gross Risk Indicator (GRI)** | **Score** |
|---|---|
| The Gross Risk Indicator (RRL × RRI) is 4 out of 100. | **4** |
| **Mitigation/Notching**<br>*RRL Mitigation (Notch)*<br>No adjustment.<br>*RRI Mitigation (Notch)*<br>No adjustment.<br>The Total Notch (RRL Notch × RRI Notch) is NN (No Notch). | **Notch**<br>**NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score (Total Notch × GRI Score) is 4 out of 100. | **4** |

### *5.2.3 Railway Service*

**Risk Information:** The Toombs County Corporate Center is located adjacent to the Georgia Central Railway, which interchanges with major Class I railroads: CSX in Savannah and Norfolk Southern. This railway linkage offers direct access to the Port of Savannah, one of the nation's primary ports, facilitating efficient trade operations for the county's businesses. Moreover, connections in Macon and Dublin maintain inland transportation which is conducive to alternative commercial freight (i.e., intermodal, ocean container inland access, etc.).

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed *low*, therefore the RRL is 4 out of 10. | **4** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed *low*, therefore the RRI is 4 out of 10. | **4** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL × RRI) is 16 out of 100. | **16** |
| **Mitigation/Notching**<br>*RRL Mitigation (Notch)*<br>No adjustment.<br>*RRI Mitigation (Notch)*<br>No adjustment.<br>The Total Notch (RRL Notch × RRI Notch) is NN (No Notch). | **Notch**<br>**NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score (Total Notch × GRI Score) is 16 out of 100. | **16** |

### *5.2.4 Accessibility to Airport*

**Risk Information:** The county Vidalia Regional Airport, a Level III airport with a 6,000-foot runway, and is close to major international airports. Mainly used as a regional transportation option for individual travelers, commercial air freight is available from the airport. Savannah/Hilton Head Island International is 66 miles from Toombs Corporate Center.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed *very low*, therefore the RRL is 2 out of 10. | **2** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed *very low*, therefore the RRI is 2 out of 10. | **2** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL × RRI) is 4 out of 100. | **4** |

| **Mitigation/Notching** | **Notch** |
|---|---|
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch × RRI Notch) is NN (No Notch). | **NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score (Total Notch × GRI Score) is 4 out of 100. | **4** |

### *5.3 Risk Factor: Social Infrastructure*

#### *5.3.1 Healthcare Facilities*

**Risk Information:** Vidalia maintains the Memorial Health Meadows Hospital, a 57-bed facility known for its ample amenities and staffing availability. The hospital is equipped with the latest in healthcare technology and offers the expertise of board-certified physicians. It is the main center for healthcare services for the immediate Toombs County region, and is roughly 11 miles from Lyons.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed *very low*, therefore the RRL is 2 out of 10. | **2** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed *very low*, therefore the RRI is 2 out of 10. | **2** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL × RRI) is 4 out of 100. | **4** |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch × RRI Notch) is NN (No Notch). | **NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score (Total Notch × GRI Score) is 4 out of 100. | **4** |

#### *5.3.2 Educational Facilities*

**Risk Information:** Higher education opportunities are available at nearby institutions such as Brewton-Parker College, East Georgia State College, Georgia Southern University, Ogeechee Technical College, and South Georgia State College. Georgia Southern University (GSU), Statesboro, is the closest post-secondary institution to Lyons. Each of these offer comparatively similar distances for travel (between 20-65 miles from Lyons), most of which require on-campus attendance. However, migration to distance education for some degrees/certificates has gained traction post-covid, offering some flexibility for the region.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed *very low*, therefore the RRL is 2 out of 10. | **2** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed *very low*, therefore the RRI is 2 out of 10. | **2** |

| **Gross Risk Indicator (GRI)** | **Score** |
|---|---|
| The Gross Risk Indicator (RRL × RRI) is 4 out of 100. | **4** |
| **Mitigation/Notching**<br>*RRL Mitigation (Notch)*<br>No adjustment.<br>*RRI Mitigation (Notch)*<br>No adjustment.<br>The Total Notch (RRL Notch × RRI Notch) is NN (No Notch). | **Notch**<br>**NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score (Total Notch × GRI Score) is 4 out of 100. | **4** |

### *5.3.3 Transportation Facilities*

**Risk Information:** Lyons' transportation system is focused on both traditional and non-traditional modes. There are publicly accessible buses as well as pedestrian and bicycle facilities, however public transit is not a commonly used mode for the bulk of labor within Lyons with less than 5% of commuters taking it. Most workers (77%) drive alone, 11% carpool, 1% work from home, and 7% walk. The average commute time is 29 minutes, indicating shorter distances compared to the national average.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed *low*, therefore the RRL is 4 out of 10. | **4** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed *low*, therefore the RRI is 4 out of 10. | **4** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL × RRI) is 16 out of 100. | **16** |
| **Mitigation/Notching**<br>*RRL Mitigation (Notch)*<br>No adjustment.<br>*RRI Mitigation (Notch)*<br>No adjustment.<br>The Total Notch (RRL Notch × RRI Notch) is NN (No Notch). | **Notch**<br>**NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score (Total Notch × GRI Score) is 16 out of 100. | **16** |

### *5.3.4 Recreational Facilities*

**Risk Information:** Toombs County offers a wide array of recreational assets. It is home to the Altamaha and Oconee Rivers, providing fishing, hunting, and water sports opportunities. The Vidalia Recreation Department and Lyons Recreation Department offer diverse programs and facilities, including community parks, baseball fields, playgrounds, pavilions, athletic leagues, and swimming programs. New additions include Warmouth Sands, a publicly-owned golf course, and several parks and recreational facilities.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed *very low*, therefore the RRL is 2 out of 10. | **2** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed *very low*, therefore the RRI is 2 out of 10. | **2** |

| | |
|---|---|
| **Gross Risk Indicator (GRI)**<br>The Gross Risk Indicator (RRL × RRI) is 4 out of 100. | **Score**<br>**4** |
| **Mitigation/Notching**<br>*RRL Mitigation (Notch)*<br>No adjustment.<br>*RRI Mitigation (Notch)*<br>No adjustment.<br>The Total Notch (RRL Notch × RRI Notch) is NN (No Notch). | **Notch**<br>**NN** |
| **Loaded RI Score**<br>The Loaded RI Score (Total Notch × GRI Score) is 4 out of 100. | **Score**<br>**4** |

### *5.3.5 Cultural Facilities*

**Risk Information:** Toombs County maintains multiple noteworthy cultural facilities. Two primary cultural landmarks: The Altama Museum of Art and History, which is centrally located in Vidalia, presents a collection that includes art pieces and historical artifacts; and the Ladson Genealogical Library, renowned for its comprehensive genealogical collection.

| | |
|---|---|
| **Raw Risk Likelihood (RRL)**<br>The risk likelihood is deemed *low*, therefore the RRL is 4 out of 10. | **Score**<br>**4** |
| **Raw Risk Impact (RRI)**<br>The risk impact is deemed *low*, therefore the RRI is 4 out of 10. | **Score**<br>**4** |
| **Gross Risk Indicator (GRI)**<br>The Gross Risk Indicator (RRL × RRI) is 16 out of 100. | **Score**<br>**16** |
| **Mitigation/Notching**<br>*RRL Mitigation (Notch)*<br>No adjustment.<br>*RRI Mitigation (Notch)*<br>No adjustment.<br>The Total Notch (RRL Notch × RRI Notch) is NN (No Notch). | **Notch**<br>**NN** |
| **Loaded RI Score**<br>The Loaded RI Score (Total Notch × GRI Score) is 16 out of 100. | **Score**<br>**16** |

### *5.3.6 Public Safety Facilities*

**Risk Information:** Toombs County's fire protection is provided by the Lyons Fire Department, the Vidalia Fire Department, and the Toombs County Fire Department, while police protection is offered by the Lyons Police Department, the Vidalia Police Department, and the Toombs County Sheriff's Department. Notable infrastructure projects for the region include the $40 million Toombs County Courthouse and Jail Expansion Project.

| | |
|---|---|
| **Raw Risk Likelihood (RRL)**<br>The risk likelihood is deemed *low*, therefore the RRL is 4 out of 10. | **Score**<br>**4** |
| **Raw Risk Impact (RRI)**<br>The risk impact is deemed *low*, therefore the RRI is 4 out of 10. | **Score**<br>**4** |
| **Gross Risk Indicator (GRI)**<br>The Gross Risk Indicator (RRL × RRI) is 16 out of 100. | **Score**<br>**16** |

| **Mitigation/Notching** | **Notch** |
|---|---|
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch × RRI Notch) is NN (No Notch). | **NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score (Total Notch × GRI Score) is 16 out of 100. | **16** |

### *5.3.7 Housing*

**Risk Information:** Toombs County, including Lyons, Vidalia, and others cities, has a total of 12,110 units, with a population of roughly 27,030 as of the 2020 census data. Out of the occupied units, owner-occupied properties account for 56%, while the balance of 44% is rented. Currently, 58% of these homes are financed through mortgages, with the median value of mortgaged homes standing at $150,800. On average, residents of Lyons can expect monthly housing costs of approximately $616, while comparatively the city of Vidalia has monthly housing costs of $713 per month.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed *low*, therefore the RRL is 4 out of 10. | **4** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed *low*, therefore the RRI is 4 out of 10. | **4** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL × RRI) is 16 out of 100. | **16** |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch × RRI Notch) is NN (No Notch). | **NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score (Total Notch × GRI Score) is 16 out of 100. | **16** |

## *5.4 Risk Factor: Workforce and Permitting*

### *5.4.1 Labor Availability*

**Risk Information:** Toombs County statistics indicate a labor force of 12,257 with a 4.9% unemployment rate. Roughly 4,000 individuals commute for work in the county. According to the Georgia Department of Labor, the Toombs County general employment area covers eight counties and has an unemployment rate of 4.6%. The region has access to a skilled, diverse, non-union labor force with relatively high productivity. The local Toombs County workforce does make minor commutes for employment, generally these are in the radius of 20-40 miles from where they live.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed *low*, therefore the RRL is 4 out of 10. | **4** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed *low*, therefore the RRI is 4 out of 10. | **4** |

| **Gross Risk Indicator (GRI)** | **Score** |
|---|---|
| The Gross Risk Indicator (RRL × RRI) is 16 out of 100. | **16** |
| **Mitigation/Notching**<br>*RRL Mitigation (Notch)*<br>No adjustment.<br>*RRI Mitigation (Notch)*<br>No adjustment.<br>The Total Notch (RRL Notch × RRI Notch) is NN (No Notch). | **Notch**<br>**NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score (Total Notch × GRI Score) is 16 out of 100. | **16** |

### *5.4.2 Labor Cost*

**Risk Information:** Toombs County's labor force has a median age of 39.3 with females making up 52%. About 94% are US-born. The average household income is $53,501, with a median of $32,920. Residents aged 25-44 earn an average of $68,289, while those 45-64 make around $32,845. Incomes decrease for those under 25 and over 65, earning $23,527 and $31,875, respectively. Roughly 45% of residents have a high school degree, 18% possess a college certificate, and 5% have a bachelor's degree. Comparatively, this is on par with cities in Toombs County like Vidalia with median individual income of $36,877 and average household income of $47,850. However, it is slightly below the national median income of $60,900.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed *low*, therefore the RRL is 4 out of 10. | **4** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed *low*, therefore the RRI is 4 out of 10. | **4** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL × RRI) is 16 out of 100. | **16** |
| **Mitigation/Notching**<br>*RRL Mitigation (Notch)*<br>No adjustment.<br>*RRI Mitigation (Notch)*<br>No adjustment.<br>The Total Notch (RRL Notch × RRI Notch) is NN (No Notch). | **Notch**<br>**NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score (Total Notch × GRI Score) is 16 out of 100. | **16** |

### *5.4.3 Training Programs/Community College*

**Risk Information:** The county is served by Southeastern Technical College (STC) located in Vidalia, which offers a variety of educational opportunities and workforce training including Georgia QuickStart job training services specialized courses, and basic research for local industries. Workforce training to eligible Georgia businesses includes training in classrooms, mobile labs, or directly at the plant site.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed *very low*, therefore the RRL is 2 out of 10. | **2** |

| | |
|---|---|
| **Raw Risk Impact (RRI)**<br>The risk impact is deemed *very low*, therefore the RRI is 2 out of 10. | **Score**<br>**2** |
| **Gross Risk Indicator (GRI)**<br>The Gross Risk Indicator (RRL × RRI) is 4 out of 100. | **Score**<br>**4** |
| **Mitigation/Notching**<br>*RRL Mitigation (Notch)*<br>No adjustment.<br>*RRI Mitigation (Notch)*<br>No adjustment.<br>The Total Notch (RRL Notch × RRI Notch) is NN (No Notch). | **Notch**<br>**NN** |
| **Loaded RI Score**<br>The Loaded RI Score (Total Notch × GRI Score) is 4 out of 100. | **Score**<br>**4** |

### *5.4.4 Permit Process*

**Risk Information:** The commercial development process typically starts with an application to the planning department, taking a few weeks for review. The application's approval, which includes site plans, may take 2-3 months, alongside securing specific permits which may also add another 1-2 months. Through application to obtaining a certificate of occupancy, permitting and commercial development approvals is straightforward for the region. This process roughly encompasses 6-12 months, which is comparatively higher than other counties nationally, which take on average 6-9 months for similar site development approvals.

| | |
|---|---|
| **Raw Risk Likelihood (RRL)**<br>The risk likelihood is deemed *low*, therefore the RRL is 4 out of 10. | **Score**<br>**4** |
| **Raw Risk Impact (RRI)**<br>The risk impact is deemed *low*, therefore the RRI is 4 out of 10. | **Score**<br>**4** |
| **Gross Risk Indicator (GRI)**<br>The Gross Risk Indicator (RRL × RRI) is 16 out of 100. | **Score**<br>**16** |
| **Mitigation/Notching**<br>*RRL Mitigation (Notch)*<br>No adjustment.<br>*RRI Mitigation (Notch)*<br>No adjustment.<br>The Total Notch (RRL Notch × RRI Notch) is NN (No Notch). | **Notch**<br>**NN** |
| **Loaded RI Score**<br>The Loaded RI Score (Total Notch × GRI Score) is 16 out of 100. | **Score**<br>**16** |

# APPENDIX C: TABLES AND FIGURES

Additional supporting materials that describe the wood supply in the Supply Basin are given below. These are provided to give more detail than the data in Appendix A.

Table C-1 lists the all the counties that are either fully contained by, or touch, the Supply Basin and Competition Zone. For those counties that are not fully contained the percent overlap is given. Note that there are several counties with very small degrees of overlap.

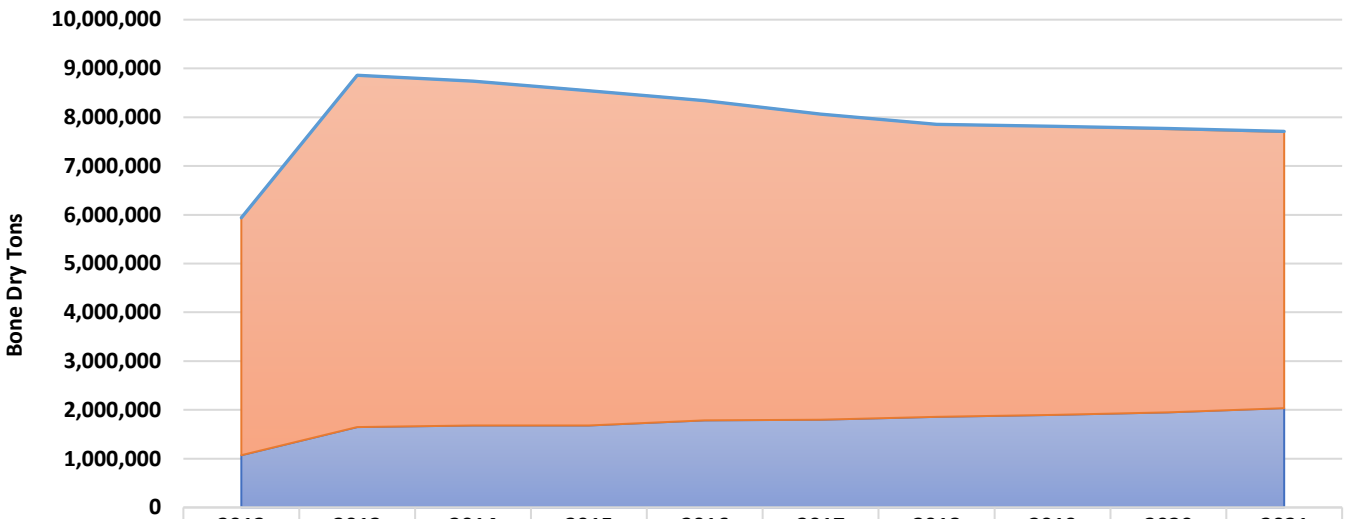
**Table C-1: Counties in Supply Basin and Competition Zone with Percent Overlap**

| State | County | Supply Basin | Competition Zone | State | County | Supply Basin | Competition Zone |
|---|---|---|---|---|---|---|---|
| GA | Appling | 100% | 100% | GA | Morgan | | 100% |
| GA | Atkinson | 7% | 100% | GA | Newton | | 78% |
| GA | Bacon | 100% | 100% | GA | Oconee | | 77% |
| GA | Baker | | 11% | GA | Oglethorpe | | 94% |
| GA | Baldwin | | 100% | GA | Peach | | 100% |
| GA | Ben Hill | 50% | 100% | GA | Pierce | 80% | 100% |
| GA | Berrien | | 100% | GA | Pike | | 66% |
| GA | Bibb | | 100% | GA | Pulaski | 19% | 100% |
| GA | Bleckley | 75% | 100% | GA | Putnam | | 100% |
| GA | Brantley | <1% | 100% | GA | Randolph | | <1% |
| GA | Brooks | | 95% | GA | Richmond | | 100% |
| GA | Bryan | 81% | 91% | GA | Schley | | 100% |
| GA | Bulloch | 100% | 100% | GA | Screven | 84% | 100% |
| GA | Burke | 70% | 100% | GA | Spalding | | 70% |
| GA | Butts | | 100% | GA | Sumter | | 100% |
| GA | Calhoun | | <1% | GA | Talbot | | 42% |
| GA | Camden | | 76% | GA | Taliaferro | | 100% |
| GA | Candler | 100% | 100% | GA | Tattnall | 100% | 100% |
| GA | Charlton | | 100% | GA | Taylor | | 100% |
| GA | Chatham | 27% | 63% | GA | Telfair | 100% | 100% |
| GA | Chattahoochee | | <1% | GA | Terrell | | 90% |
| GA | Clarke | | 43% | GA | Thomas | | 40% |
| GA | Clinch | | 100% | GA | Tift | | 100% |
| GA | Coffee | 88% | 100% | GA | Toombs | 100% | 100% |
| GA | Colquitt | | 100% | GA | Treutlen | 100% | 100% |
| GA | Columbia | | 100% | GA | Turner | | 100% |
| GA | Cook | | 100% | GA | Twiggs | 19% | 100% |
| GA | Crawford | | 100% | GA | Upson | | 86% |
| GA | Crisp | | 100% | GA | Walton | | 28% |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| GA | Dodge | 98% | 100% | GA | Ware | 16% | 100% |
| GA | Dooly | | 100% | GA | Warren | | 100% |
| GA | Dougherty | | 92% | GA | Washington | 71% | 100% |
| GA | Echols | | 100% | GA | Wayne | 71% | 100% |
| GA | Effingham | 77% | 100% | GA | Webster | | 69% |
| GA | Elbert | | 44% | GA | Wheeler | 100% | 100% |
| GA | Emanuel | 100% | 100% | GA | Wilcox | 32% | 100% |
| GA | Evans | 100% | 100% | GA | Wilkes | 92% | 100% |
| GA | Glascock | 2% | 100% | GA | Wilkinson | 49% | 100% |
| GA | Glynn | | 83% | GA | Worth | | 100% |
| GA | Grady | | 1% | SC | Abbeville | | 27% |
| GA | Greene | | 100% | SC | Aiken | | 100% |
| GA | Hancock | | 100% | SC | Allendale | | 100% |
| GA | Henry | | 47% | SC | Bamberg | | 100% |
| GA | Houston | | 100% | SC | Barnwell | | 100% |
| GA | Irwin | 13% | 100% | SC | Beaufort | | 54% |
| GA | Jasper | | 100% | SC | Calhoun | | 38% |
| GA | Jeff Davis | 100% | 100% | SC | Charleston | | 6% |
| GA | Jefferson | 84% | 100% | SC | Colleton | | 90% |
| GA | Jenkins | 100% | 100% | SC | Dorchester | | 35% |
| GA | Johnson | 100% | 100% | SC | Edgefield | | 100% |
| GA | Jones | | 100% | SC | Greenwood | | 58% |
| GA | Lamar | | 100% | SC | Hampton | | 100% |
| GA | Lanier | | 100% | SC | Jasper | | 92% |
| GA | Laurens | 100% | 100% | SC | Lexington | | 55% |
| GA | Lee | | 100% | SC | McCormick | | 100% |
| GA | Liberty | 72% | 81% | SC | Newberry | | <1% |
| GA | Lincoln | | 100% | SC | Orangeburg | | 76% |
| GA | Long | | 100% | SC | Saluda | | 94% |
| GA | Lowndes | | 100% | FL | Baker | | 51% |
| GA | Macon | | 100% | FL | Columbia | | 25% |
| GA | Madison | | 2% | FL | Duval | | 33% |
| GA | Marion | | 82% | FL | Hamilton | | 88% |
| GA | McDuffie | | 100% | FL | Jefferson | | <1% |
| GA | McIntosh | 12% | 62% | FL | Madison | | 24% |
| GA | Mitchell | | 60% | FL | Nassau | | 95% |
| GA | Monroe | | 100% | FL | Suwannee | | 2% |
| GA | Montgomery | 100% | 100% | | | | |

Figure C-1 provides net growth of pulpwood data between 2012 and 2021 broken out by softwood and hardwood species.

**Figure C-1: Pulpwood - Average Annual Net Growth in Supply Basin**

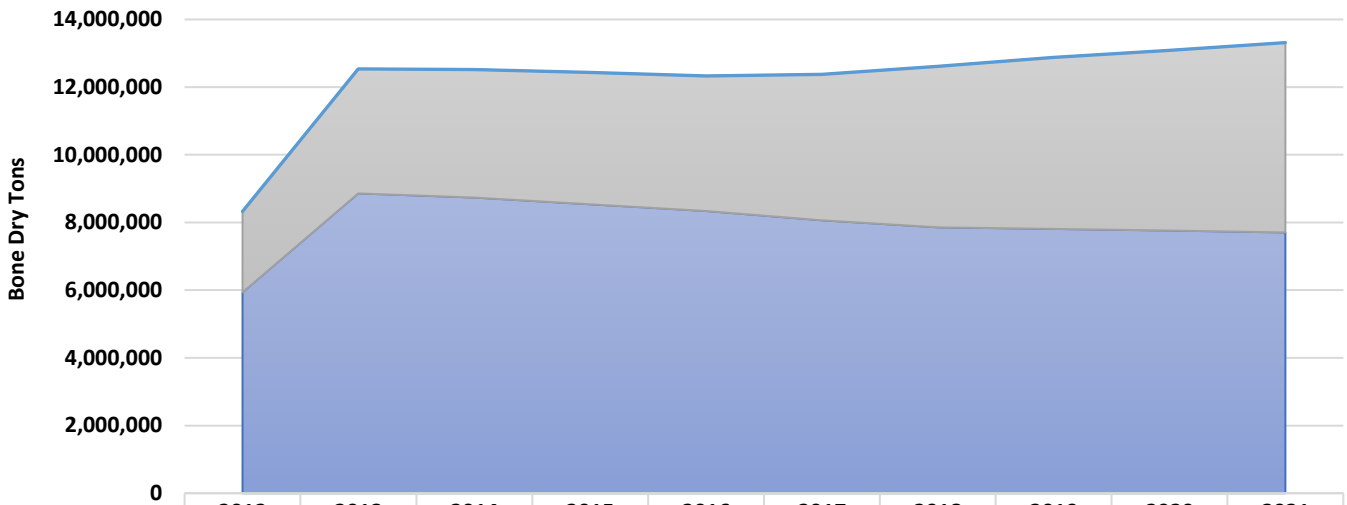



| | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 |
|---|---|---|---|---|---|---|---|---|---|---|
| Softwood | 4,867,492 | 7,216,035 | 7,062,668 | 6,861,420 | 6,551,735 | 6,266,081 | 5,996,459 | 5,912,229 | 5,806,085 | 5,660,664 |
| Hardwood | 1,070,545 | 1,644,264 | 1,677,730 | 1,678,303 | 1,785,192 | 1,800,399 | 1,860,387 | 1,899,701 | 1,951,882 | 2,037,574 |
| Total pulpwood | 5,938,037 | 8,860,299 | 8,740,398 | 8,539,723 | 8,336,927 | 8,066,481 | 7,856,845 | 7,811,930 | 7,766,427 | 7,707,411 |

- Since 2013 average pulpwood annual net growth for total pulpwood is about 8.2 million bdt
- Annual growth of all pulpwood decreased by 14% between 2013 and 2021
- Annual growth of softwood pulpwood decreased by 22% between 2013 and 2021
- Annual growth of hardwood pulpwood increased by 24% between 2013 and 2021
- 78% of pulpwood is softwood
- 22% of pulpwood is hardwood

Figure C-2 provides trends in annual average net growth in the Supply Basin for all timber types.

**Figure C-2: Total Wood Supply - Average Annual Net Growth in Supply Basin**

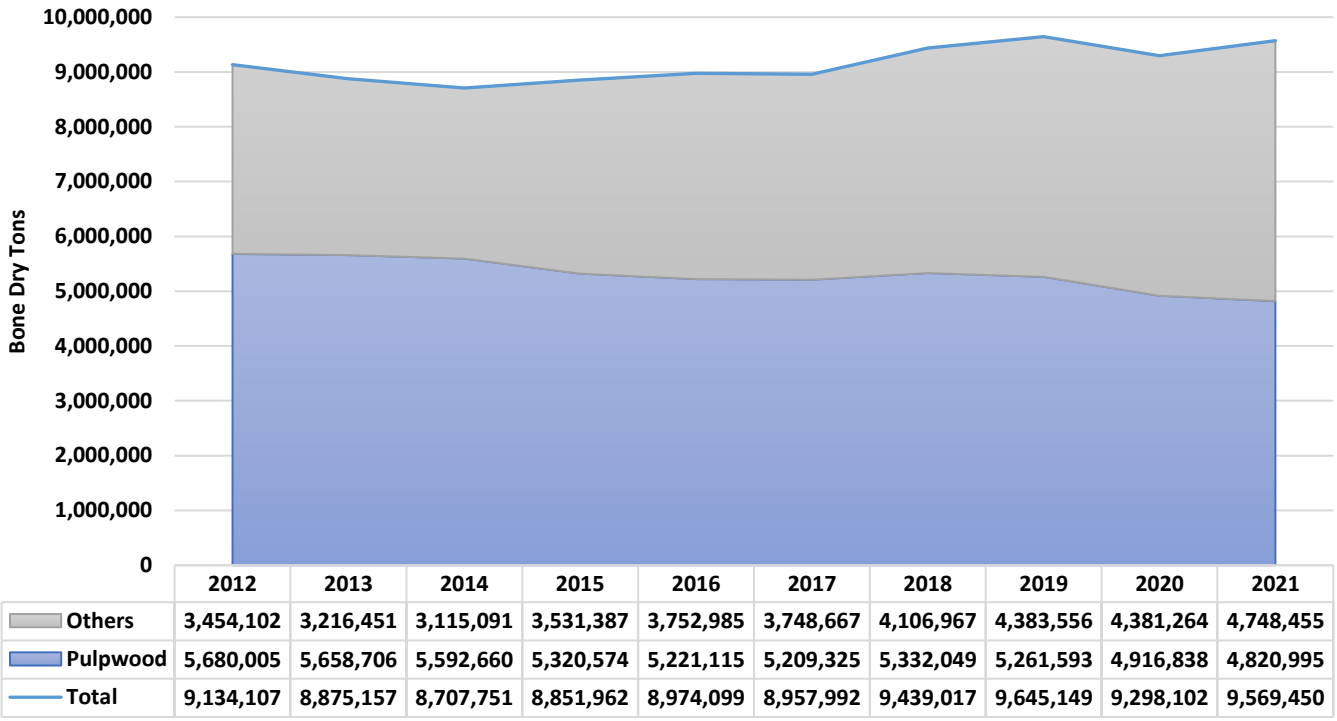



| | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 |
|---|---|---|---|---|---|---|---|---|---|---|
| Others | 2,389,759 | 3,680,528 | 3,782,149 | 3,898,365 | 3,994,211 | 4,307,706 | 4,759,091 | 5,066,761 | 5,316,521 | 5,607,852 |
| Pulpwood | 5,938,037 | 8,860,299 | 8,740,398 | 8,539,723 | 8,336,927 | 8,066,481 | 7,856,845 | 7,811,930 | 7,766,427 | 7,707,411 |
| Total | 8,327,795 | 12,540,82 | 12,522,54 | 12,438,08 | 12,331,13 | 12,374,18 | 12,615,93 | 12,878,69 | 13,082,94 | 13,315,26 |

- Since 2013 pulpwood accounts for the majority of total timber production
- In 2013, 71% of total timber production was pulpwood
- This proportion has steadily declined to 56% by 2021
- Total timber production between 2016 and 2021 increased by approximately 1.6 million dry tons
- Since 2013, the proportion of pulpwood is declining slightly while the proportion of other timber types have increased

Figure C-3 provides trends in annual average harvest removals in the Supply Basin for all timber types. These data include pulpwood and sawtimber.

**Figure C-3: Total Wood Supply - Average Annual Harvest Removals in Supply Basin**

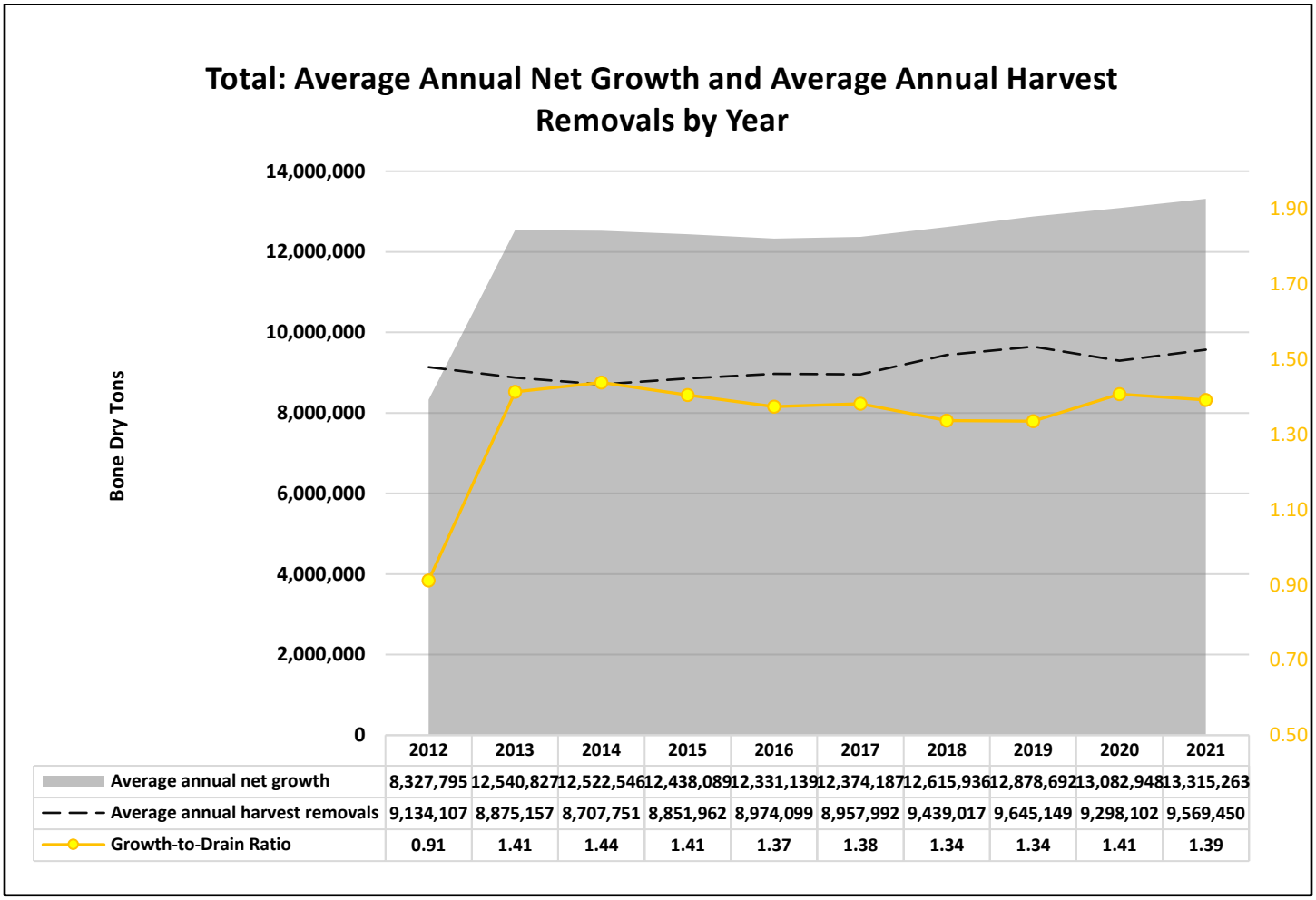



| | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 |
|---|---|---|---|---|---|---|---|---|---|---|
| Others | 3,454,102 | 3,216,451 | 3,115,091 | 3,531,387 | 3,752,985 | 3,748,667 | 4,106,967 | 4,383,556 | 4,381,264 | 4,748,455 |
| Pulpwood | 5,680,005 | 5,658,706 | 5,592,660 | 5,320,574 | 5,221,115 | 5,209,325 | 5,332,049 | 5,261,593 | 4,916,838 | 4,820,995 |
| Total | 9,134,107 | 8,875,157 | 8,707,751 | 8,851,962 | 8,974,099 | 8,957,992 | 9,439,017 | 9,645,149 | 9,298,102 | 9,569,450 |

- Pulpwood harvests have declined while other timber harvest have increased
- There is an increase in total harvest of 694,000 dry tones annually since 2013

Figure C-4 provides trends in annual average net growth and average harvest removals in the Supply Basin for all timber types. These data include pulpwood and sawtimber. In addition, this figure also provides the ratio of growth to harvest, also known as growth-to-drain ratio.

**Figure C-4: Total Wood: Average Annual Net Growth and Harvest Removals in Supply Basin**

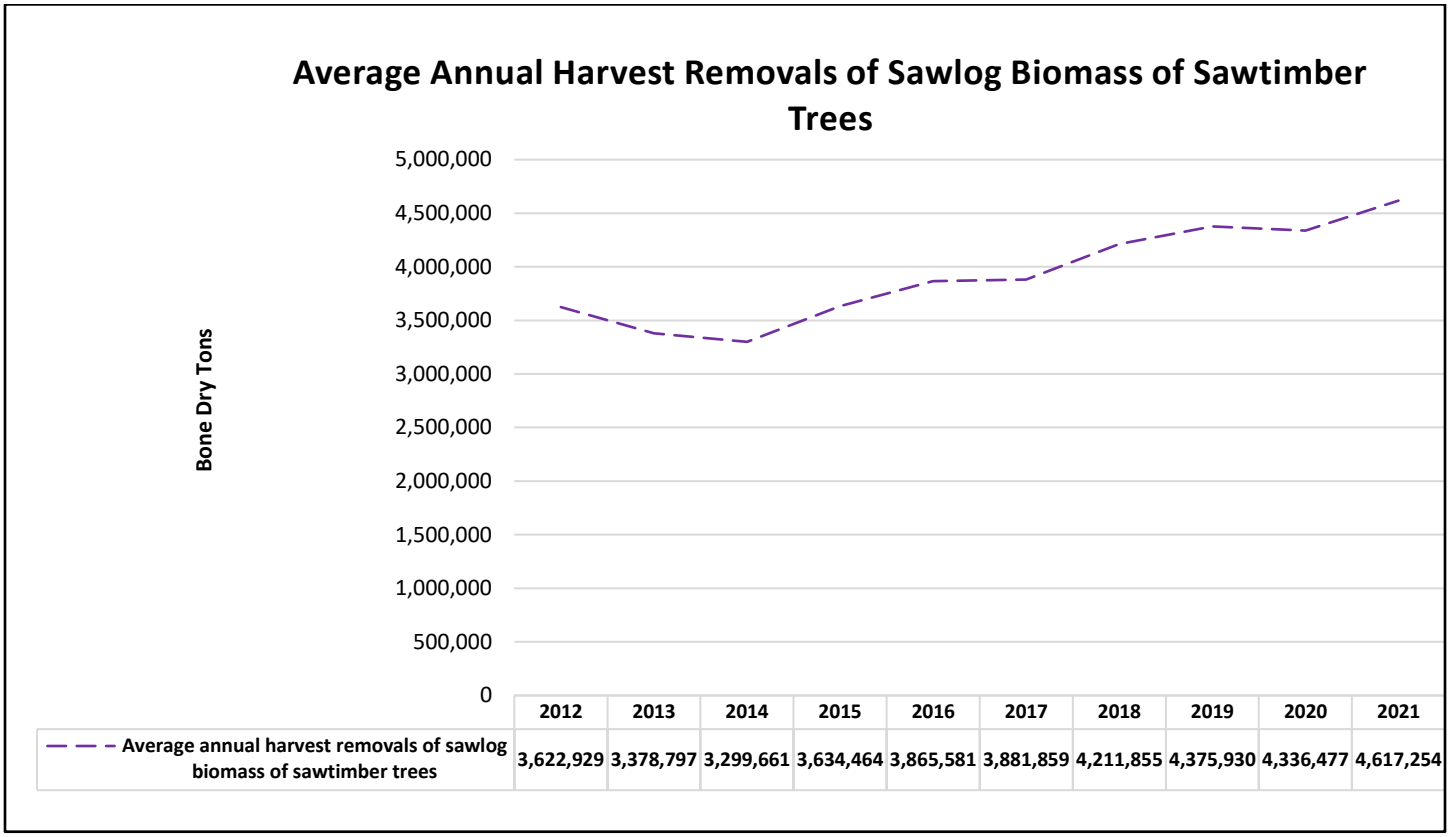



| | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 |
|---|---|---|---|---|---|---|---|---|---|---|
| Average annual net growth | 8,327,795 | 12,540,827 | 12,522,546 | 12,438,089 | 12,331,139 | 12,374,187 | 12,615,936 | 12,878,692 | 13,082,948 | 13,315,263 |
| Average annual harvest removals | 9,134,107 | 8,875,157 | 8,707,751 | 8,851,962 | 8,974,099 | 8,957,992 | 9,439,017 | 9,645,149 | 9,298,102 | 9,569,450 |
| Growth-to-Drain Ratio | 0.91 | 1.41 | 1.44 | 1.41 | 1.37 | 1.38 | 1.34 | 1.34 | 1.41 | 1.39 |

- The growth-to-drain ratio for total wood in the supply basin has been consistent since 2013 averaging about 1.39
- Total wood removals decreased slightly between 2013 and 2016
- Total wood removals have increased steadily since 2017
- Excess total wood in the Supply Basin averaged approximately 3.5 million bdt annually between 2013 and 2021

The health of the sawtimber industry in the BDO Zone is indicated by harvest removals as shown in Figure C-5. The steady increase in harvesting sawtimber since 2014 is indicative of strong demand for this product. Note that increased processing of sawtimber into dimensional lumber will also result in increased volume of sawmill residues.

**Figure C-5: Sawtimber - Average Annual Harvest Removals in Supply Basin**



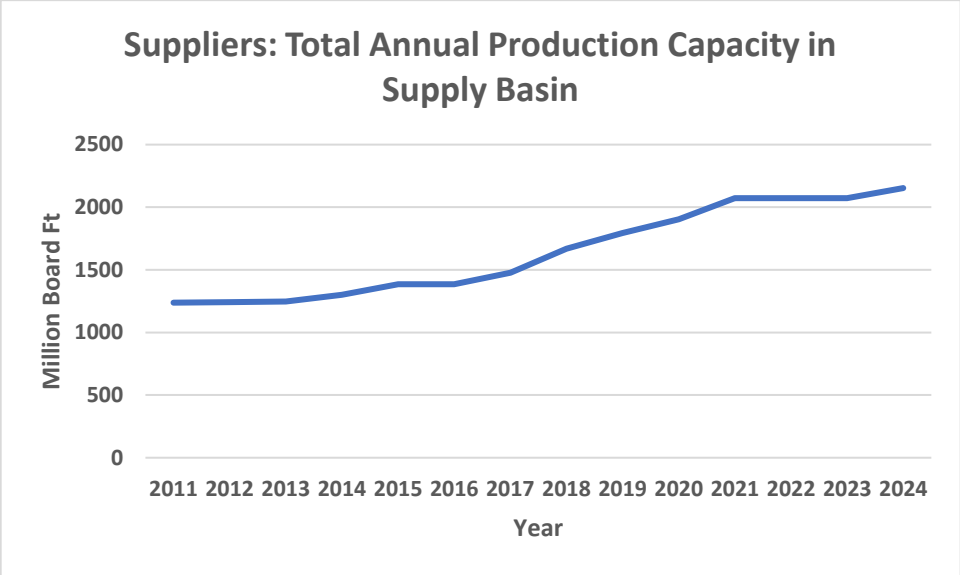

| | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 |
|---|---|---|---|---|---|---|---|---|---|---|
| Average annual harvest removals of sawlog biomass of sawtimber trees | 3,622,929 | 3,378,797 | 3,299,661 | 3,634,464 | 3,865,581 | 3,881,859 | 4,211,855 | 4,375,930 | 4,336,477 | 4,617,254 |

- Between 2014 and 2021 there has been a steady increase of sawlog removals indicating an increasing demand for high-value wood
- The increase in sawtimber removals over this period is approximately 40%
- This increase in sawtimber removals parallels an increase in housing starts in the US South[21]
- A proportional increase in sawmill residue generation would be expected

The productivity of suppliers in the supply basin (Figure C-6) closely follows the removals of sawtimber (Figure C-5) especially from 2014 onward. Part of this general increase is due to the addition of two suppliers since 2017 (Figure C-7).

[21] https://www.census.gov/construction/nrc/historical_data/index.html

**Figure C-6: Suppliers - Total Annual Production in Supply Basin**




- Sawmill production capacity has increased about 60% in the past decade

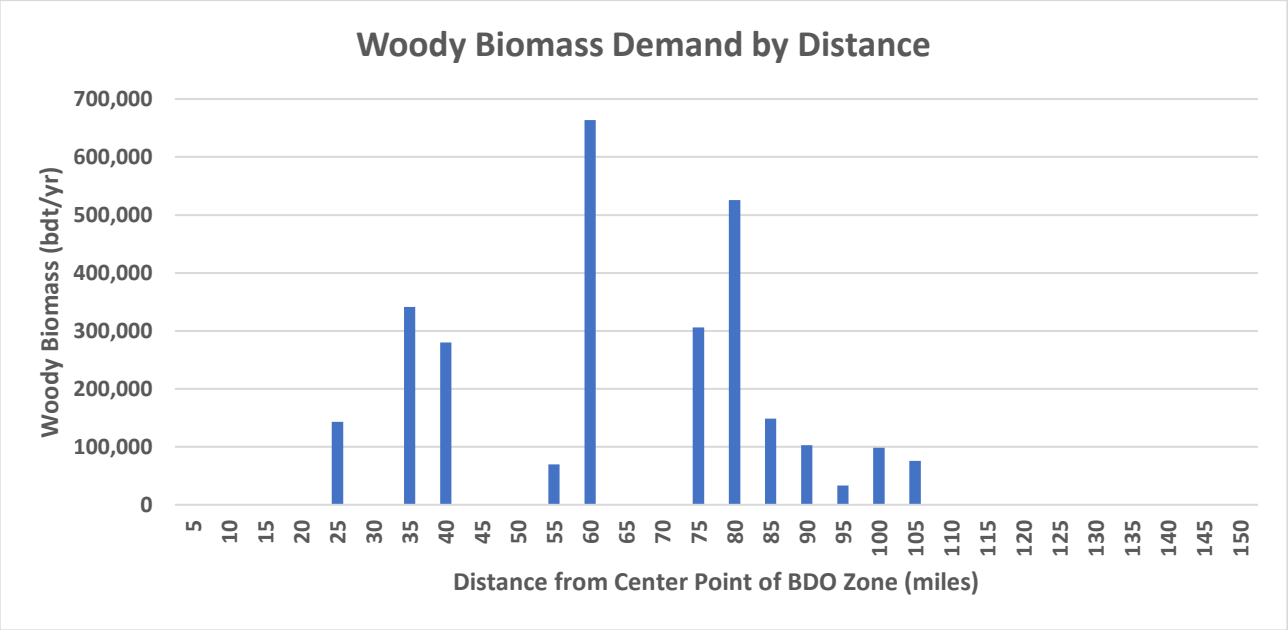
**Figure C-7: Suppliers - Number of Suppliers in Supply Basin**




- A net gain of two suppliers occurred since 2017

Based on the number of competitors, their location and their demand for woody biomass the impact of this competition can be determined. Figure C-8 shows the competitive demand for woody biomass as a function of distance from the BDO Zone center point. Table C-2 breaks down the competition biomass demand by industry.

**Figure C-8: Competitors in the Competition Zone. Use of Woody Biomass by Distance from Center Point.**




- There are three major peaks of biomass demand: 35-40 mi, 60 mi, and 75-80 mi

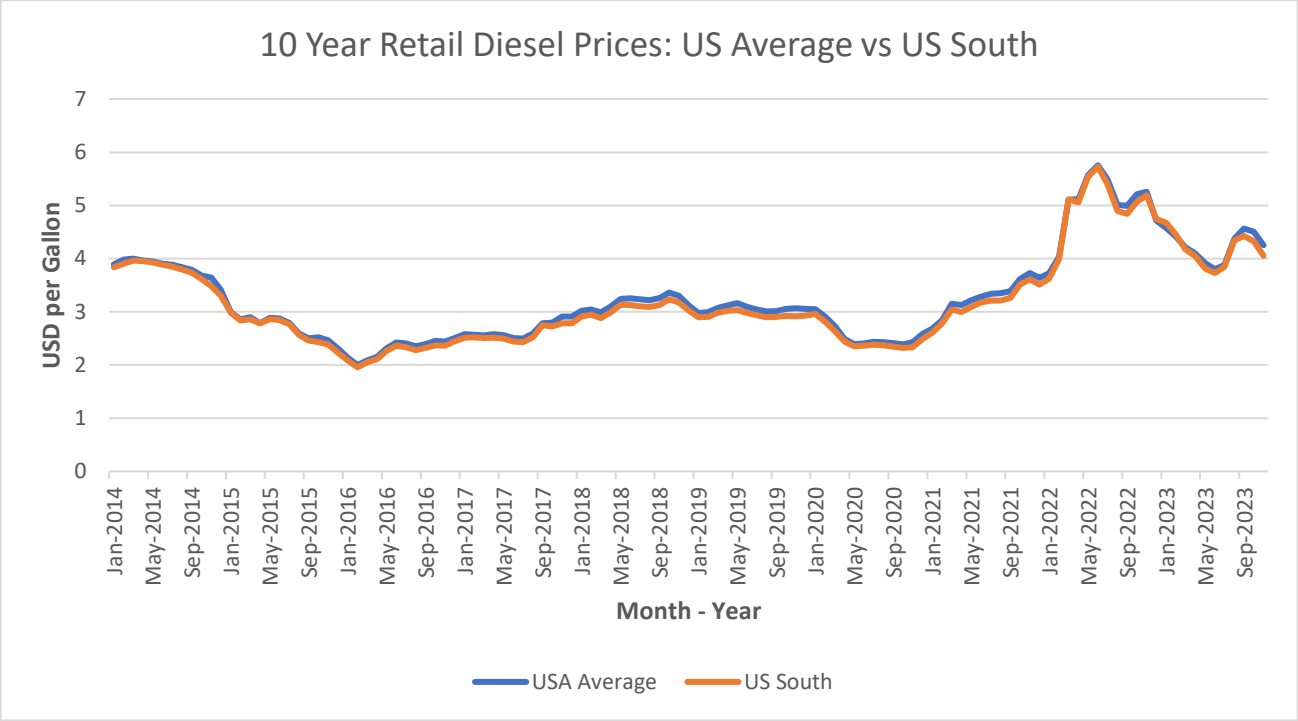
**Table C-2: Impact of Competition on Woody Biomass Supply by Industry.**

| Industry | Impact | Percent of Impact |
|---|---|---|
| Pulp & Paper | 1,323,674 | 0.47 |
| Pellet | 948,207 | 0.34 |
| OSB/MDF | 91,013 | 0.03 |
| Biomass Energy | 425,452 | 0.15 |
| Total | 2,788,346 | |

- The pulp and paper industry is the largest competitor accounting for 47% of biomass demand
- The pellet industry is the second largest competitor accounting for 34% of biomass demand

Diesel price trends for the past decade are shown in Figure C-9. The trends for both the US South region and the US national average are presented.

**Figure C-9: 10 yr Retail Price Diesel US South[22]**

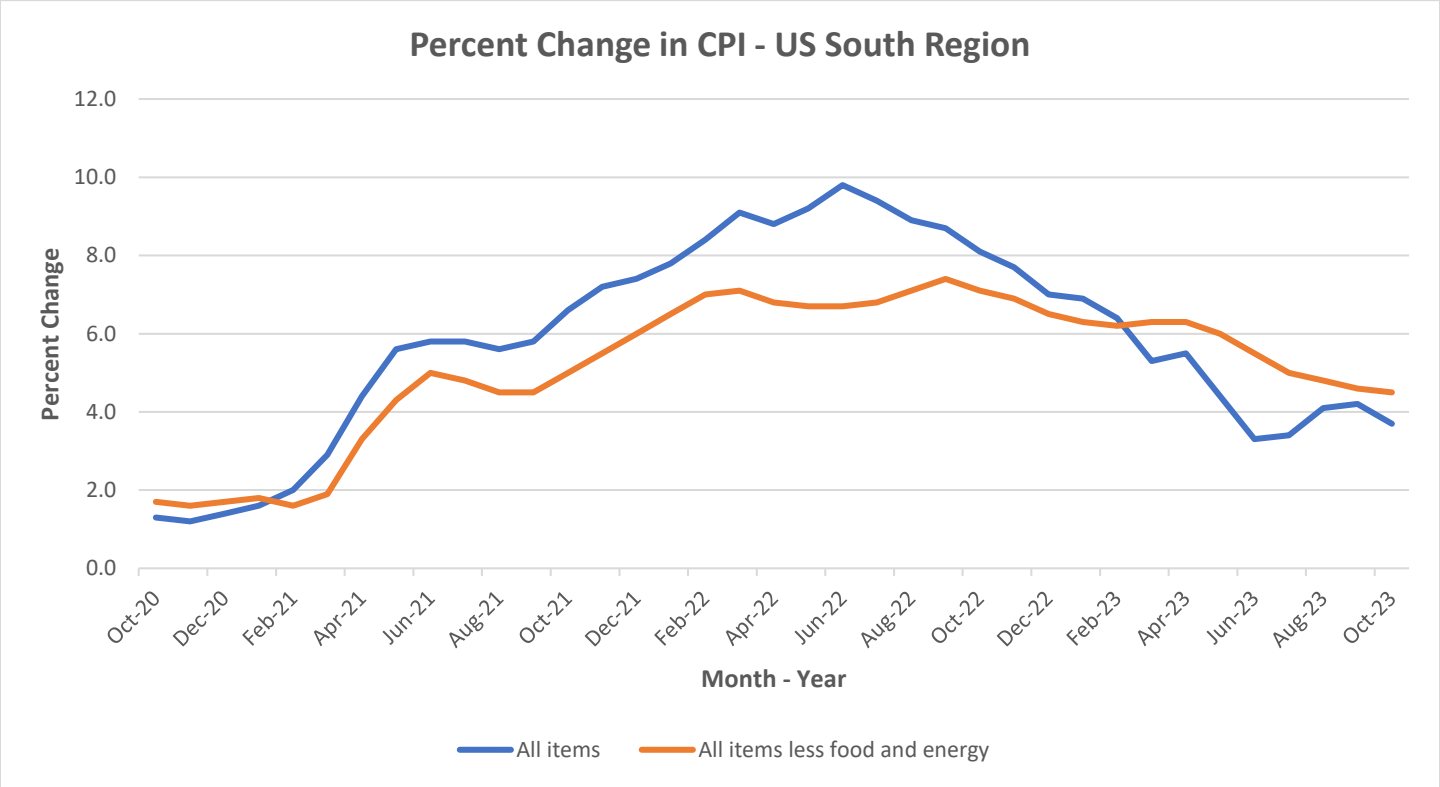



- Retail diesel prices for the US South track very closely to the national average
- US South retail diesel prices ranged from $1.96/gal to 5.73/gal over the past 10 years

Consumer Price Index (CPI) for the past three years for the US South Region is presented in Figure C-10.

[22] US Energy Information Administration. https://www.eia.gov/ Accessed Nov 29, 2023.

**Figure C-10: Consumer Price Index – Georgia, South Region[23]**




- The rate of inflation increased between Oct 2020 to Jun 2022
- Inflation has been steadily falling from Jun 2022 to the present

[23] US Bureau of Labor Statistics. https://www.bls.gov/. Accessed Nov 29, 2023.

# APPENDIX D: ADDITIONAL INFRASTRUCTURE INFORMATION

## LOCATION

Toombs Corporate Center (TCC) has a central position located in the Northern quadrant of Lyons, Georgia. Lyons acts as the hub for several development and infrastructure projects. The county has primary highway networks akin to other comparative counties in Georgia. Lyons is experiencing a multitude of commercial construction and infrastructure improvement projects, notably the downtown Lyons parking initiative and the resurfacing endeavors in the Lakeview subdivision. This underscores the county's commitment to accessibility and ease of mobility for its residents and businesses.

The water system improvements at TCC, the rehabilitation of the sewer and water systems on Roosevelt Street, and the upgrading of the Peters Street Lift Station highlight Lyons Toombs County's forward-thinking approach and commitment to local development.

## POPULATION

Lyons exhibits a unique demographic, compared to other southern state counties. Population figures for the region show over 4,100+ locals, with a surplus of rental units and regional housing accommodating residents. Multiple development projects like the water system improvements and the resurfacing project in the Lakeview subdivision demonstrate a stable populace for the near future. The demographic composition of Lyons has a median age of 39 with females making up 52%. In Toombs County, the housing landscape comprises 1,545 households with an average of three members each. Notably, families constitute 57% of these households, while non-family units make up the remaining 43%. A closer look reveals that 25% of these households are home to children. This data provides a comprehensive understanding of the residential dynamics within the area.

## EMPLOYMENT

As of the most recent data, Lyons showcases a growing number of employment opportunities, as the increasing number of local infrastructure improvement projects indicates strong employment prospects in construction, civil engineering, and related sectors. The inclusion of new projects, such as the parking area in downtown Lyons and the water and sewage/wastewater upgrades, highlights the region's commitment to progress and an increase in employment opportunities for its residents. Toombs County workforce numbers and unemployment rates are encouraging - an overall unemployment rate of 4.6%, and an average household income of $53,501. Labor demographics highlight that office-based workers make up 53% of the working population in the region, while on-site employees account for 47%. A steady stream of projects and improvements reflects a positive economic trajectory for the county.

The Toombs Corporate Center in Lyons stands out as an optimal development opportunity (Figure D-1). A key attribute of this site is its flexibility in land utilization. Specific zoning parameters are absent in adjacent private lands, and restrictive covenants within these property deeds ensure that developments are coordinated with the Toombs Corporate Center and the city of Lyons. Within city limits both I-1 and I-2 industrial development zoning provides optimal parcels for developers.

**Figure D-1: Image of Planning Zones at Toombs County Corporate Center**



Encompassing a dedicated 175-acre expanse, the corporate center has varied pre-graded plots up to 12 acres. This enables developers plot selection to fit their operational needs. There is also an available 40,000 SF of speculative office building space at the Toombs Corporate Center main site. This makes it feasible for businesses desiring site occupation with administrative support.

**Figure D-2: Toombs County Corporate Center (Commercially Cleared Land)**



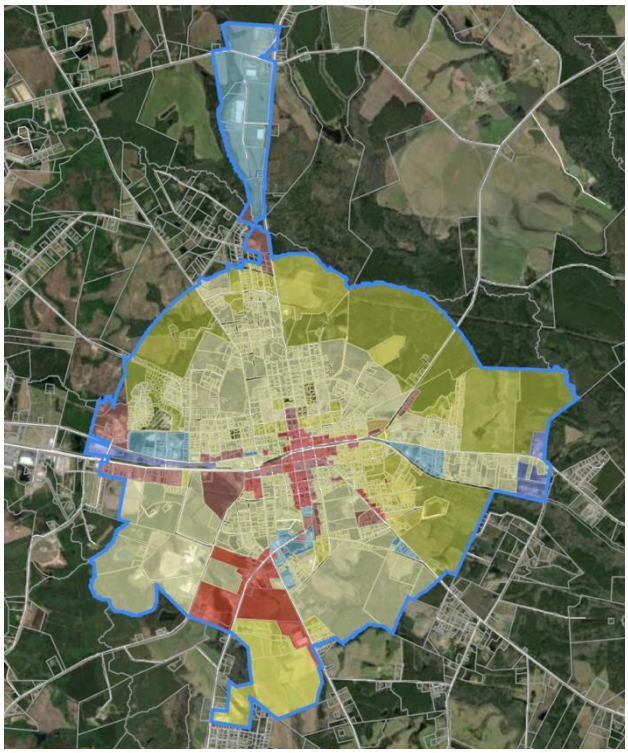
The Toombs Corporate Center's location on primary transportation routes is important for logistical convenience. Toombs Corporate Center's location in Lyons ensures connection to major interstates, facilitating easy access to crucial markets in the eastern U.S. Regionally, the Center's connectivity to key cities such as Savannah and Jacksonville also have appeal, positioning Lyons as a nexus for commerce in Eastern Georgia.

Additionally, there is proximity to local educational/training institutions with a track record of academic partnerships/training programs and access to a diverse talent pool. Being situated in the enterprise zone, businesses within the Toombs Corporate Center's boundaries can leverage multiple local and state incentives which are not covered in detail in this review. Please contact local economic development offices for more detail.

## Regional Overview

- The Industrial Park boasts 175 acres with multiple land parcels. All of these are tailored for research, technology, high-tier manufacturing, and bio-based projects.
- More than 50 manufacturers are located in the Toombs County region, benefiting from cost efficiencies, a proficient workforce, and transportation availability.
- Municipal, State and Federal stimulus packages and incentives to stimulate job creation and economic diversification. This includes:
    - Reputable utility providers
    - Advanced broadband options
    - New Market Tax Credit Program
    - Industrial revenue bonds
    - Job tax credit system
- A well-educated workforce complemented by diverse higher education avenues provides continued workforce training.
- Lifestyle features include abundant outdoor recreational pursuits and a secure, community-driven environment.

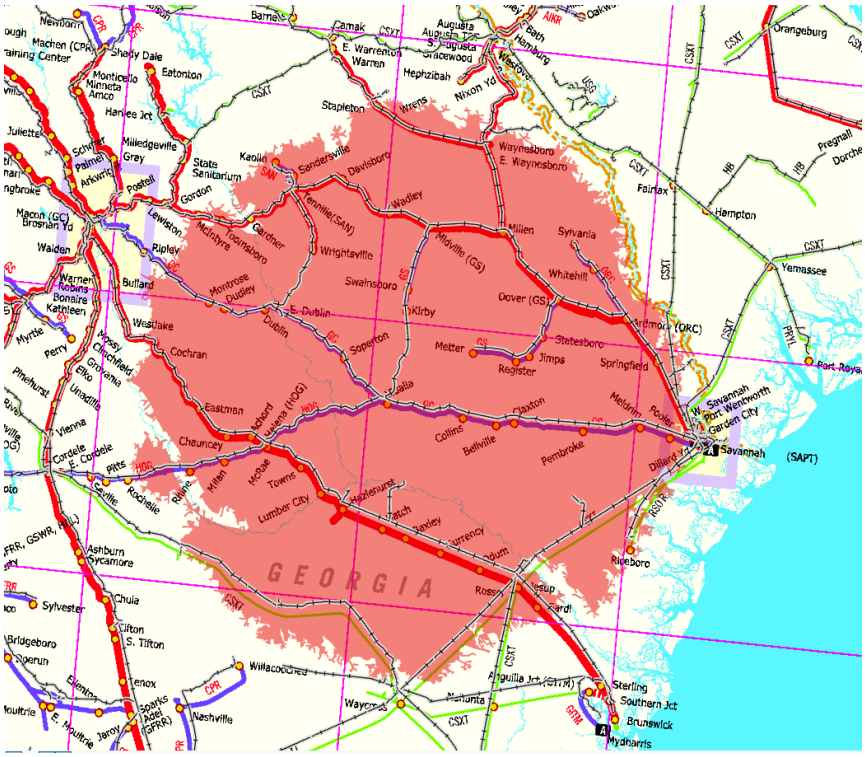
**Figure D-3: Toombs County Corporate Center (I-1 and I-2 Zoning Designations)**



## Transportation Infrastructure Overview

Lyons provides convenient access to markets east of the Mississippi and the East Coast United States due to a large network of primary roads and proximity to major highways, rail and nearby ocean ports (Figure D-4). Lyons central positioning between major southern cities allows businesses to access a significant portion of the U.S. population within 500 miles.

**Figure D-4: Rail and Ocean Transportation Network (Georgia)**




The region's transportation infrastructure is enhanced by the Georgia Central Railway, which serves the nearby City of Vidalia, offering reliable and efficient shipping options by interchanging with major rail networks like CSX in Savannah and Norfolk Southern in Macon and Dublin. The regional rail connectivity, combined with the regional road network, underscores the area's strategic significance for various industries relying on transportation for import and export.

In terms of maritime infrastructure, Lyons has proximity to the Port of Savannah, located approximately 86 miles away. As one of the largest container ports in the U.S., the Port of Savannah operates with an impressive capacity, accommodating vast amounts of freight from global destinations. The synergy of road, rail, and port connectivity makes Lyons an advantageous location for businesses aiming for both inter-state and national market accessibility.

# APPENDIX E: LEGAL DISCLAIMER

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