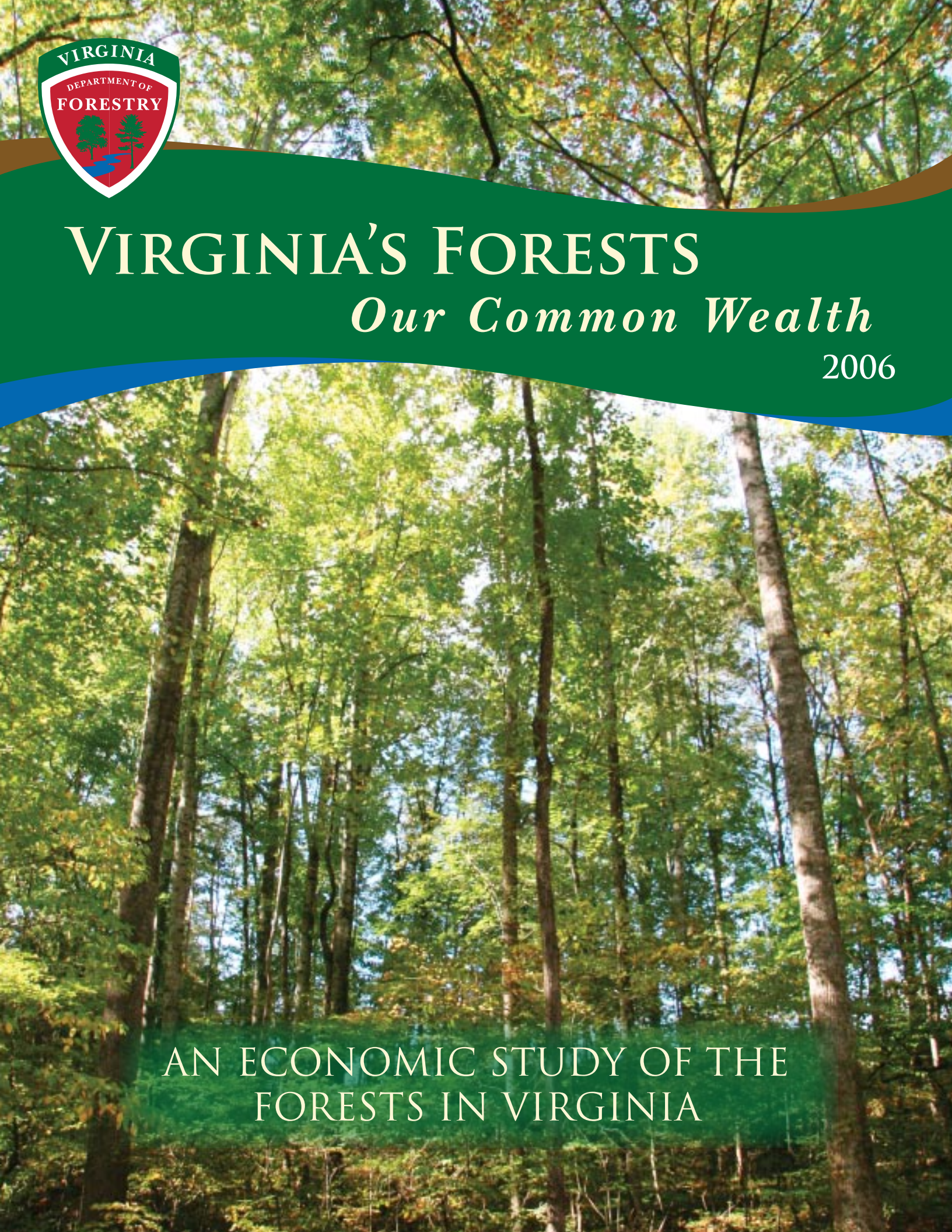
Virginia's Forests

Our Common Wealth

2006



AN ECONOMIC STUDY OF THE FORESTS IN VIRGINIA

VIRGINIA DEPARTMENT OF FORESTRY

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Executive Summary

The economic and social importance of Virginia's forest resources and the increasing demand for forest products are here to stay. At 7.5 million and growing, the state's population is placing greater demands on our remaining forest lands and the benefits they provide. The sustained stewardship of the forest resources and their contribution to the lives of the people of the Commonwealth is the mission of the Virginia Department of Forestry (VDOF). For 400 years, Virginia's forests have been – and continue to be – the backbone to a strong economy and healthy environment. Virginia's forest products industry provides a vital source of income and jobs to many rural areas and smaller cities. The harvesting, processing and marketing of forest products generates more than **$25.2 billion** annually to Virginia's economy and accounts for **183,898** jobs. Opportunities for growth in the forest products industry still exist, especially in the areas of value-added products. Non-timber utilization of Virginia's forests will also continue to grow.

Stronger conservation of the forest land base and a greater knowledge of how forests and people interact are necessary if the benefits of forest lands are to be sustained.

"The Virginia Strategy – Prosperity into the New Century" states that key issues to maintaining a thriving forest industry include "availability of land, availability of capital and awareness on the part of the general public of the benefits of natural resource based industries." [1]

In its entirety, Virginia's forests provide more than $29.44 billion in benefits annually to the Commonwealth.

Major Attributes and Benefits of Virginia's Forests and Its Forest Industry are:

- Virginia has nearly **16 million acres** of forest land with **15.3 million** acres classified as commercial forest.
- Non-industrial private landowners hold **77 percent** of Virginia forest land.
- The harvesting, processing and marketing of forest products generates more than **$25.2 billion** annually.
- Landowners receive more than **$276 million** in stumpage for their timber annually.
- Timber harvesting contributes more than **$927 million** annually to the economy.
- Specialty and non-timber forest products contribute more than **$60 million** annually to Virginia's economy.
- Forest-related recreational spending contributes more than **$2.4 billion** annually to Virginia.
- Carbon sequestering and pollution control value exceeds **$1.7 billion** annually.
- Every $1 landowners receive for their timber generates **$41.82** of value-added to Virginia's economy.

Introduction

The "value" of Virginia's forests is many things to many people. To some, the value lies in the beauty of the forests. Landowners and the forest products industry consider the utilization of the resource as the most valuable asset. Whatever the "value," we must recognize that Virginia's forests provide a renewable natural resource that extends from harvesting timber to natural beauty. Whether it's a walk in the urban forest or a hunter in the rural forest, all Virginians can enjoy this resource as it continues to provide a necessary framework for our daily lives.

The Virginia Department of Forestry, using the IMPLAN PRO economic model for Virginia, has completed its fifth comprehensive evaluation of Virginia's forest land. The first report was completed in 1985 with revisions in 1988, 1994 and 2001. The availability of new information has made it possible to revise the forest economic outlook. The numbers used are real, and in those cases where estimates have been used, the more conservative number was chosen when different estimates were obtained.

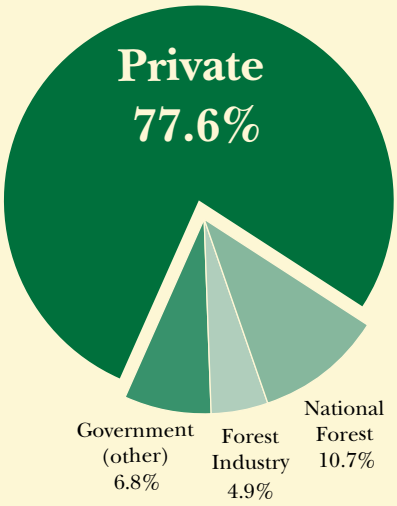
Virginia's forests still cover nearly two-thirds of the state, an extraordinary figure considering the overwhelming population growth in some areas. Virginia stands to lose some of its resource base to future urban growth. The importance of forests in cleansing the air, purifying our water, providing products and fostering recreation opportunities must be embraced as we look toward the future. Tree populations in cities and towns (Virginia's urban forests) enhance the quality of life and provide critical environmental services. Our Virginia standard of living depends on the abundance and stability of the forest resource. A direct correlation exists between forest loss and our economy; and loss of forest resources has a direct economic impact on Virginia. From the hardwood forests in the majestic mountains to the pine forests of the Chesapeake Bay, the role of forests continues to be different for each person. We must realize that as varied as our reasons for enjoying forests are, a commonality exists among us all.

The value of Virginia's forests is in fact … Our Common Wealth

Carl E. Garrison III, State Forester

The Forest Resource

Figure 1
Virginia Forest Land Ownership



Ownership	Acres
Private	12,236,300
National Forest	1,692,400
Forest Industry	763,200
Government (other)	1,073,800
Total	**15,765,700**

Table 1
Forest Types

Forest Land Timber Types	Acres
Upland Hardwood	10,072,400
Lowland Hardwood	549,800
Oak–Pine	1,532,800
Natural Pine	1,374,100
Pine Plantation	1,666,000
Non-Stocked	113,700
Total Timberland	**15,308,800**
Reserved Forest Land	410,200
Other Forest Land (Unproductive)	41,600
Reserved Other Forest Land (Unproductive)	5,100
Total Forest Land	**15,765,700**

Present Condition

Virginia is blessed with a multitude of forest resources. Of the 25.6 million acres of land, more than 61 percent (15.8 million acres) is covered in forests, with the vast majority (15.3 million acres) classified as commercial forest land (timberland). Nearly every county in Virginia has abundant forest lands. In addition to commercial forest land, there are more than 450,000 acres of non-commercial forest land, including woodland and reserved forests that provide numerous benefits such as: recreation, watershed protection, wildlife habitat and preserves for unique habitat. Non-industrial private forest landowners (NIPF) own 77.6 percent of the total forest land (Figure 1); forest industry owns 4.9 percent, and the remaining 17.5 percent is owned by federal, state and local governments. [2] Forest industry land holdings have declined to 763,200 acres – a reduction of 49 percent since the previous inventory in 1992. Indications are that this trend will continue.

Virginia's commercial forest lands are divided into five major timber types (Table 1).

Based on the 2005 Forest Inventory, hardwood types cover 80 percent of the total forest acreage and pine types cover the remaining 20 percent. The inventory also shows, for the first time, pine plantation acreage exceeding that of natural pines. Loblolly pine is the dominant conifer and yellow poplar is the most abundant hardwood species, although the oaks as a group outnumber yellow poplar in number and volume.

The most positive change in Virginia's forest over the last 65 years has been in the volume of standing timber. From 1940 to 2005, the volume of growing stock increased from 10.4 billion cubic feet to 26.9 billion cubic feet. Hardwood accounted for 85 percent and softwood for 15 percent of the increase. The volume increase occurred while the forest continues to provide an increasing supply of sawtimber and pulpwood to be manufactured into paper, furniture, cabinets, veneer, poles, posts, pilings, lumber for homes and other products. Today, we harvest more than 1.25 billion board feet of sawtimber (enough to build 80,000 2,000-square-foot homes) and almost three million cords of pulpwood annually. In 1940, Virginia's timber resource could have provided enough lumber for two million homes. Today, we have enough timber for almost six million homes. More significant is the fact that enough timber has been harvested in Virginia since 1940 to build about five million homes. [2, 3, 4]

This wonderful success story will continue only with the dedicated effort to conserve the forest land base and maintain high-quality forest management.

Virginia's urban and community forests are in need of revitalization. A recent VDOF survey of municipalities indicated that 72 percent of respondents felt their urban forests were suffering from over-maturity or decline. There has been only minimal funding for public tree planting and care in recent years.

Survey results indicate an average net annual loss of forest land of more than 26,100 acres since 2001. This loss through development and land use conversion has a direct impact on Virginia's economy.

To better manage this resource, the Virginia Department of Forestry, in cooperation with the USDA Forest Service, conducts an annualized Forest Inventory and Analysis (FIA) to characterize the condition of Virginia's forests. The results of the Virginia Forest Inventory can be accessed at the USDA Forest Service Mapmaker Web site (http://www.ncrs2.fs.fed.us/4801/fiadb). There is also a link from the Virginia Department of Forestry Web site (www.dof.virginia.gov).

Risks to the Resource

There are risks involved with any long-term investment, and this is especially true with growing timber. Virginia's forests have been impacted with insect and disease outbreaks, ice storms, tropical storms and hurricanes, floods, drought, and other natural disasters that have damaged or killed thousands of acres of trees. Although some of this timber was salvaged, the loss to landowners was still millions of dollars.

Specific risks include native insects, such as the southern pine beetle, which can reach outbreak numbers every 10 to 15 years and cause widespread destruction to the pine resource. Even more serious are invasive species in the form of insects, diseases and weeds. Gypsy moth and hemlock woolly adelgid are two invasive insects that have been established in Virginia for decades and have caused widespread mortality to oaks and hemlocks, respectively. Newer threats from invasive insects include the emerald ash borer, Asian longhorned beetle and European woodwasp.

Virginia's urban forests are also at risk from a wide variety of threats including: lack of maintenance, storms, exotic insect pests and improper plant selections. The loss of trees during the development process is having a tremendous impact on the composition of future urban forests. Most localities lack strong measures to prevent or minimize this tree loss.

Invasive weed species, such as tree of heaven, multi-flora rose and Japanese honeysuckle, are particularly troublesome because of their prolific growth and reproduction, adaptability to a variety of conditions, and ability to invade disturbed sites. Fragmentation and parcelization of intact forest creates environments that are extremely vulnerable to invasion by weeds. In many areas of Virginia, at least half of the plant biomass in the forest consists of invasive weeds. This will have profoundly negative ecological effects on future forests because less competitive native trees and plants will be unable to reestablish themselves on these sites without human intervention.

Other potential risks to Virginia's forests are uncontrolled forest fires, land-use changes and forest land management restrictions. The rate of conversion of forest land is related to the amount of risk and costs that landowners must bear to manage their land. Land-use policies can have major impacts on our forest resources.

Forest Management and Industry Economics

The management, sale, harvesting and processing of forest products, along with construction contributions, added more than $25 billion to Virginia's economy in 2003.

The value of forest industry economic contributions is based on the IMPLAN Pro Input-Output Model using local data where available. [5] Due to national changes in industrial classifications, care is needed in directly comparing economic impacts from earlier studies. The value has been steadily rising over the past several years. To continue this increase, more emphasis will be needed to encourage better forest management, adopting new technology, adapting to changing markets and forest conditions, while enhancing the development of value-added processing and specialty forest product production.

Virginia's Forests are Critical to a Prosperous Economy

- **Direct Impacts:** Economic effects directly related to the selected industries' production.
- **Indirect Impacts:** Economic effects derived from businesses providing products or services to the selected industries.
- **Induced Impacts:** Economic effects derived from employee spending.
- **Total Output:** Total value of production of goods and services by an industry for a given time frame.

Virginia Department of Forestry conducts ongoing research to produce high-quality trees.

Forest Management and Related Services

The growing and management of forests for timber and other resources is essential to ensuring that Virginia's forests can sustain the multitude of benefits we expect. These activities include planting or regenerating high-quality trees; protecting forests from fire, insects, disease, competition and other threats; forest education and research, and providing professional assistance to landowners on management, harvests of timber and other products or benefits. Improved management and utilization will be needed to maintain and increase the future vitality and sustainability of Virginia's forests. The Virginia Department of Forestry reinvests in the future through the education of landowners and loggers to improve management, utilization and sustainability of our forest resources.

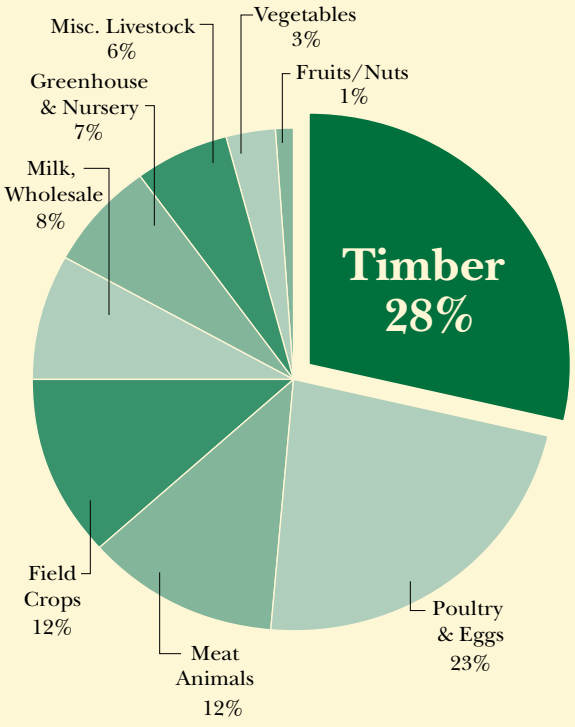
- The direct economic impact of these activities in 2003 was more than **$178 million**.
- The total economic output of these activities in 2003 was more than **$378 million**.
- The total value-added impact in 2003 was more than **$269 million**.

Harvesting

In 2004, approximately 1,200 logging operations employing more than 5,000 workers were involved in harvesting Virginia's timberland. [6] These operations had a direct economic impact of more than **$927 million**. [5] Many of these activities occur in the more rural areas of the state where timber harvesting provides much-needed income to local landowners and jobs for rural communities. The $927 million is also considered the market value of the harvested timber when transported to the first point of delivery. This was first-in-value and accounted for 28 percent of the total when compared to market values of Virginia agricultural crops as shown in Figure 2. [4, 5, 7]

Figure 2
2003 Market Value of Crops

Crop	Value
Timber	**$927,699,840**
Poultry & Eggs	$732,073,000
Meat Animals	$393,754,000
Field Crops	$386,179,000
Milk, Wholesale	$244,666,000
Greenhouse & Nursery	$225,283,000
Misc. Livestock	$200,594,000
Vegetables	$100,519,000
Fruits/Nuts	$41,023,000



Primary Manufacturing

Primary processing converts raw materials into lumber, veneer, railroad ties, poles, posts, barrel staves, handles, wood pulp, paper, particleboard, fiberboard, oriented strand board (OSB), laminated veneer lumber (LVL), laminated strand lumber, chemicals and other products. Hardwood sawmill production has surpassed pine production every year since 1970. This pattern should continue into the foreseeable future. Combined production produced more than 1.25 billion board feet in 2003 from Virginia's forests (Figure 3). [4] Although production is dependant on the economy, construction continues to create good demand for hardwood flooring, oriented strand board (OSB), laminated veneer lumber (LVL) and other wood products. In addition, new products such as bio-based materials, bio-energy and engineered wood, along with increases in domestic and foreign forest-based exports bode well for Virginia's forest industry. Roundwood pulpwood production increased from one million cords in 1950 to almost three million cords in 2003. Pine continues to be the dominant pulpwood species, although the use of hardwoods has increased considerably since 1960 (Figure 4). In addition, approximately one million cords of wood residues (mostly wood chips, sawdust and shavings from mills) are provided to pulp and composite mills annually. [8]

- The direct economic impact from primary forest products manufacturing in 2003 was more than **$4.1 billion**.
- The total economic output from primary forest products manufacturing in 2003 was more than **$7.6 billion**.
- The total value-added from primary forest products manufacturing of timber in 2003 was more than **$3.4 billion**.

Secondary Manufacturing

Secondary manufacturing processes lumber, pulp, paper, particle board and other primary products into other components or final products. These include boxes, cartons and other packaging materials, furniture, cabinets, dimension and component parts, flooring, paneling, molding, pallets, household goods, instruments, and crafts. Even with the closing of several well-known furniture manufacturing plants, Virginia continues to be one of the larger producers of wood furniture in the United States. The furniture industry is the major solid-wood manufacturer in the secondary sector and accounts for about one-third of the value. Other large manufacturers in the secondary sector are paper container producers, and pallet, cabinet and wood flooring manufacturers. As materials go through the processing chain from raw material to finished products, every step provides additional jobs and income to the area. By converting raw resources into finished products locally, Virginia can maximize the benefits it receives from our forests.

- The direct impacts from secondary manufacturing, including construction, contributed more than **$5.9 billion** to Virginia's economy in 2003.
- The secondary manufacturing, including construction, had a total economic impact of more than **$15.2 billion** to Virginia's economy in 2003.
- The total value-added from secondary forest products manufacturing, including construction, was more than **$6.9 billion** in 2003.

With the population expanding, construction increasing and demands for industrial and consumer products growing, opportunities to expand secondary manufacturing should continue to increase.

Figure 3

Virginia Sawtimber Harvests

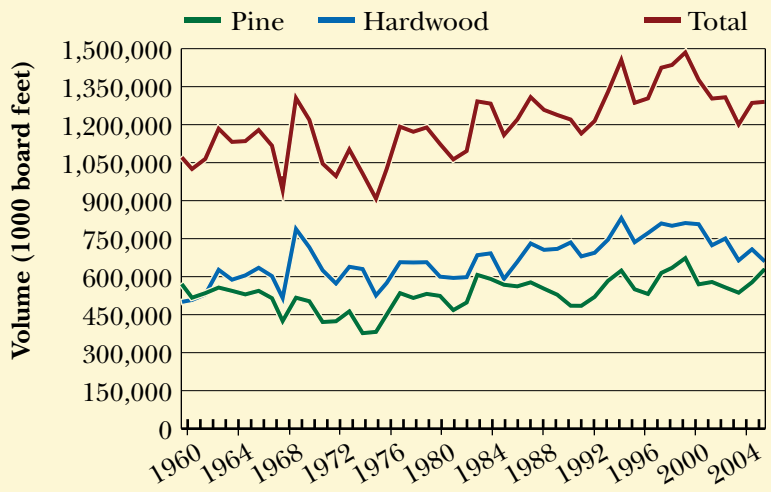


Figure 4

Virginia Roundwood Volume

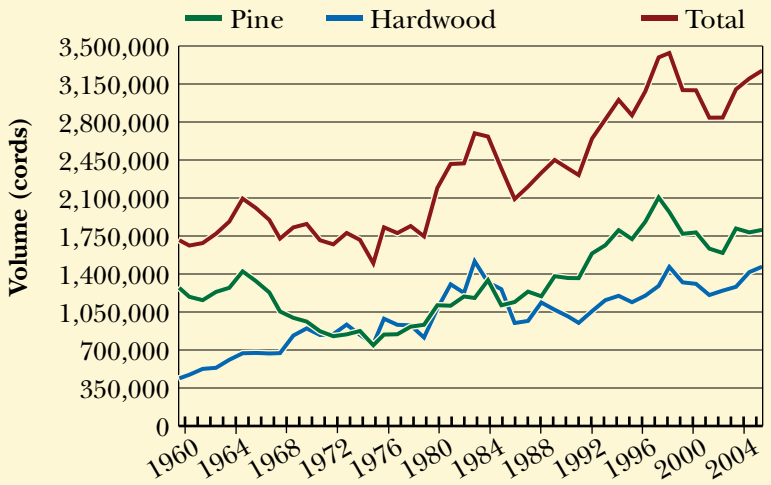


Figure 5

Value-Added to Forest Products

Stumpage $1.00 =

Forest Management $0.52

+ Harvesting $1.37 +

Primary Processing $4.36

+ Secondary Processing $6.71 +

Indirect Impacts $6.38

+ Construction $6.04 +

Induced Impacts $16.44

Total Value-Added Into Virginia's Economy **$ 41.82**

Value-Added

Value-added is the increased worth of a product as additional processing takes place. Each step harvested timber takes – from stump to final product – adds value to a product and the economy of Virginia.

Through this process, the $276 million paid to landowners for their standing trees (stumpage value) in 2003, generated more than **$11.5 billion** in total value-added impacts. [5] Every dollar paid to Virginia landowners provides $41.82 worth of total value-added to Virginia's economy (Figure 5). The largest sector of value-added is induced economic impacts. This is the economic activity attributable to household income generated by Virginia's forest products industry. Induced economic impacts contribute approximately **$4.5 billion** in the Commonwealth. The second largest sector (which exceeded **$3.6 billion**) is direct impacts, comprised of primary and secondary manufacturing, and including forest management and harvesting.

The third sector, indirect impacts, is comprised of construction, services, marketing and transportation, which contribute approximately **$3.3 billion**.

Economic Output

Economic output is the total value of products that an industry produces. This includes all materials that are necessary to produce the products, along with labor, profit and other costs of doing business.

When all of these impacts are combined, the forest products industry and related businesses generate an economic output of more than **$25.2 billion** annually in Virginia (Table 2). [5] Retail sales of forest products generate billions of dollars more to the economy of Virginia.

Table 2

Total Economic Contribution of Virginia's Forest Products Industry 2003

Forest Management	$178,996,356
Stumpage	$276,137,792
Logging	$927,669,840
Primary	$4,105,747,040
Secondary	$5,932,317,389
Construction	$3,820,769,413
Indirect Impacts	$3,059,988,172
Induced Impacts	$6,909,220,775
TOTAL	**$25,210,846,777**

Survey of Virginia Manufacturers

Processing of forest products is a major contributor to the manufacturing sector of Virginia's economy (Table 3). [5, 9, 10] As a group, the forest products industry ranks **first in manufacturing jobs**, accounting for one in every six manufacturing employees, and **first in salaries and wages** with $1 out of every $7 paid out to employees. It also accounts for $1 out of every $9.00 of value-added through manufacturing.

Table 3

Total Economic Contribution of Virginia's Forest Products to Manufacturing 2003

Sector	Employment	Salaries & Wages (million $)	Value-Added (million $)	Capital Expenditures (million $)
Wood Products	19,115	$573.5	$3,583.6	$100.4
Furniture & Related Products	19,582	$545.8	$2,221.2	$24.2
Paper	12,496	$624.4	$3,718.9	$47.2
Total All Wood Manufacturing	51,193	$1,743.7	$9,523.7	$171.8
All Manufacturing	313,112	$12,862.6	$86,449.5	$1,605.8

Table 4

Forest Industry-Related Employment 2003

Sector	Number Employed
Forest Management & Harvesting	8,042
Primary & Secondary Manufacturing	49,594
Construction	30,890
Indirect Impacts	21,823
Induced Impacts	73,549
TOTAL	**183,898**

Table 5

Top 10 Forest Products Exports from Virginia Ports 2003

Country	Value (millions $)
Italy	$69.8
Spain	$68.6
China	$44.8
Germany	$42.5
United Kingdom	$34.2
Hong Kong	$27.7
Portugal	$14.0
Belgium	$12.7
Japan	$12.2
Ireland	$8.5

Capital Investment and Employment

From 2001 through 2005, forest product companies planned capital expenditures of more than **$786 million** for new or expanding manufacturing plants and increases of more than **10,100** new jobs. [10]

In 2003, the employment of 184,000 Virginians was dependent on forest-related industries and businesses (Table 4). For each manufacturing job created, an additional two support/service jobs, such as trucking, are created. Every county, city and town benefits directly or indirectly from the forest products industry. [5]

Export Markets

Virginia forest products in the form of logs, lumber, chips, pulp, paper and finished goods are sold to markets all over the United States and the world. Exports continue to play an increasing role in the economic value of forest products in Virginia (Table 5). Countries importing the greatest amount of forest products in 2003 were Italy, Spain, China, Germany and the United Kingdom. Canada is also an important importer, but actual values are not available. In 2003, the total value of forest products exports through Virginia's Norfolk District Ports was estimated at more than $445 million. [11]

Tax Revenues

Forest products industries and landowners make significant contributions to local schools, roads and other tax-funded governmental services. These revenues include forest land property taxes, forest products taxes, sales taxes, corporate and business taxes, and state and federal income taxes. A precise estimate of forest products-related taxes paid by landowners, employees and industry is not available. However, one of the taxes paid by industry is the forest products tax. This tax is based on the amount of raw wood material obtained. In 2003, **$1.66 million** was collected. [4] These funds are used for forest protection and, along with some matching funds from the General Assembly, in the Reforestation of Timberlands program to provide financial assistance to private landowners for reforestation. More than **25,000 acres** were reforested during the 2003-2004 planting season by landowners benefiting from this program. [12]

Economic Benefits To Landowners

Private landowners owned more than **12.2 million acres** of forest land in 2005. This land was divided among **468,000 landowners**, with an average tract size of less than 27 acres. [13] Average forested tract size is expected to decrease as more land is divided into smaller parcels. Virginia landowners receive many benefits from forest land ownership, and some of these benefits contribute to Virginia's economy. Income is derived from timber sales, hunting, fishing and recreational leases, and specialty products, such as Christmas trees, firewood, maple syrup, pine garland production and others.

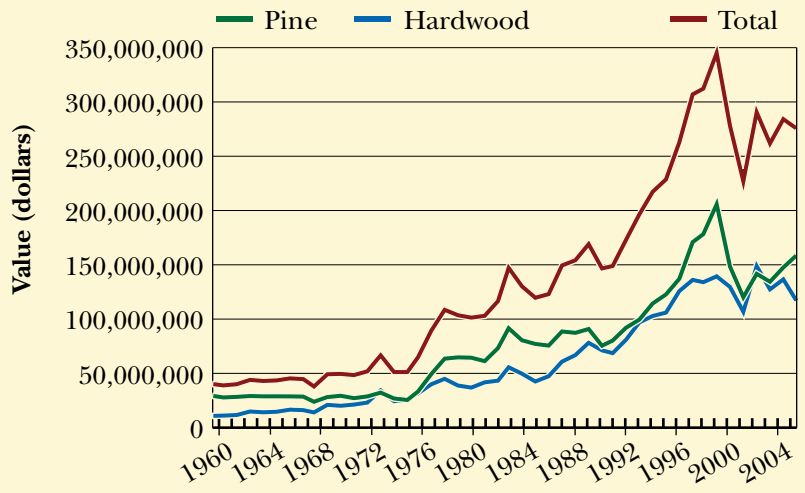
Studies show that landowners who use professional assistance receive 23 percent more income per acre and 64 percent more per board foot. [14]

Forest Products Revenues

In 2003, Virginia landowners were paid more than **$276 million** for trees harvested from their land. [4, 15] Other income was derived from the sale of special forest products, such as firewood, pine tips, horticultural and medicinal plants, Christmas trees and maple syrup. Landowners also receive money from hunting leases and other recreational activities. Virginia is fortunate to have a strong, professional forestry work force available to provide management and marketing services to Virginia landowners. Most landowners sell their trees as standing timber known as stumpage. Stumpage revenues have increased more than 700 percent since 1960 with the greatest increase in sawtimber (Figure 6). [15]

Figure 6

Virginia Stumpage Values



Reforestation

Landowners harvesting their timber often invest in forest regeneration practices following harvest. In 2003, Virginia landowners invested more than **$8.2 million** on reforestation, which includes site preparation, tree planting, vegetation control and other practices. Most of this work was done through small, private contractors. During the 2003-2004 planting season, Virginia landowners reforested more than **76,500 acres** with another **13,660 acres** regenerating naturally. [12] These long-term investments are essential to maintaining Virginia's forests for the future.

Risk of Investment

Ice-damaged forest

There are risks involved with any long-term investment, and this is especially true with growing timber. Over the last 10 years, Virginia's forests have been impacted with insect and disease outbreaks, ice storms, and other natural disasters that have damaged or killed thousands of acres of trees. Although some of this timber was salvaged, the loss to landowners was still millions of dollars. Other potential risks to Virginia's forests are uncontrolled forest fires, invasive species, land-use changes and forest land management restrictions.

One of the greatest potential threats to our forest lands is the conversion of forest land to other land uses. Unlike timber harvesting, where trees are allowed to regenerate, once an area is converted to an industrial park, sub-division, strip mall, etc., it will be lost as forest land indefinitely.

The rate of conversion of forest land is directly related to the amount of risk and costs that landowners must bear to manage their land. Land-use and tax policies will have major impacts on our future forest resources.

Specialty Forest Products

Specialty forest products tend to be unique, regional or seasonal in nature, and have little relationship to traditional commodity products, such as lumber, veneer or chips. They may be products that are collected without cutting trees down, such as maple syrup, naval stores (turpentine, pine rosin, etc.), pine tips for garlands, fruits and nuts, pine cones and pine straw; products found only in forested areas, such as rhododendron, grapevines, mushrooms, ginseng, moss and other botanical or medicinal plants; products from harvested trees, such as firewood, burl and crotch wood for fine crafts, highly figured wood for custom furniture and musical instruments, bark for crafts or mulch, and lighter wood from pine stumps; or plants grown for specific uses, such as Christmas trees, horticultural use or orchards. It is estimated that specialty products provide in excess of **$60 million** to local rural economies each year. [21]

Horticulture and Christmas Tree Industry

The wild collecting and growing of trees for the horticulture industry is expanding every year. As Virginia becomes more urbanized, the demand for trees in the landscape is increasing. Another horticultural forest product is bark for growing medium and mulch. Several bark processing plants in Virginia sell bulk and packaged bark products. In the past, much of this product was disposed of by burning or dumping in landfills. The greenhouse and nursery industries production is more than **$225 million** annually in Virginia. [7] Although it is not considered or included as part of the value of Virginia's forests, much of it is forestry-related. Virginia apple and peach orchards production was approximately **$29 million** in 2003. [7]

The Virginia Christmas tree industry consists of hundreds of Christmas tree farms, which harvest and sell one to two million trees each year with a wholesale value of **$20 to $40 million dollars**. [16]

Christmas Greenery Industry

Associated with the Christmas tree industry is the greenery industry. Branch tips of white pine, Fraser fir and other evergreens are cut in the fall of the year and sold to local manufacturers. The tips are used for Christmas wreaths, rope garland and other holiday decorations. This regional cottage industry provides income and seasonal employment to several hundred residents and landowners. Tipping, garland and wreath sales exceed **$16 million** annually. [17]

Forest-related Values

Many benefits of the Commonwealth's forests are derived not from products, but from experiences and environmental attributes. Virginians spend many hours hiking, camping, hunting, fishing or taking pictures. Forests provide relief from the noise and pollution of industrial areas and congested urban sprawl.

Wildlife-Related Recreation

According to the 2001 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation, more than **3.4 million** people, ages 6 and older participated in wildlife-related activities in Virginia. Along with non-residents, they spent **$1.9 billion** on trip-related expenses, equipment, licenses and other fees. Approximately 80 percent of these activities, **$1.52 billion**, are estimated to be associated with the forests of Virginia. [18]

Forest-Related Recreation

Backpacking, hiking, camping, forest viewing and other forest-related activities generate a large amount of economic activity. Based on the Virginia Tourism Corporation's 2003/04 Visitor Survey, it is estimated that **27 million** visitors (people traveling more than 50 miles) spent more than **$918 million** in pursuit of these activities. Millions more were spent by Virginia residents and visitors traveling less than 50 miles. [19]

One of our most basic resources, clean water, comes from our forests.

Water Quality and Erosion Control

Forests work as natural filters that remove pollutants from the air and water. This natural cleaning process reduces the amount and cost of treating water from forested watersheds and riparian areas and helps purify the air we breathe. Approximately 50 percent of Virginia's streams have forest buffers. Because of their high value in stabilizing stream banks and reducing sedimentation, storm water runoff and water pollution, Virginia is investing millions of dollars to protect and increase the extent of riparian forests. [20]

Air Pollution and Carbon Dioxide Reduction

Trees are the cheapest and most efficient way to sequester and store carbon from the atmosphere. This reduces the impact from burning fossil fuels. The trees of Virginia's forests contain more than **392 million** metric tons of carbon, which is equivalent to removing more than 1.4 billion metric tons of carbon dioxide from the air. This volume of carbon storage has an estimated value of more than **$60.4 billion**. [1, 21, 22] Since the volume of wood in Virginia is still increasing, an additional annual average of **4.68 million** metric tons of carbon is being stored and **17.16 million** metric tons of carbon dioxide are being removed. This is approximately 20 percent of all carbon dioxide emissions produced in Virginia and has an estimated value of more than **$649 million**. [23] These numbers do not include the impact of other forest vegetation or the carbon stored in wood products that are harvested each year. Estimated value for carbon dioxide removal and storage in forest products, such as furniture, housing and other long-term uses, is **$182 million** annually. [21]

Virginia's forests provide more than **$900 million** of air pollution abatement each year (Table 6). This is based on conservative estimates of what it would cost to remove the same quantities of five major pollutants (carbon monoxide, sulfur dioxide, nitrogen dioxide, ozone and particulate matter) through alternative means. These include only the removal costs and not additional concerns, such as health, infrastructure deterioration and environmental degradation. [21, 24]

Table 6

Pollutant Removal by Virginia's Forests

Pollutant	Tons Removed Per Year	Value ($)
Carbon Monoxide	23,766	$21,864,727
Ozone	217,063	$106,360,805
Nitrogen Dioxide	87,934	$387,965,813
Particulate Matter	200,427	$261,957,649
Sulfur Dioxide	76,843	$125,562,155
TOTAL	**606,033**	**$903,771,149**

Urban and Community Forests

Urban and community forests in Virginia provide numerous "environmental services," such as air pollution reduction, storm water mitigation, cleansing water, aesthetics and view shed protection. However, with new scientific modeling, these "services" will become products as their values can be quantified. Urban forest models, such as UFORE (Urban Forest Effects Model, USDA Forest Service, www.ufore.org) and City Green (an urban forest ecosystem analysis tool of American Forests), are already doing this work. For example, a recent City Green Analysis conducted in 2005 by the City of Roanoke and American Forests of Roanoke City quantified the values for air pollution removal by the urban forest at 951,322 pounds of pollutants removed per year at a value of $2.2 million.

The total value of storm water reduction provided by the urban forest in the Roanoke area (based on deferment of storm

water storage facility construction because of tree cover) was **$9,781,721** annually. [25]

Virginia's urban forests also have an effect on economic vitality in cities and towns. Research in consumer behavior shows that consumers stay up to 28 percent longer in shopping districts with healthy tree canopies. Shoppers will also spend 10 percent more during the visit and prices obtained by merchants for their products were 11 percent higher than in districts without a healthy tree canopy. [26]

Improved Quality of Life

Wooded home lots and urban areas have higher values than similar open areas. Several studies have indicated that forested neighborhoods have reduced energy costs, less crime, less pollution and higher "quality of life" compared to similar communities without trees. [27] Thousands of people are employed in the maintenance, care and expansion of Virginia's urban and community forests. According to research, the annual energy conservation value of the trees in Fairfax County in 1995 was more than **$330 million**. [28]

Table 7
Annual Benefits

Benefits	Value
Forest Management	$179 Million
Stumpage	$276 Million
Logging	$928 Million
Primary	$4.10 Billion
Secondary	$5.93 Billion
Indirect Impacts	$3.06 Billion
Construction	$3.82 Billion
Induced Impacts	$6.91 Billion
Specialty Forest Products	$60 Million
Wildlife-Related Recreation	$1.52 Billion
Forest-Related Recreation	$918 Million
Air Pollution Control	$904 Million
Carbon Sequestering	$832 Million
TOTAL	**$29.44 Billion**

Conclusion

As the population of Virginia continues to grow and people and businesses move into more traditional rural areas, the importance of maintaining our forests for all uses will become a greater challenge. It is very important that Virginia not only protects the amount of forest land it has now, but also ensures that sufficient well-managed "working forests" are available to provide the products and services we will need in the future.

From a strong industrial base providing annual economic outputs of more than **$25.2 billion** to a wide-ranging array of forest-related values that contribute an additional **$4.2 billion** plus, the forests of Virginia provide more than **$29.44 billion** in economic output annually (Table 7). In addition, our forests satisfy many environmental, social and spiritual needs. Today, Virginia's forests are healthy and diverse, yet they are constantly changing and their future is threatened by population growth and other socioeconomic pressures.

Forest Resources of the Commonwealth...

- Contribute more than **$29.44 billion** to Virginia's economy annually.
- Return more than **$276 million** annually to Virginia landowners for selling timber.
- Provide recreational opportunities to residents and visitors valued at more than **$2.4 billion** annually.
- Generate an estimated **$60 million** annually through specialty forest products.
- Increase water quality and protect Virginia watersheds from erosion and sedimentation.
- Provide long-term carbon sequestration through the forest management of 15.8 million acres of total forest land, which contribute to clean air and a high quality of life.
- Continue to support one of the largest manufacturing industries in the state, ranking first in employment, first in wages and salaries, and accounting for 11 percent of the value-added in the manufacturing sector.
- Provide important social benefits, including attractive sites for homes, scenic beauty and wildlife habitat... a draw for visitors and potential new residents.

The benefits we derive from Virginia's forests have resulted in a strong economy and enhanced quality of life.

A continued commitment to conserving the forest land base and improving management is needed to maintain these invaluable benefits now and for future generations.

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