



## Regional Forest Harvest Characteristics across Virginia

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### Introduction

Sustainable forestry is practiced across the Commonwealth of Virginia. Recent data indicates that in Virginia the volume of wood harvested is less than half of the total annual growth (VDOF 2016). While some of the general public may view forest harvesting as a negative environmental impact, forestry is one of the most sustainable and beneficial industries in the country. Forest management, including timber harvesting operations, provide benefits to our communities, including jobs, wood products, recreational value and water quality protection. Active management of the forest also benefits wildlife, improves forest health and provides protection to the waters of the U.S.



Skidding operation in the Virginia mountain region.

from sedimentation when compared to other industries and land uses (Aust and Blinn, 2004). The forest industry in Virginia contributes more than \$17 billion to the state's economy each year and provides more than 103,000 jobs for Virginia's citizens (VDOF 2016).

The Virginia Department of Forestry (VDOF) is responsible for the protection of water quality during harvesting operations. This is done through an active inspection program to ensure compliance with the Virginia Silvicultural Water Quality Law. Loggers are required to notify the VDOF when harvesting timber so the site can be inspected to ensure protection of water quality. The Virginia Tech Department of Forest Resources and Conservation (FREC) partnered with VDOF to analyze the information in the harvest notifications / inspections and characterize timber harvests in Virginia. The harvests were divided into three physiographic regions of the state for comparison: Mountains (including Alleghany Plateau, Blue Ridge and Ridge and Valley), Piedmont and Coastal Plain.

### Methods

The Virginia Tech team acquired a list of 5,169 individual harvests completed between

July 2015 and July 2016 from the VDOF. Because harvest notifications are required for all commercial timber harvests, many small harvests are often reported, including harvests around subdivisions or small clearing operations that may not be typical of forest management harvesting operations. Therefore, we removed from the analysis harvests of less than five acres leaving a sample of 4,539 harvests, totaling 230,775 acres (Tables 1 and 2). Each harvest included data on the county location, type of harvest, tract acreage, and logger information. The VDOF reporting system originally had nine harvest types listed: biomass removal, clear cut, total harvest, thinning, partial cut, shelterwood deferment, seed tree, group selection and commercial selection. We grouped the nine original harvest types into four categories that represented common forest operations in Virginia. The categories are:

1. Complete Harvests (including harvests categorized as biomass, which were typically complete harvests where biomass from logging residues was also removed)
2. Thinnings
3. Commercial Selections
4. Other Silvicultural Systems (including shelterwood, seed tree and group selection)

Analysis was performed for each region to estimate average tract size, type of harvest performed, percentage of harvests conducted for silvicultural purposes and percentage of harvests on industrial land. The VDOF harvest data includes the logger or operator name for each tract harvested. Logging businesses were grouped into regions based on the physiographic region where the majority of their harvests occurred. We examined loggers from each region in terms of acres harvested over the year and calculated the average acres cut per business per year. We also divided the loggers of each region into the upper, middle and lower one-third in terms of acres harvested to determine how Virginia's timber harvests are distributed among logging businesses.

Acreage data utilized in this report was based on acreage reported by logging operations when they notify the VDOF of their harvests. Data on harvest type, silvicultural or non-silvicultural acres and type of land ownership are based on data input by the VDOF inspectors when they complete a harvest inspection. While there are possible areas for discrepancies, this data represents the most complete and representative assessment for current characteristics of harvesting operations across Virginia.

Table 1. Number of Virginia harvests by region and type 2015-2016.

Harvest Type	Mountains	Piedmont	Coastal Plain	Total
Commercial Selection	234	286	38	558
Complete Harvest	266	1557	1108	2931
Other Silvicultural Systems	13	25	7	45
Thinning	225	488	292	1005
<b>Grand Total</b>	<b>738</b>	<b>2356</b>	<b>1445</b>	<b>4539</b>

Table 2. Area (acres) of harvest type by region.

Harvest Type	Mountains	Piedmont	Coastal Plain	Total
Commercial Selection	7986	9065	1572	18623
Complete Harvest	9496	79014	57306	145815
Other Silvicultural Systems	409	1733	257	2399
Thinning	7840	29947	26151	63938
<b>Grand Total</b>	<b>25730</b>	<b>119759</b>	<b>85286</b>	<b>230775</b>

## Results and Discussion

Harvest type varies by region as harvesting systems and land management objectives change according to terrain, climate, soil characteristics and local markets. The Mountains have a higher rate of commercial selection harvests compared to the other regions, although within the Mountains themselves, the three main harvest types (complete, thin, commercial selection) are used in approximately equal proportions (Figure 1). Twice as many complete harvests occurred in the Coastal Plain and in the Piedmont than other harvest types.

The relatively evenly distributed harvest types in the Mountains have similar average tract sizes regardless of the harvest type (Table 3). Average tract size overall is substantially less in the Mountains (35 acres) compared to Piedmont (51 acres) and Coastal Plain (59 acres). Thinnings in the Coastal Plain are typically larger than other harvest types within



Loading operation in the Virginia piedmont region.

the region, with an average tract size of 90 acres. The “other silvicultural systems” category represents only a small portion of all harvests.

The majority of industry land harvests were in the Piedmont as thinnings and complete harvests. Industry land accounted for less than 10% of harvests in all regions (Table 4).

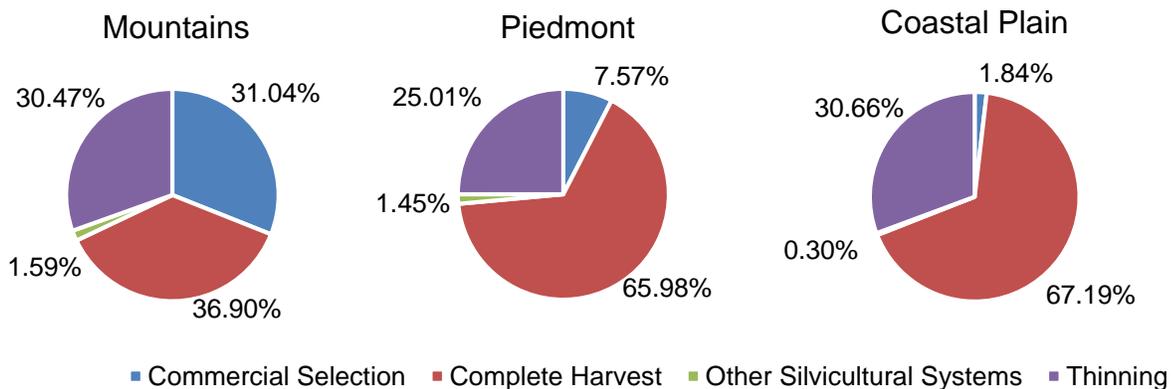


Figure 1. Harvest type by region.

Table 3. Average tract size (acres).

Harvest Type	Mountains	Piedmont	Coastal Plain	Statewide
Commercial Selection	34.13	31.70	41.37	33.37
Complete Harvest	35.70	50.75	51.72	49.75
Other Silvicultural Systems	31.46	69.34	36.69	53.32
Thinning	34.84	61.37	89.56	63.62
Overall Average	<b>34.86</b>	<b>50.83</b>	<b>59.02</b>	<b>50.84</b>

Table 4. Industrial acres harvested within each region.

	Mountains	Piedmont	Coastal Plain	Total
Harvests reported as Industry land	0.52%	9.02%	6.26%	7.05%
Industry land acres harvested	133.00	10806.10	5337.50	16276.60
Total Acreage	25730.10	119759.10	85285.50	230774.70

The primary purpose of harvest inspections is to verify compliance with the Silvicultural Water Quality Law. Timber harvests sometimes occur as part of a conversion to a non-silvicultural land use, such as clearing for agriculture, housing or other non-silvicultural uses. In cases where the VDOF inspectors know of conversions to other land uses for all or part of

the harvest area, they will note the acres that are non-silvicultural and will likely end up being another non-forest use. The majority of acres harvested (98%) were categorized as silvicultural harvests and are likely to remain in forest. Greater than half of these harvests were complete harvests (Table 5).

Table 5. Harvest type by region (acres harvested) for silvicultural harvests.

Harvest Type	Mountains	Piedmont	Coastal Plain	Total
Commercial Selection	31.1%	7.7%	1.9%	8.1%
Complete Harvest	36.4%	65.5%	67.3%	62.9%
Other Silvicultural Systems	1.5%	1.5%	0.2%	1.00%
Thinning	31.1%	25.4%	30.6%	28.0%
Grand Total	<b>100.00%</b>	<b>100.00%</b>	<b>100.00%</b>	<b>100.00%</b>

## Logging Business Production Levels

There were approximately 1,000 logging businesses or individuals that were listed as the operator for at least one harvest during this one-year period. Results indicate that a small percentage of those loggers harvest the majority of area in all regions of the state. In both the Piedmont and Coastal Plain, the top 10 logging businesses are responsible for nearly 30 percent of the acres harvested in their respective regions, while they account for only about 2 percent to 5 percent of the logging businesses in their regions (Table 6). The top 10 loggers in

the Mountains harvested nearly 20 percent of the region's acres. We also analyzed logger production in acreage by dividing the loggers into thirds. In all three regions, the top third of loggers with the most acres harvested are responsible for 75 percent or more of the total acres harvested (Figure 2). Table 7 illustrates the variability in logging businesses among the regions; an average business in the Coastal Plain cuts almost twice as much as an average business in the Piedmont, and almost six times as much as an average business in the Mountains.

Table 6. Area (acres) harvested by top 10 logging businesses in each region.

	Mountains	Piedmont	Coastal Plain
<b>Acres Harvested</b>	4492	32557	23862
<b>Percent of total acres harvested in Region</b>	17.5	27.2	27.9
<b>Percent of total Logging businesses in region</b>	3.1	1.9	4.5

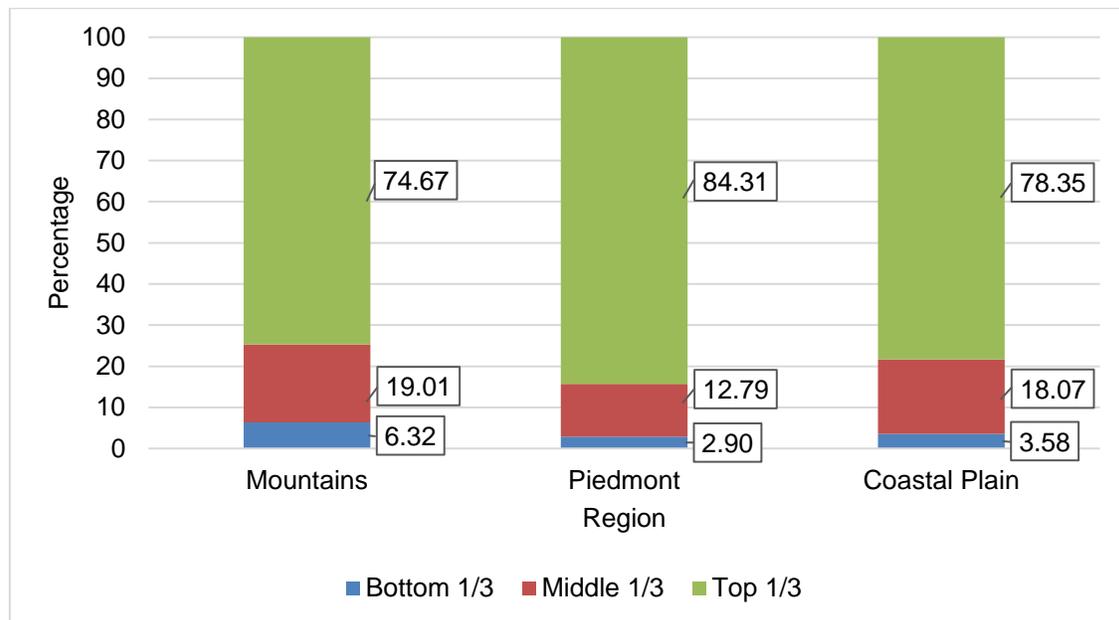


Figure 2. Percentage of total acres harvested by region for the bottom, middle and top third of logging businesses when grouped by production level of total acres harvested per business.

Table 7. Area (acres) harvested per logging business by region.

	<b>Mountains</b>	<b>Piedmont</b>	<b>Coastal Plain</b>
<b>Average Acres per Business</b>	83.32	265.97	488.50
<b>Maximum Acres per Business</b>	660	5949	4298

## Conclusions

Virginia’s forests are a vital resource for the Commonwealth and provide a variety of benefits to the citizens of Virginia. Forest harvesting provides the raw material for Virginia’s forest industry and provides forest landowners with the opportunity to manage their forests and generate revenue from forestland. Logging businesses provide the critical link between forest landowners and the mills that produce forest products. The VDOF water quality enforcement program is critical to ensuring the protection of water quality during harvesting operations and also provided data that resulted in valuable insight into the characteristics of harvesting operations in Virginia’s forests.

Harvest types tend to be evenly distributed in the Mountains, while complete harvests and thinnings dominate the operations conducted in the Piedmont and Coastal Plain. Ninety-eight percent of total acres harvested were noted as silvicultural harvests where it appeared the landowner intended to keep the land in forest. While there are a large number of logging businesses operating in Virginia, the top third of logging businesses harvest 75 percent or more of the area in their regions. Production levels in the Mountains tend to be lower due to steep and rough terrain, smaller crews and high use of manual felling operations (Bolding et al. 2010). Operations in the Piedmont and Coastal Plain are primarily mechanized and, generally, have higher production rates.

Forestry practices in Virginia are largely determined by private landowners with only a small percentage of harvests on industrial land. With more than 230,000 acres harvested in a year, Virginia’s landowners, logging businesses and forest industry make a significant contribution to the management of Virginia’s forests.

## Literature Cited

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