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Final Report

**The Economic Footprint and Quality-of-Life Benefits of Urban
Forestry in the United States**

Prepared for the Arbor Day Foundation

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Executive Summary

Urban forestry contributes to the economy and quality-of-life in communities across the United States. Private sector industries, local governments, universities, and utilities involved in urban forestry provide jobs and create an economic footprint throughout the economy. Urban forestry also provides a wide range of environmental and aesthetic benefits that enhance quality-of-life.

This study examines the economic contributions of private and public sector urban forestry in the 50 U.S. states and the District of Columbia for the year 2017. Across the country, private sector industries are involved in growing, distributing, planting, and maintaining urban trees and forests. City governments, county governments, utilities, and universities are also engaged in planting and maintenance of landscape trees, often contracting with private sector businesses.

A consistent methodology is used across all states to provide both national results and comparisons among the states. The methodology also relies on administrative data from the U.S. Bureau of Census and the Arbor Day Foundation, which is collected over time and will allow future studies to track the growth of the urban forestry sector. The study relies on the recently released 2017 Economic Census from the United States Department of Commerce and urban forestry spending data gathered for local governments, universities, and utilities involved in the recognition programs of the Arbor Day Foundation. Administrative data from 2017 is supplemented with surveys that gather additional data or more detailed data about spending.

Nationwide, private sector industries and local governments had \$35.4 billion in urban forestry sales or spending in 2017. That estimate includes the urban forestry activity of cities, counties, utilities, and universities involved in the Tree City USA, Tree Line USA, and Tree Campus USA programs of the Arbor Day Foundation. As seen in Table ES.1, the total economic footprint of these activities, including the economic multiplier on businesses outside of the urban forestry sector, was \$64.0 billion in 2017. The total economic footprint includes employee compensation of \$25.1 billion in 2017 spread over an estimated 501,600 jobs.

Table ES.1: National Economic Footprint of Urban Forestry in 2017

Industry or Government Agency	Direct Economic Footprint Output	Multiplier Economic Footprint Output	Total Economic Footprint Output
Output (in millions)	\$35,445.7	\$28,514.5	\$63,960.3
Employee Compensation (in millions)	\$15,929.2	\$9,141.2	\$25,070.3
Employment	337,244	164,388	501,632

Source: Bureau of Business Research calculations utilizing IMPLAN

Quality-of-life benefits include aesthetic values and energy savings for homeowners and environmental benefits from carbon sequestration, the removal of air pollution, and runoff mitigation. As seen in Table ES.2 below, tree cover in the United States is found to increase the value of private homes by \$604.2 billion in 2017. This property value contribution is the present value of annual services provided by trees to homeowners. The annualized value of these tree services is \$31.5 billion. The annual benefits to society from carbon sequestration and reduced air pollution and runoff was an additional \$73.4 billion in 2017, bringing the combined annual economic benefits from urban forestry to a total of \$105.0 billion.

Table ES.2: Economic Benefits of U.S. Urban Forestry

Economic Benefit	Value
Property Value Impact (measured in 2017)	\$604,167.4 million
Implied Annual Value of Tree Services to Property Owners	\$31,518.4 million
Annual Value of Pollution and Runoff Mitigation (2017)	\$73,436.5 million
Total Annual Value	\$104,954.9 million

Source: Bureau of Business Research calculations utilizing the i-Tree Landscape web application

Table ES.3 provide estimates of the economic footprint and quality-of-life benefits in each state and the District of Columbia. The largest total economic footprint is seen in California, Florida, New York, and Texas, which have the largest volume of households and businesses that require tree services. More generally, the economic footprint tends to be larger for states on a per capita basis in the Northeast, industrial Midwest, and Pacific coast. The economic footprint is often smaller in the Plains states.

The employment footprint follows a similar pattern as the economic footprint. Florida and Texas have the largest employment footprint from urban forestry, at around 39,000 jobs in each state. Quality-of-life benefits also tend to be large in California, Florida, New York, and Texas, along with North Carolina, Georgia, and South Carolina.

Table ES.3: 2017 Economic Footprint and Quality-of-life Benefits by State

State	Economic Footprint Output (Millions \$)	Employment Footprint	Annual Quality-of-Life Benefits (Millions \$)
Alabama	\$1,019.7	8,416	\$4,613.5
Alaska	\$57.1	513	\$1.5
Arizona	\$1,017.7	9,602	\$230.1
Arkansas	\$167.5	1,579	\$3,114.7
California	\$7,768.3	65,514	\$4,137.8
Colorado	\$1,334.7	9,738	\$967.2
Connecticut	\$1,033.3	6,956	\$1,008.9
Delaware	\$428.4	3,333	\$203.0
Dist. of Columbia	\$39.2	280	\$50.8
Florida	\$4,368.5	39,017	\$6,448.9
Georgia	\$1,175.7	9,362	\$6,496.2
Hawaii	\$274.9	2,287	\$0.8
Idaho	\$235.8	2,176	\$858.9
Illinois	\$3,563.4	24,892	\$1,236.0
Indiana	\$988.5	8,119	\$1,022.3
Iowa	\$491.2	3,725	\$398.8
Kansas	\$587.2	5,141	\$455.0
Kentucky	\$582.5	4,249	\$2,020.5
Louisiana	\$411.2	3,566	\$3,868.0
Maine	\$356.9	2,642	\$1,933.0
Maryland	\$1,396.2	12,129	\$1,371.4
Massachusetts	\$2,243.7	13,262	\$1,916.7
Michigan	\$1,904.4	14,590	\$3,110.0
Minnesota	\$1,076.3	8,018	\$1,088.9
Mississippi	\$250.2	2,106	\$4,768.9
Missouri	\$842.1	7,729	\$1,634.7
Montana	\$96.3	753	\$1,012.2
Nebraska	\$253.1	2,099	\$145.3
Nevada	\$248.6	2,429	\$293.4
New Hampshire	\$443.5	3,357	\$814.9
New Jersey	\$1,829.0	12,590	\$1,600.4
New Mexico	\$161.8	1,697	\$685.0
New York	\$5,140.6	31,347	\$3,681.1
North Carolina	\$2,043.3	16,109	\$6,234.2
North Dakota	\$90.0	706	\$67.6
Ohio	\$2,857.4	22,566	\$2,405.7
Oklahoma	\$803.7	8,033	\$1,505.1
Oregon	\$1,415.9	13,515	\$2,604.6
Pennsylvania	\$3,270.2	22,218	\$4,187.0
Rhode Island	\$184.8	1,371	\$318.1
South Carolina	\$445.8	4,148	\$3,765.7
South Dakota	\$85.6	696	\$89.7
Tennessee	\$997.5	8,135	\$2,797.6
Texas	\$5,070.8	38,657	\$7,758.6
Utah	\$334.5	2,950	\$592.2
Vermont	\$157.5	1,058	\$552.9
Virginia	\$1,676.5	14,939	\$3,879.1
Washington	\$1,708.2	14,587	\$2,890.6
West Virginia	\$57.1	619	\$1,825.6
Wisconsin	\$922.0	7,394	\$1,841.8
Wyoming	\$52.0	716	\$450.0

Source: Bureau of Business Research calculations

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1. Introduction

The growth, distribution, planting and maintenance of urban trees and forests has economic implications for communities throughout the country. Private sector industries and local governments involved in urban forestry provide employment directly and yield an economic footprint across the economy. Urban forests and trees also provide valuable environmental and aesthetic benefits that enhance the quality-of-life for residents. This study by the University of Nebraska-Lincoln Bureau of Business Research (BBR), sponsored by the Arbor Day Foundation and the USDA Forest Service, estimates the economic footprint and quality-of-life benefits of urban forestry for the year 2017.

There are numerous definitions of urban forestry in the literature. For the purposes of this study, we draw attention to two such definitions. First, “Urban forestry is a specialized branch of forestry and has as its objectives the cultivation and management of trees for their present and potential contribution to the physiological, sociological, and economic well-being of urban society. Inherent in this function is a comprehensive program designed to educate the urban populace on the role of trees and related plants in the urban environment. In its broadest sense, urban forestry embraces a multi-managerial system that includes municipal watersheds, wildlife habitats, outdoor recreation opportunities, landscape design, recycling of municipal wastes, tree care in general, and the future production of wood fiber as raw material” (Deneke, 1978, p. 155). A second definition is the “growing, planting, maintaining, removing, disposing, and studying trees that are usually located in incorporated cities, towns, and other human settlements and that are used primarily to meet needs and enable activities of people” Templeton and Goldman (1996, p. 131). This definition is useful for the present study as it aligns with those community-level activities that are actively tracked and measured by the Arbor Day Foundation.

The study utilizes detailed information about industry activity at the state level compiled in the Economic Census, which is conducted every five years by the U.S. Department of Commerce. The Economic Census, last conducted in 2017, was recently released and contains detailed information about industry sales patterns at the state level, allowing the research team to isolate industry sales related to urban forestry. The study also utilizes administrative data on 2017 urban forestry spending collected by the Tree City USA, Tree Line USA, and Tree Campus USA programs of the Arbor Day Foundation.¹ Additional detailed data on urban forestry spending by city and county governments that are not part of Arbor Day programming was collected via survey.

This study examines the economic “footprint” of private and public urban forestry activity. The economic footprint includes economic activity, employment, and employee compensation both at businesses or government agencies involved in urban forestry as well as businesses throughout the economy due to the economic multiplier. An economic multiplier captures the spillover of activity to other businesses; for example, as employees of a landscaping company spend their paychecks.

State data on the contribution of urban trees and forests to the quality-of-life are gathered in part from the i-Tree suite of online tools. Data on benefits to homeowners are estimated based on a review of economic research which links tree cover and property values. Property value contributions reflect the value of tree services to private homeowners while calculations using the i-Tree Landscape tool provide

¹ More information about these and other Arbor Day Foundation programs can be found at: www.arborday.org/programs.

the value of external benefits from contributions to the environment. These benefits include carbon sequestration, mitigation of air pollution, and water runoff.

For each U.S. state and the District of Columbia, the report provides an estimate of the annual economic footprint and quality-of-life contributions for the year 2017. Report estimates can be updated every five years with the release of subsequent editions of the Economic Census, and given ongoing data gathering by the Arbor Day Foundation.

Section 2 of the report describes the methodology used to estimate both the economic footprint and societal benefits from urban forestry. Detailed information about the methodology is provided in Appendix 1. Section 3 provides estimates of the national economic footprint and quality-of-life benefits with state-by-state results presented in Section 4 and Appendix 2. Section 5 concludes the report by discussing limitations of the study which can be addressed in future economic studies of urban forestry.

2. Methodology

This chapter summarizes the methodology used to estimate the 2017 economic footprint and benefits of urban forestry both nationally and for each state and the District of Columbia. The *economic footprint* measures business sales and employment in the economy related to urban forestry. *Economic benefits* refer to the value of environmental services provided by urban forestry which contribute to the quality-of-life. The methodology is described in more detailed information in Appendix 1.

A. Economic Footprint

Economic footprint analysis traces the sales, employee compensation and employment in each state that is tied to urban forestry.² The economic footprint includes the direct activities by private sector businesses, city and county governments and utilities and universities to grow, distribute, plant, and maintain urban trees and forests. Information on sales and labor utilization in urban forestry industries in each state is available from multiple federal government sources such as the Economic Census, Census of Agriculture or Quarterly Census of Employment and Wages. The use of federal data sources ensures that data are comparable across states and the District of Columbia. Administrative data on urban forestry spending by city governments, utilities and universities are gathered regularly by the Arbor Day Foundation. More detailed information about spending was gathered by the research team via survey, as was information about urban forestry spending by county governments and city government which do not participate in Arbor Day Foundation programs. All data is gathered for the year 2017, the year of the most recent Economic Census. More detailed information about the methodology is provided in Appendix 1.

² Local economic activities such as urban forestry are supported by the economic base of industries in each state which export goods and services around the country and the world. Such exporting industries impact the aggregate size of a state economy, in a process often referred to as *economic impact*. Locally oriented industries, however, can have a substantial economic footprint which reflects all of the businesses activity in a state which is related to that industry. The current study examines the *economic footprint* of the urban forestry industry.

The economic footprint also includes the spillover of economic activity to other industries which do not engage in urban forestry. Such spillovers are broad-based and occur as urban forestry businesses and agencies purchase professional services, office products and other goods and services needed to operate. Spillovers also occur as urban forestry workers spend their paychecks throughout the economy on retail shopping, groceries and dining, personal services, health care, insurance, shelter and all the other elements of household spending. In the economic footprint analysis, the size of these spillovers, known as multiplier impacts, are estimated utilizing economic multipliers for each U.S. state and the District of Columbia provided by IMPLAN (Impact Analysis for Planning; IMPLAN 2017 Data).

The economic footprint is examined for six private sector industries and for city and county governments in each U.S. state. The economic footprint also is estimated for utilities and universities which participate in the Tree Line USA and Tree Campus USA programs of the Arbor Day Foundation. The direct employment and sales in these industries and agencies represent the bulk of the economic footprint from urban forestry on state economies. Private industries include tree producers such as nurseries and support businesses, wholesale and retail businesses which distribute trees, landscaping services and landscape architects which participate in the planting and maintenance of urban trees and forests. Public sector agencies involved in urban forestry included city governments and county governments. Utilities and universities are a mixed sector, meaning that each industry includes both private and public sector entities.

Table 2.1: Components of the Urban Forestry Sector

<p>Private Sector Industries Nursery and Tree Products Support Activities for Forestry Nursery and Florist Wholesale Lawn and Garden Equipment and Supply Stores Landscape Architecture Services Landscaping Services</p> <p>Public Agencies City Governments (includes Arbor Day Foundation Tree City USA Participants) County Governments</p> <p>Mixed Industries and Agencies Electric Utilities (Arbor Day Foundation Tree Line USA Participants) Universities (Arbor Day Foundation Tree Campus USA Participants)</p>

For each industry and agency, the economic footprint analysis isolates the portion of activity which is related to urban forestry; that is, the growing, distributing, planting, and maintaining of urban trees and forests. Other types of industry or agency activity are excluded. For example, within the landscaping services industry, sales and employment related to planting, maintaining (and retailing) trees is included in the economic footprint, but lawn maintenance and other activities are excluded. The methodology also is designed to avoid double-counting of activities.

For example, estimates of wholesale and retail activity exclude the value of trees sold while the economic footprint of local governments, utilities and universities excludes tree planting and maintenance that is contracted out to private sector businesses.

B. Quality-of-Life Benefits

Quality-of-life benefits are the environmental services provided by urban forests that contribute to the quality-of-life of urban and community residents. These benefits include the aesthetic and cost-of-living benefits to homeowners as well as environmental benefits to society as whole. Quality-of-life benefits due to the aesthetic value and energy cost savings are measured through the impact of trees on property values. Census data on housing units in each state is combined with estimates of property value impacts from the economic literature. The increase in property values represents the present value of annual benefits that trees to provide homeowners over the coming decades. Along with property values, the annualized value of tree services to homeowners is estimated based on a 50-year time horizon and a 5 percent annual discount rate. The environmental benefits of urban forestry are measured for each state utilizing the i-Tree Landscape benefits calculator³. The annualized value of tree services to homeowners is added to the environmental benefits to yield the total annual economic benefits from urban forestry. A more detailed discussion of the benefits methodology is provided in Appendix 1.

³ i-Tree Landscape. i-Tree Software Suite v5.x. (n.d.). Web. Accessed October 2020. <http://www.itreetools.org>

3. National Economic Footprint and Quality-of-Life Benefits

Tables below report the direct, multiplier and total economic footprint of urban forestry and its economic benefits at the national level. Information is provided for private industries and local governments as well as utilities and universities which participate in Arbor Day Foundation recognition programs. All estimates are for the year 2017. Information about private sector industries comes from the Economic Census and other secondary data, while information for other entities was gathered from the administrative records of the Arbor Day Foundation and surveys.

A. Direct Economic Footprint

The direct economic impact of private sector industries nationwide is provided in Table 3.1 in terms of annual business sales, annual employee compensation and employment. Total employee compensation and employment in each industry is equivalent to the direct economic footprint. Likewise, annual sales is the direct economic footprint for most industries. The exception is wholesale and retail trade industries. The value of wholesale and retail services is represented by the mark-up charged on trees sold. Mark-up levels are available from the IMPLAN software and are used to turn estimates of wholesale and retail sales into estimates of industry direct sales and services. The table below shows the direct economic footprint for each private sector industry totaled across all states in terms of direct sales and services (i.e., output), employee compensation, and employment.

Table 3.1: 2017 Direct Economic Footprint of Urban Forestry by Private Sector Industry

Industry	Direct Footprint Output (Millions \$)	Direct Footprint Employee Compensation (Millions \$)	Direct Footprint Employment
Nursery and Tree Products (111421)	\$2,617.0	\$1,315.8	35,585
Support Activities for Forestry (11531)	\$354.8	\$322.0	4,745
Nursery and Florist Wholesale (42493)	\$2,426.6	\$1,135.3	20,272
Lawn and Garden Equipment and Supply Stores (4442)	\$1,693.0	\$748.7	19,440
Landscape Architecture Services (54132)	\$2,093.7	\$1,089.7	13,421
Landscaping Services (56173)	\$25,074.5	\$10,568.8	229,469
Total	\$34,259.6	\$15,180.4	322,931

Source: Bureau of Business Research calculations

Nationwide, the direct economic footprint of private sector urban forestry activities was \$34.3 billion in 2017. Included in this footprint was \$15.2 billion in employee compensation encompassing wages, salaries, and benefits. The employee compensation is earned across an estimated 323,000 jobs. Landscaping services to plant and maintain tree resources account for the majority of the economic footprint. Depending on the measure, two-thirds to three-quarters of the economic footprint is due to landscaping services. Remaining private sectors industries involved in growing, distributing, and designing the placement of urban trees and forests each have a \$1.5 to \$3 billion annual economic footprint and create between 13,000 and 36,000 jobs. Support Activities for Forestry had an annual economic footprint of \$355 million and 4,700 jobs.

Table 3.2 shows the direct economic footprint from city governments that are part of the Tree City USA program, other city governments, county governments, Tree Campus USA universities, and Tree Line USA utilities. The direct economic footprint for the nation is presented in terms of direct sales and services (i.e., output), employee compensation and employment. Total spending values are collected from the administrative records of the Arbor Day Foundation for city governments participating in the Tree City USA program and participants in the Tree Campus USA or Tree Line USA programs. Surveys were used to gather details about spending, including the share of spending that is contracted out to private sector firms and employee compensation. Surveys also are the source of information on spending and employee compensation for city governments which are not in the Tree City USA program and for county governments. Employment is estimated based on employee compensation, using the average annual wages in each state in relevant occupations. Resulting spending estimates adjust for contracting out to private sector businesses and reflect only in-house spending by local governments, utilities, and universities. More detail on this methodology is available in Appendix 1.

Table 3.2: 2017 Direct Economic Footprint of Urban Forestry in Local Government and Participating Universities and Utilities

Local Government or Participating University or Utility	Direct Footprint Output (Millions \$)	Direct Footprint Employee Compensation (Millions \$)	Direct Footprint Employment
Tree City USA Cities & Towns	\$688.2	\$492.1	8,773
Other Cities	\$117.8	\$84.9	1,833
County Governments	\$52.1	\$30.5	660
Tree Campus USA Universities	\$33.7	\$25.8	573
Tree Line USA Utilities	\$294.3	\$115.4	2,473
Total	\$1,186.1	\$748.8	14,313

Source: Bureau of Business Research calculations

Nationwide, the direct economic footprint of urban forestry in public and mixed sector agencies was \$1.2 billion in 2017. Included in this footprint was \$750 million in employee compensation including wages, salaries, and benefits. The employee compensation is earned in approximately 14,300 jobs. Cities which are part of the Tree City USA program of the Arbor Day Foundation had the largest economic footprint. There also was a relatively large economic footprint from the urban forestry activities of the 155 utilities which participate in the Tree Line program of the Arbor Day Foundation.

A1. Tree City USA vs. Non-Tree City USA Communities

Tree City USA communities meet four core standards of urban forestry set by the Arbor Day Foundation. These communities maintain a tree board or department, have a community tree ordinance, spend at least \$2 per capita on urban forestry, and celebrate Arbor Day. In 2017, there were 152.3 million residents in cities participating in the Tree City USA program versus 85.3 million living in cities that are not participating in the program (the remaining residents of the United States live outside of cities). The

economic footprint of cities participating in the Tree City USA program is larger than that for non-Tree City USA communities because participating cities account for a greater number of urban residents in the United States and have higher per-person spending on urban forestry. Cities participating in the Tree City USA program report an average spending of \$7.37 per resident on urban forestry. Respondents to the survey of non-participating cities reported average spending of \$3.00 per resident. Excluding city spending that is contracted out, annual in-house spending averaged \$5.29 per resident in cities participating in the Tree City USA program and \$1.87 per resident in non-participating cities.

The difference in spending between cities participating in the Tree City USA program and non-participating cities may arise from multiple sources. For participating cities, data on total spending on urban forestry is gathered from the administrative records of the Arbor Day Foundation. Cities that participate in the program gather and report that information to the Arbor Day Foundation on an annual basis. By contrast, data on total spending in non-participating cities was gathered via a special survey. Respondents to that special survey may be compiling spending figures on urban forestry for the first time and may not recognize and report some types of relevant spending. The survey response rate for non-participating cities also was below 20 percent, implying potential for response bias in which responding cities have higher or lower spending than non-responding cities. The first of these two factors would tend to reduce reported spending in the special survey of non-participating cities while the second factor could either increase or reduce it. Nonetheless, the significant gap in per-resident spending on urban forestry likely reflects a higher level of spending in cities that participate in the Tree City USA program. That higher level of spending may mean cities that devote more resources to urban forestry are more likely to participate the Tree City USA program, and may also reflect that participating in the Tree City USA program encourages cities to spending more on urban forestry.

Table 3.3 shows the overall direct economic footprint of urban forestry in 2017. The overall footprint across both private sector and public sector activity and participating universities and utilities was \$35.5 billion including \$15.9 billion in employee compensation spread across 337,000 jobs.

Table 3.3: 2017 Overall Direct Economic Footprint of Urban Forestry

Industry or Government Agency	Direct Footprint Output (Millions \$)	Direct Footprint Employee Compensation (Millions \$)	Direct Footprint Employment
Private Sector	\$34,259.6	\$15,180.4	322,931
Local Government, University or Utility	\$1,186.1	\$748.8	14,313
Total	\$35,445.7	\$15,929.2	337,244

Source: Bureau of Business Research calculations

B. Multiplier and Total Economic Footprint

The IMPLAN model is used to calculate economic multipliers for private sector industries, cities and counties, as well as universities and utilities which are part of the Tree Campus USA and Tree Line USA programs of the Arbor Day Foundation.⁴ Economic multipliers show the ratio of total economic activity in each industry to direct economic activity. Economic multipliers were provided by IMPLAN for output (i.e., direct sales and services), employee compensation and employment. Output is a measure of the value of business sales or agency spending. Business sales reflect purchased inputs and the new value-added by firms through the production process. Employee compensation is a component of output, reflecting the compensation to labor involved in the production process. Employment refers to the full-time and part-time jobs associated with production.

Table 3.4 below shows the national direct, multiplier and total economic footprint for each private sector industry involved in urban forestry in terms of direct sales and services. Nationwide, the total economic footprint of private sector urban forestry was \$61.9 billion in 2017. Approximately 45 percent of the footprint was due to the multiplier influencing other industries throughout the economy. Looking at individual industries, landscaping services accounts for the majority of the total economic footprint. Specifically, \$44.6 billion, or nearly three-quarters of the total private sector economic footprint, is due to landscaping services. Remaining private sectors that grow, distribute, and design the placement of urban trees and forests collectively have a \$17.3 billion annual economic footprint.

Table 3.4: 2017 Total Economic Footprint of Urban Forestry by Private Sector Industry

Industry (NAICS)	Direct Economic Footprint Output (Millions \$)	Multiplier Economic Footprint Output (Millions \$)	Total Economic Footprint Output (Millions \$)
Nursery and Tree Products (111421)	\$2,617.0	\$2,105.6	\$4,722.6
Support Activities for Forestry (11531)	\$354.8	\$295.5	\$650.3
Nursery and Florist Wholesale (42493)	\$2,426.6	\$1,846.3	\$4,273.0
Lawn and Garden Equipment and Supply Stores (4442)	\$1,693.0	\$1,472.8	\$3,165.9
Landscape Architecture Services (54132)	\$2,093.7	\$2,388.6	\$4,482.3
Landscaping Services (56173)	\$25,074.5	\$19,510.2	\$44,584.7
Total	\$34,259.6	\$27,619.1	\$61,878.7

Source: UNL Bureau of Business Research calculations

Table 3.5 shows the direct, multiplier and total economic footprint from Tree City USA program communities, other city governments, county governments, Tree Campus USA universities, and Tree Line USA utilities. Nationwide, the total economic footprint of urban forestry in public sector agencies was \$2.1 billion in 2017. More than 3,500 cities and towns are recognized

⁴ For local government, universities and utilities, spending is broken down into four components, with multipliers applied to each component: tree service activities, management, utility spending, and spending on tree service equipment.

through the Tree City USA program of the Arbor Day Foundation; these communities had the largest public sector footprint. The 155 utilities nationwide that are enrolled in the Tree Line USA program had the second largest economic footprint.

Table 3.5: 2017 Total Economic Footprint of Urban Forestry in Local Government and Participating Universities and Utilities

Government Agency	Direct Economic Footprint Output (Millions \$)	Multiplier Economic Footprint Output (Millions \$)	Total Economic Footprint Output (Millions \$)
Tree City USA Cities & Towns	\$688.2	\$520.4	\$1,208.5
Other Cities	\$117.8	\$92.4	\$210.2
County Governments	\$52.1	\$40.4	\$92.5
Tree Campus USA Universities	\$33.7	\$25.5	\$59.3
Tree Line USA Utilities	\$294.3	\$216.8	\$511.1
Total	\$1,186.1	\$895.5	\$2,081.5

Source: Bureau of Business Research calculations

Table 3.6 shows the combined economic footprint of urban forestry in 2017. The combined footprint across both private sector, local government and select university and utility urban forestry activities was \$64.0 billion. The multiplier footprint was approximately 80 percent of the direct footprint.

Table 3.6: 2017 Total Economic Footprint of Urban Forestry

Industry or Government Agency	Direct Economic Footprint Output (Millions \$)	Multiplier Economic Footprint Output (Millions \$)	Total Economic Footprint Output (Millions \$)
Private Sector	\$34,259.6	\$27,619.1	\$61,878.7
Local Government, University or Utility	\$1,186.1	\$895.5	\$2,081.5
Total	\$35,445.7	\$28,514.5	\$63,960.3

Source: Bureau of Business Research calculations

Table 3.7 shows the direct, multiplier and total labor market footprint for each private sector industry involved in urban forestry. The labor market footprint is measured via both employee compensation and employment. Nationwide, the total employee compensation footprint of private sector urban forestry was \$23.9 billion in 2017. Approximately 64 percent of the total employee compensation footprint is due to the direct footprint with 36 percent due to the multiplier. The total employment footprint of private sector urban forestry was 475,000 in 2017. Approximately 68 percent of the total employment footprint is due to the direct footprint. Landscaping services account for \$15.9 billion, or two-thirds, of the total private sector employee compensation, and a similar share of the employment footprint. The remaining private sectors that grow, distribute, and design the placement of urban trees and forests have an \$8 billion annual employee compensation footprint and an approximate employment footprint of 172,000 jobs.

Table 3.7: 2017 Total Labor Market Footprint of Urban Forestry by Private Sector Industry

Industry	Employee Compensation Footprint (Millions \$)			Employment		
	Direct	Multiplier	Total	Direct	Multiplier	Total
Nursery and Tree Products	\$1,315.8	\$977.6	\$2,293.4	35,585	23,503	59,087
Support Activities for Forestry	\$322.0	\$97.4	\$419.4	4,745	1,173	5,918
Nursery and Florist Wholesale	\$1,135.3	\$883.1	\$2,018.4	20,272	24,283	44,555
Lawn and Garden Equipment and Supply Stores	\$748.7	\$565.2	\$1,313.9	19,440	12,035	31,474
Landscape Architecture Services	\$1,089.7	\$843.3	\$1,933.0	13,421	17,866	31,287
Landscaping Services	\$10,568.8	\$5,328.2	\$15,897.0	229,469	72,760	302,229
Total	\$15,180.4	\$8,694.8	\$23,875.2	322,931	151,619	474,550

Source: UNL Bureau of Business Research calculations

Table 3.8 shows the total labor market footprint of local governments, Tree Campus USA universities, and Tree Line USA utilities. The total employee compensation footprint in 2017 was \$1.2 billion spread across 27,000 jobs. Fifty-three percent of employment and 63 percent of employee compensation is due to the direct footprint. Communities that participate in the Tree City USA program account for the largest portion of the employment and employee compensation impact.

Table 3.8: 2017 Total Labor Market Footprint of Urban Forestry in Local Government and Participating Universities and Utilities

Industry	Employee Compensation Footprint (Millions \$)			Employment		
	Direct	Multiplier	Total	Direct	Multiplier	Total
Tree City USA Cities & Towns	\$492.1	\$205.5	\$697.6	8,773	3,436	12,209
Other Cities	\$84.9	\$42.2	\$127.1	1,833	684	2,517
County Governments	\$30.5	\$15.4	\$45.8	660	246	906
Tree Campus USA Universities	\$25.8	\$11.5	\$37.3	573	184	757
Tree Line USA Utilities	\$115.4	\$171.9	\$287.3	2,473	8,222	10,693
Total	\$748.8	\$446.4	\$1,195.2	14,313	12,769	27,082

Source: Bureau of Business Research calculations

Table 3.9 shows the combined labor market footprint of urban forestry in 2017. The combined employee compensation footprint was \$25.1 billion. The combined employment footprint was 502,000.

Table 3.9: 2017 Total Labor Market Footprint of Urban Forestry

Industry	Employee Compensation Footprint (Millions \$)			Employment		
	Direct	Multiplier	Total	Direct	Multiplier	Total
Private Sector	\$15,180.4	\$8,694.8	\$23,875.2	322,931	151,619	474,550
Local Government, University or Utility	\$748.8	\$446.4	\$1,195.2	14,313	12,769	27,082
Total	\$15,929.2	\$9,141.2	\$25,070.3	337,244	164,398	501,633

Source: Bureau of Business Research calculations

C. Quality-of-Life Benefits

Trees in the urban landscape deliver multiple benefits. Tree cover impacts property values. It helps conserve energy, provides shade and privacy, screens visual affronts from undesirable land uses, enhances landscape aesthetics, and supports wildlife. Property values, however, reflect only the value of trees to the owners of property. Trees also provide external benefits to society, including protection from erosion and water runoff and health benefits to people through sequestration of carbon and capturing other airborne emissions. The current study was able to estimate the internal property value benefits for homeowners as well as the external benefits to the public from pollution abatement and flood mitigation.

The benefit for homeowners, as measured through property values, is estimated based on a count of urban homes in each state, average tree coverage on private property, and a review of literature quantifying the relationship between tree cover and property values. The external benefits to society from urban forestry flow from pollution abatement and flood mitigation. External benefits for each state are calculated using the i-Tree Landscape web application developed by the USDA Forest Service. A detailed discussion of the methodology for estimating the quality-of-life benefits of urban forests is provided in Appendix 1.

The annual value of quality-of-life benefits are reported in Table 3.10. Tree cover in the United States is found to have increased the value of private homes by \$604.2 billion in 2017. This property value contribution is the present value of the annual services that trees provide to homeowners in future years such as aesthetic value, shade and related energy cost savings.⁵ That amount of annual services can be calculated using discounting, that is, by determining the (inflation-adjusted) annual value of tree services associated with a \$604.2 billion increase in property values.⁶ The finding is that \$31.5 billion worth of annual tree services over a 50-year lifespan for adult trees would generate \$604.2 million in property values. This value is calculated using a 5% real discount rate which is appropriate for investments with moderate risk. There is a moderate risk that an adult tree would die or otherwise need to be replaced during its lifespan.

⁵ This is similar to the idea that the price of a home reflects the value of living in that home during future years.

⁶ The time value of money refers to the notion that a dollar earned a future year is less valuable than a dollar earned in the current year. This must be true because a dollar earned in the current year could be invested and on average would have a higher value in future years.

The \$31.5 billion in annual benefits to homeowners are supplemented by environmental benefits from urban trees, which flow to all members of society. The annual benefits to society from environmental benefits such as carbon sequestration, reduced air pollution and runoff was \$73.4 billion in 2017. The combined annual economic benefits of urban forestry from both sources is \$105.0 billion.

Table 3.10: Economic Benefits of U.S. Urban Forestry

Economic Benefit	Value
Property Value Impact (measured in 2017)	\$604,167.4 million
Implied Annual Value of Tree Services to Property Owners	\$31,518.4 million
Annual Value of Pollution and Runoff Mitigation (2017)	\$73,436.5 million
Total Annual Value	\$104,954.9 million

Source: Bureau of Business Research calculations utilizing the i-Tree Landscape web application

4. State Economic Footprint and Quality-of-Life Benefits

State values for economic footprint and quality-of-life benefits can be estimated using the same methodological approach employed at the national level. Estimates for each state and the District of Columbia are presented below.

A. Direct Economic Footprint

Table 4.1 below reports on the direct economic footprint of urban forestry by state in private industries, local governments and participating universities and utilities. The 2017 economic footprint is provided for direct sales, employee compensation and employment. The footprint of urban forestry by state largely follow known patterns for population and employment. California, New York, Texas and Florida have the largest footprint. This pattern makes sense given that landscaping services is the largest urban forestry industry and California, Florida, New York and Texas have the largest number of housing units and businesses sites. Some states, such as Oregon, also have a larger direct footprint because of a specialization in nurseries to raise and sell trees over a multi-state geography.

Regional patterns also are a factor, as is seen in Figure 4.1, which displays 2017 ratios of urban forestry direct sales per capita for each of the 50 states and the District of Columbia. Per capita direct sales and employment also are provided for states in Table 1 of Appendix 2. The states with the largest economic footprint on a per capita basis are found in the Northeast, coastal Northwest and industrial Midwest of the country. Northeast states with a large per capita footprint include Delaware, New Hampshire, Massachusetts, Connecticut, Vermont, Maine, New York and Pennsylvania. Oregon and Washington represent the coastal Northwest while the industrial Midwest is represented by Ohio and Illinois. Alabama and North Carolina are two Southern states in the top half of the ranking but most Southern states are ranked towards the bottom as are most inter-mountain West states such as Arizona, Idaho, Nevada, New Mexico, Utah and Wyoming.

Table 4.2 examines the economic footprint in terms of direct sales and services by specific industry or local government and for participating utilities and universities. Similar figures for employee compensation and employment are included in Tables 2 and 3 in Appendix 2. National patterns regarding industry composition are also evident in state data. Landscaping services accounts for the majority of the economic footprint of urban forestry in most states. Communities that are part of the Tree City USA program account for the largest share of local government urban forestry activity. Utilities that are part of the Tree Line USA program also have a significant direct economic footprint in many cases. Results also show evidence of a specialization in nursery and tree production in select states. Oregon ranks third in tree production direct sales and services, behind only California and Florida but ahead of the much larger state of Texas. Oregon is a center of tree production for urban forestry. While Oregon stands out, other states see some specialization in tree production for urban forestry. New Jersey ranks fifth despite having only the eleventh-largest population of any state.

Table 4.1: 2017 Overall Direct Economic Footprint of Urban Forestry by State

State	Direct Footprint Output (Millions \$)	Direct Footprint Employee Compensation (Millions \$)	Direct Footprint Employment
Alabama	\$604.4	\$267.9	6,296
Alaska	\$35.9	\$16.4	385
Arizona	\$528.8	\$241.3	6,014
Arkansas	\$103.6	\$50.2	1,212
California	\$4,006.6	\$1,982.9	40,610
Colorado	\$695.7	\$330.2	6,236
Connecticut	\$615.2	\$265.2	5,123
Delaware	\$269.5	\$129.3	2,604
Dist. of Columbia	\$28.5	\$15.8	207
Florida	\$2,228.5	\$991.8	23,499
Georgia	\$629.2	\$265.7	5,997
Hawaii	\$158.1	\$78.8	1,733
Idaho	\$143.3	\$62.3	1,527
Illinois	\$1,921.9	\$891.9	15,920
Indiana	\$570.9	\$259.7	5,951
Iowa	\$303.6	\$123.9	2,752
Kansas	\$356.5	\$172.0	3,835
Kentucky	\$351.8	\$133.5	3,145
Louisiana	\$241.2	\$92.6	2,328
Maine	\$210.3	\$87.7	1,903
Maryland	\$842.7	\$394.8	8,523
Massachusetts	\$1,233.3	\$540.6	8,934
Michigan	\$1,044.9	\$454.2	9,689
Minnesota	\$571.6	\$254.0	5,127
Mississippi	\$156.3	\$62.0	1,618
Missouri	\$477.8	\$227.5	5,337
Montana	\$57.1	\$25.2	553
Nebraska	\$153.0	\$63.1	1,522
Nevada	\$145.9	\$71.7	1,687
New Hampshire	\$263.1	\$114.9	2,471
New Jersey	\$1,061.1	\$431.2	8,617
New Mexico	\$100.0	\$51.8	1,231
New York	\$3,049.9	\$1,292.3	23,011
North Carolina	\$1,138.2	\$484.9	11,238
North Dakota	\$56.0	\$24.0	516
Ohio	\$1,574.6	\$693.3	15,353
Oklahoma	\$467.6	\$220.5	5,333
Oregon	\$810.8	\$415.2	8,949
Pennsylvania	\$1,788.9	\$744.7	15,394
Rhode Island	\$110.4	\$51.0	963
South Carolina	\$261.2	\$118.0	2,896
South Dakota	\$53.3	\$22.3	508
Tennessee	\$578.1	\$246.5	5,935
Texas	\$2,589.9	\$1,129.2	25,009
Utah	\$177.3	\$78.3	1,922
Vermont	\$98.7	\$42.8	796
Virginia	\$1,004.9	\$472.9	10,605
Washington	\$977.1	\$484.2	10,055
West Virginia	\$37.4	\$18.0	460
Wisconsin	\$525.9	\$225.8	5,133
Wyoming	\$35.4	\$15.2	585

Source: Bureau of Business Research calculations.

Figure 4.1: Urban Forestry 2017 Direct Output Per Capita by State

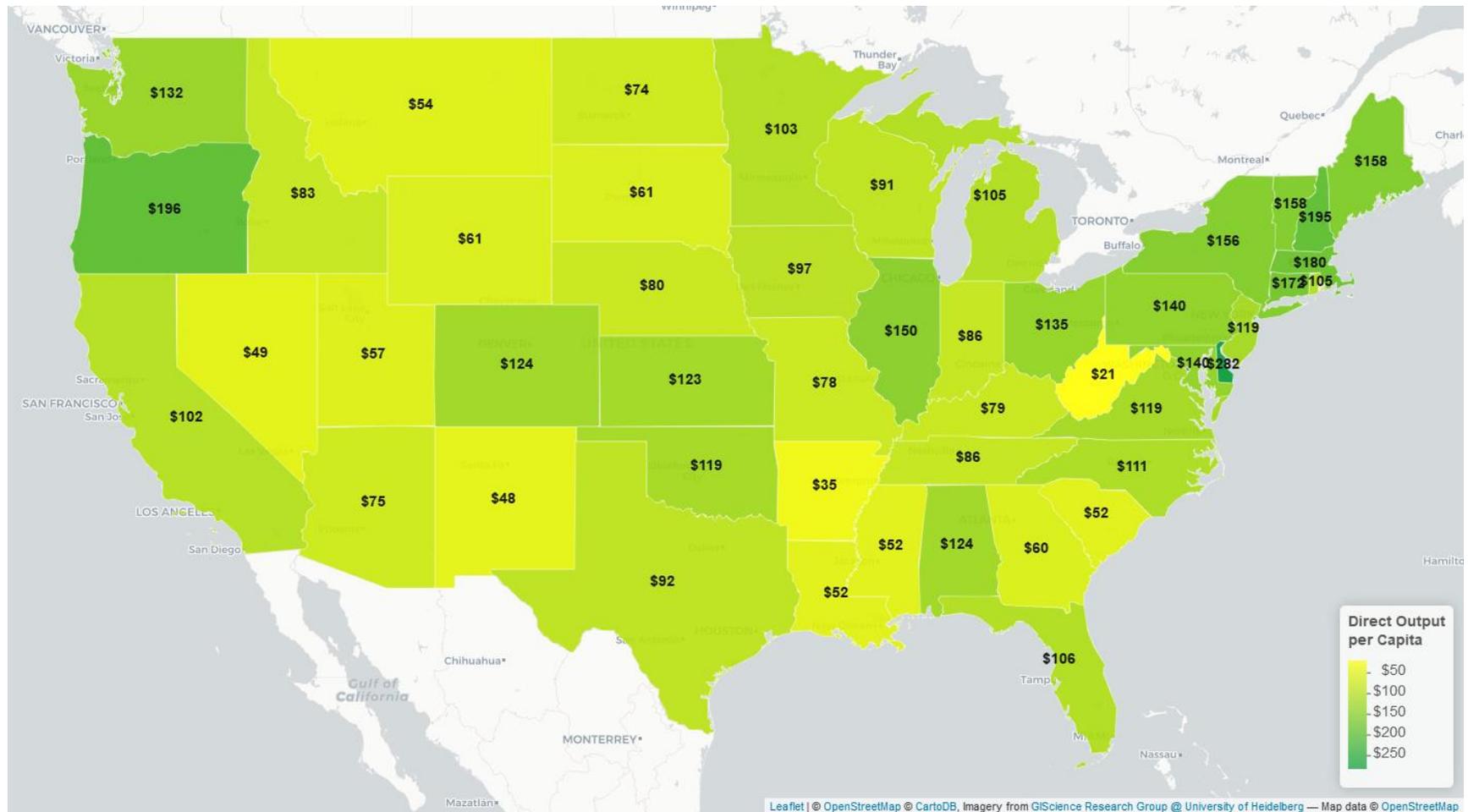


Table 4.2: 2017 Direct Economic Footprint of Urban Forestry by Industry or Government in States (Millions \$)

State	Private – Nursery and Tree Products	Private – Support Activities for Forestry	Private – Nursery and Florist Wholesalers	Private – Lawn & Garden Equipment and Supply Stores	Private – Landscape Architecture Services	Private – Landscaping Services	Public – Tree City USA	Public – Other Cities	Public – Counties	Mixed – Tree Campus USA	Mixed – Tree Line USA
Alabama	\$41.2	\$7.7	\$28.8	\$22.9	\$5.2	\$476.5	\$13.4	\$1.7	\$0.8	\$1.3	\$5.1
Alaska	\$0.6	\$0.1	\$0.3	\$1.1	\$1.2	\$30.4	\$0.9	\$0.3	\$0.1	\$0.1	\$0.7
Arizona	\$64.1	\$3.4	\$33.8	\$30.3	\$48.4	\$328.9	\$7.4	\$2.3	\$1.1	\$0.3	\$8.8
Arkansas	\$2.7	\$2.2	\$3.7	\$12.4	\$2.0	\$74.8	\$3.5	\$1.5	\$0.5	\$0.1	\$0.3
California	\$501.3	\$82.0	\$322.5	\$190.1	\$447.0	\$2,319.4	\$79.6	\$22.3	\$6.3	\$1.3	\$34.8
Colorado	\$37.8	\$7.6	\$12.6	\$59.8	\$96.1	\$461.2	\$17.1	\$1.2	\$0.8	\$0.6	\$0.9
Connecticut	\$45.9	\$1.0	\$22.7	\$23.9	\$19.6	\$494.3	\$5.2	\$1.4	\$0.6	\$0.7	\$0.0
Delaware	\$6.0	\$0.1	\$0.8	\$5.9	\$6.2	\$247.1	\$0.8	\$0.3	\$0.2	\$0.0	\$2.2
Dist. of Columbia	\$0.0	\$0.0	\$6.9	\$0.6	\$8.6	\$4.7	\$6.3	\$0.0	\$0.0	\$0.2	\$1.2
Florida	\$386.0	\$31.1	\$289.5	\$52.2	\$146.0	\$1,247.8	\$47.4	\$8.0	\$3.3	\$3.2	\$14.0
Georgia	\$71.4	\$9.5	\$48.1	\$31.5	\$47.7	\$390.7	\$15.0	\$2.5	\$1.6	\$1.3	\$9.8
Hawaii	\$12.1	\$0.6	\$2.3	\$0.6	\$15.2	\$120.3	\$6.6	\$0.2	\$0.2	\$0.0	\$0.0
Idaho	\$17.5	\$2.7	\$1.8	\$9.8	\$8.3	\$97.4	\$3.3	\$0.2	\$0.3	\$0.0	\$2.1
Illinois	\$61.5	\$2.0	\$371.5	\$48.5	\$86.3	\$1,270.6	\$56.1	\$6.1	\$2.1	\$2.0	\$15.2
Indiana	\$15.0	\$0.9	\$17.6	\$20.3	\$14.5	\$483.4	\$10.3	\$2.6	\$1.1	\$0.8	\$4.4
Iowa	\$6.6	\$0.4	\$4.9	\$9.4	\$7.9	\$260.3	\$6.8	\$1.2	\$0.5	\$0.8	\$5.0
Kansas	\$5.7	\$0.2	\$7.6	\$12.6	\$6.1	\$306.1	\$14.0	\$0.6	\$0.5	\$0.4	\$2.7
Kentucky	\$7.5	\$0.6	\$20.3	\$36.2	\$8.3	\$270.2	\$4.3	\$1.4	\$0.7	\$1.7	\$0.6
Louisiana	\$47.5	\$2.1	\$4.6	\$24.7	\$15.0	\$123.1	\$8.9	\$2.5	\$0.7	\$0.6	\$11.4
Maine	\$2.8	\$0.2	\$3.0	\$8.8	\$4.7	\$186.3	\$1.2	\$0.4	\$0.2	\$0.0	\$2.5
Maryland	\$43.8	\$1.0	\$116.4	\$40.8	\$39.0	\$583.9	\$15.8	\$0.4	\$1.0	\$0.5	\$0.0
Massachusetts	\$15.3	\$3.6	\$82.6	\$57.3	\$125.5	\$927.7	\$18.3	\$1.4	\$1.1	\$0.6	\$0.0
Michigan	\$71.0	\$3.4	\$102.1	\$48.7	\$31.0	\$765.0	\$18.0	\$2.7	\$1.6	\$1.1	\$0.4
Minnesota	\$35.4	\$2.6	\$36.7	\$23.5	\$23.7	\$413.0	\$20.9	\$2.1	\$1.0	\$0.1	\$12.6
Mississippi	\$11.6	\$2.3	\$10.8	\$12.7	\$2.1	\$113.3	\$1.0	\$1.8	\$0.5	\$0.2	\$0.0
Missouri	\$13.0	\$2.4	\$6.7	\$23.9	\$17.9	\$382.0	\$13.3	\$2.1	\$1.2	\$0.4	\$14.9

Table 4.2: 2017 Direct Economic Footprint of Urban Forestry by Industry or Government in States (Millions \$) (Continued)

State	Private – Nursery and Tree Products	Private – Support Activities for Forestry	Private – Nursery & Florist Wholesalers	Private – Lawn & Garden Equipment and Supply Stores	Private – Landscape Architecture Services	Private – Landscaping Services	Public – Tree City USA	Public – Other Cities	Public – Counties	Mixed – Tree Campus USA	Mixed – Tree Line USA
Montana	\$3.8	\$5.1	\$0.5	\$7.1	\$4.4	\$33.6	\$2.0	\$0.3	\$0.2	\$0.1	\$0.0
Nebraska	\$7.9	\$0.3	\$3.4	\$8.6	\$3.6	\$122.3	\$3.3	\$0.3	\$0.2	\$0.8	\$2.4
Nevada	\$5.1	\$0.4	\$6.8	\$42.7	\$10.1	\$75.9	\$2.2	\$1.8	\$0.5	\$0.5	\$0.0
New Hampshire	\$1.5	\$1.2	\$3.8	\$14.7	\$4.6	\$233.8	\$3.0	\$0.3	\$0.2	\$0.0	\$0.0
New Jersey	\$106.9	\$0.3	\$70.9	\$55.1	\$55.4	\$744.7	\$21.9	\$1.7	\$1.9	\$0.1	\$2.2
New Mexico	\$5.1	\$7.1	\$11.5	\$11.8	\$5.6	\$56.3	\$0.9	\$1.4	\$0.3	\$0.0	\$0.0
New York	\$53.9	\$2.9	\$78.8	\$87.2	\$164.1	\$2,573.6	\$46.6	\$4.8	\$3.2	\$2.6	\$32.1
North Carolina	\$102.1	\$9.9	\$55.0	\$59.9	\$69.2	\$814.2	\$22.5	\$2.6	\$1.6	\$0.8	\$0.4
North Dakota	\$1.1	\$0.0	\$0.4	\$2.4	\$1.8	\$44.5	\$4.2	\$0.1	\$0.1	\$0.1	\$1.3
Ohio	\$78.0	\$3.8	\$72.5	\$78.4	\$21.3	\$1,268.9	\$20.3	\$4.4	\$1.9	\$1.2	\$23.8
Oklahoma	\$16.4	\$16.0	\$76.5	\$22.2	\$7.6	\$316.0	\$3.8	\$1.9	\$0.6	\$0.6	\$6.0
Oregon	\$286.6	\$87.4	\$44.8	\$22.9	\$31.1	\$319.3	\$9.4	\$1.3	\$0.6	\$0.3	\$7.1
Pennsylvania	\$44.8	\$6.6	\$62.1	\$56.1	\$74.2	\$1,516.8	\$12.2	\$4.7	\$2.0	\$1.5	\$7.9
Rhode Island	\$4.7	\$0.0	\$8.2	\$7.8	\$3.5	\$84.2	\$1.6	\$0.2	\$0.2	\$0.0	\$0.0
South Carolina	\$29.8	\$5.2	\$17.3	\$26.2	\$23.7	\$150.5	\$5.5	\$1.7	\$0.7	\$0.5	\$0.0
South Dakota	\$1.9	\$0.0	\$4.9	\$2.4	\$2.9	\$38.1	\$2.3	\$0.3	\$0.1	\$0.4	\$0.0
Tennessee	\$59.9	\$6.1	\$12.8	\$37.2	\$25.7	\$410.9	\$16.8	\$2.0	\$1.0	\$0.6	\$5.2
Texas	\$115.0	\$7.5	\$152.2	\$166.4	\$211.7	\$1,845.7	\$48.1	\$11.6	\$4.5	\$2.9	\$24.4
Utah	\$4.2	\$1.5	\$8.3	\$20.5	\$18.0	\$115.4	\$6.8	\$1.1	\$0.5	\$0.4	\$0.5
Vermont	\$1.6	\$0.7	\$1.3	\$4.4	\$4.7	\$84.8	\$0.6	\$0.2	\$0.1	\$0.3	\$0.0
Virginia	\$52.4	\$4.2	\$39.1	\$59.9	\$52.2	\$766.1	\$15.4	\$2.3	\$1.3	\$1.0	\$11.0
Washington	\$64.6	\$15.2	\$117.0	\$46.6	\$43.2	\$653.1	\$18.6	\$3.3	\$1.2	\$0.5	\$13.9
West Virginia	\$1.0	\$0.1	\$3.5	\$5.4	\$1.2	\$24.6	\$0.5	\$0.9	\$0.3	\$0.0	\$0.0
Wisconsin	\$45.4	\$3.4	\$15.1	\$37.0	\$18.0	\$374.6	\$23.2	\$1.4	\$0.9	\$0.1	\$6.8
Wyoming	\$0.0	\$0.0	\$1.3	\$1.5	\$2.6	\$28.3	\$1.5	\$0.1	\$0.1	\$0.0	\$0.0

Source: Bureau of Business Research calculations

B. Multiplier and Total Economic Footprint

Table 4.3 shows the 2017 total economic footprint of urban forestry in each state as well as the labor market footprint in terms of employee compensation and employment. As with the direct footprint, the largest total economic footprint is in California and Florida. New York and Texas are in the next group of states. Note that New York has higher employee compensation than Florida, consistent with higher employee compensation per worker in the Empire State. In terms of regional factors, more trees are maintained in the Northeast part of the country which may be why the economic footprint is larger in states such as New York, Pennsylvania and New Jersey. The total economic and labor market footprint is also smaller in states in the inter-mountain West and Southwest even when those states have logging activities within mountainous regions.

Figure 4.2 provides total urban forestry output per capita for each of the 50 states and the District of Columbia in 2017. The total sales and employment footprint per capita also is provided for states in Table 4 of Appendix 2. As was found for the direct footprint, the largest total economic footprint on a per capita basis is found in the Northeast, coastal Northwest or industrial Midwest of the country. In addition, most Southern states again are ranked towards the bottom as are most inter-mountain West states such as Nevada, New Mexico, Utah and Wyoming.

Table 4.4 examines the total economic footprint in terms of direct sales and services by specific industry. Similar figures for employee compensation and employment are included in Appendix Tables 5 and 6 in Appendix 2. Results in Table 4.4 show that national patterns regarding industry composition hold throughout the country. In most states, landscaping services account for the majority of the total economic footprint of private sector urban forestry. Cities which are participating in the Tree City USA program of the Arbor Day Foundation account for the largest share of the economic footprint from local governments. Results also show evidence of specialization in nursery and tree production in select states such as Oregon and New Jersey.

Table 4.3: 2017 Total Economic Footprint of Urban Forestry by State

State	Total Output Footprint (Millions \$)	Total Employee Compensation Footprint (Millions \$)	Total Employment Footprint
Alabama	\$1,019.7	\$401.3	8,416
Alaska	\$57.1	\$22.6	513
Arizona	\$1,017.7	\$396.7	9,602
Arkansas	\$167.5	\$71.6	1,579
California	\$7,768.3	\$3,326.2	65,514
Colorado	\$1,334.7	\$529.2	9,738
Connecticut	\$1,033.3	\$396.4	6,956
Delaware	\$428.4	\$175.2	3,333
Dist. of Columbia	\$39.2	\$20.7	280
Florida	\$4,368.5	\$1,678.7	39,017
Georgia	\$1,175.7	\$441.5	9,362
Hawaii	\$274.9	\$112.6	2,287
Idaho	\$235.8	\$89.0	2,176
Illinois	\$3,563.4	\$1,441.4	24,892
Indiana	\$988.5	\$384.5	8,119
Iowa	\$491.2	\$174.9	3,725
Kansas	\$587.2	\$243.8	5,141
Kentucky	\$582.5	\$194.5	4,249
Louisiana	\$411.2	\$146.3	3,566
Maine	\$356.9	\$131.7	2,642
Maryland	\$1,396.2	\$584.9	12,129
Massachusetts	\$2,243.7	\$854.0	13,262
Michigan	\$1,904.4	\$707.0	14,590
Minnesota	\$1,076.3	\$414.4	8,018
Mississippi	\$250.2	\$89.0	2,106
Missouri	\$842.1	\$356.1	7,729
Montana	\$96.3	\$35.5	753
Nebraska	\$253.1	\$92.6	2,099
Nevada	\$248.6	\$106.4	2,429
New Hampshire	\$443.5	\$168.2	3,357
New Jersey	\$1,829.0	\$659.8	12,590
New Mexico	\$161.8	\$71.9	1,697
New York	\$5,140.6	\$1,932.1	31,347
North Carolina	\$2,043.3	\$753.4	16,109
North Dakota	\$90.0	\$33.2	706
Ohio	\$2,857.4	\$1,071.9	22,566
Oklahoma	\$803.7	\$338.3	8,033
Oregon	\$1,415.9	\$624.3	13,515
Pennsylvania	\$3,270.2	\$1,178.8	22,218
Rhode Island	\$184.8	\$75.0	1,371
South Carolina	\$445.8	\$196.6	4,148
South Dakota	\$85.6	\$32.4	696
Tennessee	\$997.5	\$400.8	8,135
Texas	\$5,070.8	\$1,936.5	38,657
Utah	\$334.5	\$123.1	2,950
Vermont	\$157.5	\$60.9	1,058
Virginia	\$1,676.5	\$684.9	14,939
Washington	\$1,708.2	\$730.2	14,587
West Virginia	\$57.1	\$25.5	619
Wisconsin	\$922.0	\$334.6	7,394
Wyoming	\$52.0	\$19.4	716

Source: Bureau of Business Research calculations

Figure 4.2: Urban Forestry 2017 Total Output Per Capita by State

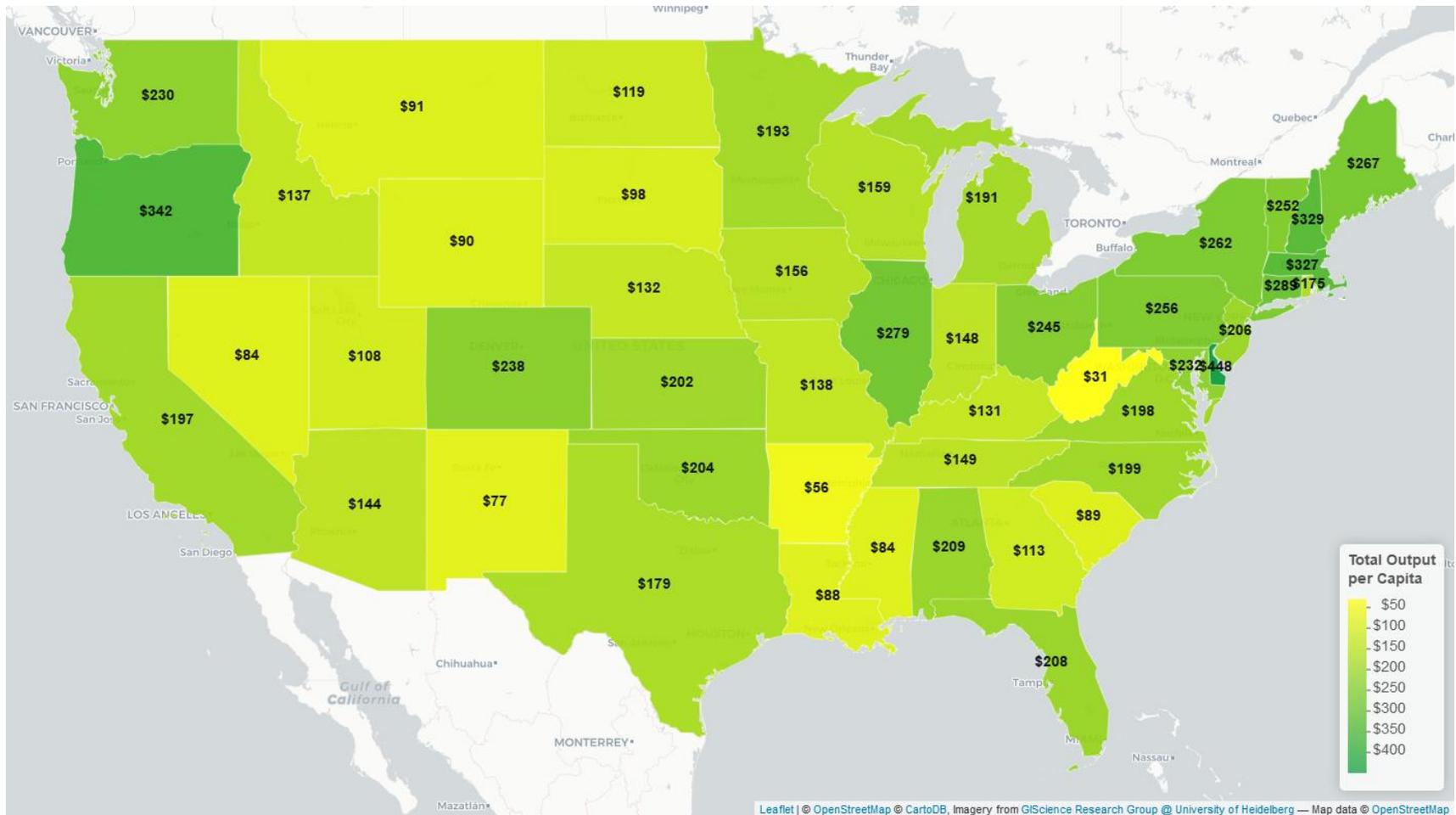


Table 4.4: 2017 Total Economic Footprint of Urban Forestry by Industry or Government in States (Millions \$)

State	Private – Nursery and Tree Products	Private – Support Activities for Forestry	Private – Nursery & Florist Wholesalers	Private – Lawn & Garden Equipment and Supply Stores	Private – Landscape Architecture Services	Private – Landscaping Services	Public – Tree City USA	Public – Other Cities	Public – Counties	Mixed – Tree Campus USA	Mixed – Tree Line USA
Alabama	\$67.8	\$13.0	\$46.6	\$38.9	\$9.7	\$807.3	\$21.9	\$2.8	\$1.3	\$2.1	\$8.3
Alaska	\$0.9	\$0.2	\$0.5	\$1.8	\$2.1	\$47.7	\$1.5	\$0.5	\$0.2	\$0.1	\$1.4
Arizona	\$121.4	\$6.6	\$62.9	\$59.8	\$109.5	\$623.5	\$14.0	\$4.2	\$2.0	\$0.5	\$13.1
Arkansas	\$4.3	\$3.5	\$5.8	\$20.6	\$3.6	\$120.5	\$5.6	\$2.3	\$0.8	\$0.2	\$0.4
California	\$997.6	\$155.7	\$585.1	\$368.6	\$1,000.7	\$4,390.6	\$148.2	\$41.7	\$11.9	\$2.5	\$65.7
Colorado	\$70.0	\$14.5	\$23.8	\$118.5	\$212.5	\$858.2	\$31.0	\$2.2	\$1.4	\$1.2	\$1.4
Connecticut	\$80.7	\$1.6	\$36.2	\$43.5	\$38.5	\$819.8	\$8.6	\$2.2	\$1.0	\$1.2	\$0.0
Delaware	\$9.4	\$0.3	\$1.3	\$10.2	\$11.3	\$391.0	\$1.2	\$0.5	\$0.2	\$0.0	\$3.0
Dist. of Columbia	\$0.0	\$0.0	\$9.2	\$0.8	\$13.0	\$6.3	\$7.7	\$0.0	\$0.0	\$0.3	\$1.9
Florida	\$734.9	\$62.2	\$548.5	\$106.6	\$341.0	\$2,430.9	\$89.9	\$15.3	\$6.4	\$6.2	\$26.5
Georgia	\$129.4	\$17.9	\$86.5	\$61.2	\$105.1	\$724.0	\$26.1	\$4.5	\$3.0	\$2.4	\$15.6
Hawaii	\$21.3	\$1.1	\$3.9	\$1.0	\$29.1	\$206.4	\$11.2	\$0.4	\$0.4	\$0.1	\$0.0
Idaho	\$28.9	\$4.7	\$2.9	\$16.9	\$15.7	\$157.8	\$5.2	\$0.4	\$0.4	\$0.0	\$2.9
Illinois	\$106.1	\$3.8	\$661.4	\$94.6	\$193.2	\$2,354.0	\$102.5	\$11.3	\$3.9	\$3.6	\$29.0
Indiana	\$24.5	\$1.6	\$28.9	\$36.3	\$27.6	\$837.4	\$17.3	\$4.5	\$1.8	\$1.4	\$7.2
Iowa	\$10.1	\$0.6	\$7.8	\$16.2	\$14.4	\$418.4	\$10.9	\$2.0	\$0.7	\$1.2	\$8.8
Kansas	\$8.8	\$0.4	\$12.4	\$21.4	\$11.4	\$500.6	\$24.4	\$1.0	\$0.8	\$0.6	\$5.4
Kentucky	\$11.0	\$1.0	\$32.0	\$62.4	\$15.6	\$446.5	\$6.8	\$2.3	\$1.2	\$2.8	\$0.9
Louisiana	\$76.3	\$3.8	\$7.4	\$42.0	\$28.9	\$209.1	\$16.2	\$4.2	\$1.2	\$1.0	\$21.1
Maine	\$4.9	\$0.4	\$5.1	\$15.9	\$9.3	\$314.0	\$2.1	\$0.7	\$0.4	\$0.0	\$4.0
Maryland	\$68.2	\$1.7	\$193.8	\$72.2	\$76.5	\$954.8	\$25.8	\$0.7	\$1.6	\$0.8	\$0.0
Massachusetts	\$27.5	\$6.6	\$145.9	\$111.4	\$264.8	\$1,649.8	\$32.2	\$2.5	\$2.0	\$1.0	\$0.0
Michigan	\$123.2	\$6.3	\$179.0	\$91.1	\$65.5	\$1,396.3	\$32.5	\$4.9	\$3.0	\$1.9	\$0.8
Minnesota	\$61.7	\$5.1	\$68.0	\$45.9	\$52.4	\$773.6	\$38.7	\$3.9	\$2.0	\$0.1	\$25.0
Mississippi	\$18.3	\$3.8	\$16.4	\$20.5	\$3.7	\$182.0	\$1.6	\$2.9	\$0.8	\$0.2	\$0.0
Missouri	\$21.5	\$2.9	\$11.9	\$45.0	\$36.5	\$667.2	\$23.1	\$3.6	\$2.1	\$0.7	\$26.1

Table 4.4: 2017 Economic Footprint of Urban Forestry by Industry or Government in States (Millions \$) (Continued)

State	Private – Nursery and Tree Products	Private – Support Activities for Forestry	Private – Nursery & Florist Wholesalers	Private – Lawn & Garden Equipment and Supply Stores	Private – Landscape Architecture Services	Private – Landscaping Services	Public – Tree City USA	Public – Other Cities	Public – Counties	Mixed – Tree Campus USA	Mixed – Tree Line USA
Montana	\$5.9	\$5.8	\$0.7	\$12.6	\$8.4	\$55.6	\$3.3	\$0.5	\$0.3	\$0.2	\$0.0
Nebraska	\$12.5	\$0.4	\$5.7	\$15.3	\$6.9	\$201.6	\$5.2	\$0.5	\$0.4	\$1.3	\$3.1
Nevada	\$7.9	\$0.5	\$11.5	\$75.5	\$19.6	\$125.2	\$3.7	\$3.0	\$0.8	\$0.8	\$0.0
New Hampshire	\$2.5	\$1.5	\$6.5	\$27.0	\$9.1	\$390.2	\$5.2	\$0.4	\$0.4	\$0.1	\$0.0
New Jersey	\$178.2	\$0.4	\$121.5	\$101.8	\$113.6	\$1,266.5	\$36.9	\$2.9	\$3.2	\$0.2	\$3.7
New Mexico	\$8.2	\$7.8	\$18.1	\$19.3	\$9.9	\$90.3	\$1.4	\$2.2	\$0.5	\$0.0	\$0.0
New York	\$86.2	\$3.5	\$133.1	\$156.0	\$331.7	\$4,285.3	\$76.8	\$8.0	\$5.2	\$4.4	\$48.7
North Carolina	\$185.6	\$11.5	\$96.3	\$113.2	\$143.3	\$1,439.0	\$38.3	\$4.5	\$2.8	\$1.4	\$0.8
North Dakota	\$1.6	\$0.0	\$0.6	\$4.0	\$3.1	\$71.0	\$6.6	\$0.2	\$0.2	\$0.2	\$2.5
Ohio	\$133.4	\$5.1	\$131.2	\$148.3	\$45.2	\$2,298.9	\$36.5	\$8.0	\$3.4	\$2.2	\$42.8
Oklahoma	\$27.6	\$18.0	\$124.8	\$39.6	\$14.6	\$546.1	\$6.6	\$3.2	\$1.1	\$1.1	\$11.3
Oregon	\$499.1	\$101.1	\$78.0	\$43.5	\$62.3	\$549.1	\$15.6	\$2.2	\$1.0	\$0.6	\$10.5
Pennsylvania	\$77.0	\$9.0	\$109.4	\$109.4	\$156.5	\$2,753.6	\$21.9	\$8.5	\$3.7	\$2.7	\$14.7
Rhode Island	\$7.4	\$0.0	\$13.5	\$13.8	\$6.9	\$139.9	\$2.6	\$0.3	\$0.3	\$0.0	\$0.0
South Carolina	\$46.6	\$5.8	\$28.3	\$46.1	\$46.2	\$255.2	\$9.6	\$2.8	\$1.3	\$0.8	\$0.1
South Dakota	\$2.9	\$0.1	\$7.8	\$4.1	\$5.1	\$60.7	\$3.6	\$0.4	\$0.2	\$0.7	\$0.0
Tennessee	\$92.8	\$7.2	\$21.6	\$67.5	\$52.1	\$714.0	\$25.6	\$3.4	\$1.7	\$1.0	\$7.2
Texas	\$235.6	\$9.2	\$268.0	\$324.9	\$476.1	\$3,580.7	\$89.6	\$22.0	\$8.5	\$5.6	\$45.4
Utah	\$7.5	\$1.8	\$15.4	\$41.3	\$38.9	\$211.4	\$12.6	\$2.0	\$0.9	\$0.7	\$1.0
Vermont	\$2.4	\$0.8	\$2.1	\$7.5	\$8.8	\$133.7	\$1.0	\$0.3	\$0.2	\$0.5	\$0.0
Virginia	\$80.8	\$4.8	\$65.8	\$107.7	\$102.4	\$1,261.5	\$25.0	\$3.9	\$2.2	\$1.6	\$18.6
Washington	\$115.2	\$18.2	\$196.8	\$84.5	\$87.7	\$1,137.3	\$31.4	\$5.6	\$2.0	\$0.8	\$19.5
West Virginia	\$1.4	\$0.1	\$5.2	\$8.4	\$2.0	\$37.4	\$0.7	\$1.3	\$0.5	\$0.0	\$0.0
Wisconsin	\$75.6	\$4.1	\$26.4	\$68.9	\$35.9	\$651.8	\$40.5	\$2.4	\$1.6	\$0.2	\$12.6
Wyoming	\$0.1	\$0.0	\$1.9	\$2.3	\$4.1	\$41.0	\$2.2	\$0.2	\$0.1	\$0.0	\$0.0

Source: Bureau of Business Research calculations

C. Quality-of-Life Benefits

The property value benefits of urban forests for homeowners in each state are shown in Table 4.5. The first column shows the statewide contribution of tree cover to property values, ranging from \$38.7 billion in Florida to \$15.0 million in Hawaii. Table 7 in Appendix 2 breaks down these impacts by urban and rural counties within each state. In some states, all of the value is in urban counties. In Vermont, 84 percent of the property value due to tree cover comes from rural counties. On average in the U.S., 78 percent of the impact of tree cover on property values occurs in urban counties.

The remaining columns of Table 4.5 show the dollar-value of external benefits that trees in each state have on carbon sequestration, pollution mitigation, and reducing erosion and runoff (hydrology). In Alabama, for example, sequestration of carbon by urban trees has a \$3.4 billion impact; in Alaska, urban trees have almost no impact. The value of pollution mitigation ranges from minimal in Alaska to \$344 million in Georgia. The hydrology impact is the smallest of the three, peaking at \$254 million. Tables A2.7 and A2.8 in Appendix 2 break down these impacts by urban and rural counties within each state. Note that for four states, there were no non-urban counties.

Table 4.6 reports the annualized value of tree services for homeowners over the coming decades. Increases in property values are used to estimate the annual value of tree services, using the same approach that was utilized for national data. Annual benefits to homeowners are reported in the first column. The total value of external environmental benefits in each state are repeated in the second column of the table. In the last column, annual values to homeowners and external benefits are summed to estimate total annual quality-of-life benefits for each state. These values range \$7.8 billion per year in Texas to \$68 million in smaller states like North Dakota.

Table 4.5: Statewide Impact of Tree Cover on Property Values and Environmental Amenities

State	Property Value (Millions \$)	Value (Millions \$) from iTree			
		Carbon	Pollution	Hydrology	Total
Alabama	\$17,995	\$3,367	\$193	\$114	\$3,675
Alaska	\$29	\$0	\$0	\$0	\$0
Arizona	\$877	\$181	\$3	\$1	\$184
Arkansas	\$9,984	\$2,439	\$71	\$84	\$2,594
California	\$17,570	\$3,023	\$136	\$62	\$3,221
Colorado	\$6,989	\$577	\$16	\$10	\$603
Connecticut	\$10,285	\$285	\$122	\$64	\$472
Delaware	\$2,110	\$73	\$13	\$6	\$93
Dist. of Columbia	\$805	\$2	\$6	\$1	\$9
Florida	\$38,657	\$3,889	\$303	\$240	\$4,432
Georgia	\$33,688	\$4,141	\$344	\$254	\$4,739
Hawaii	\$15	\$0	\$0	\$0	\$0
Idaho	\$1,564	\$740	\$22	\$15	\$777
Illinois	\$10,725	\$500	\$111	\$66	\$676
Indiana	\$7,092	\$576	\$47	\$29	\$652
Iowa	\$1,624	\$295	\$7	\$11	\$314
Kansas	\$1,991	\$328	\$12	\$12	\$351
Kentucky	\$12,123	\$1,235	\$83	\$71	\$1,388
Louisiana	\$12,387	\$2,981	\$110	\$130	\$3,222
Maine	\$6,701	\$1,474	\$55	\$54	\$1,583
Maryland	\$15,417	\$407	\$114	\$46	\$567
Massachusetts	\$21,426	\$390	\$249	\$160	\$799
Michigan	\$20,380	\$1,799	\$123	\$125	\$2,047
Minnesota	\$5,301	\$760	\$26	\$26	\$812
Mississippi	\$11,356	\$3,983	\$110	\$84	\$4,176
Missouri	\$10,370	\$935	\$91	\$67	\$1,094
Montana	\$1,628	\$874	\$28	\$25	\$927
Nebraska	\$472	\$114	\$3	\$3	\$121
Nevada	\$549	\$254	\$9	\$2	\$265
New Hampshire	\$6,833	\$388	\$36	\$35	\$458
New Jersey	\$20,267	\$298	\$173	\$71	\$543
New Mexico	\$1,508	\$592	\$11	\$3	\$606
New York	\$33,723	\$1,484	\$302	\$135	\$1,922
North Carolina	\$36,577	\$3,921	\$248	\$157	\$4,326
North Dakota	\$108	\$60	\$2	\$1	\$62
Ohio	\$21,698	\$954	\$202	\$118	\$1,274
Oklahoma	\$5,823	\$1,106	\$62	\$33	\$1,201
Oregon	\$11,579	\$1,785	\$115	\$101	\$2,001
Pennsylvania	\$37,746	\$1,780	\$313	\$125	\$2,218
Rhode Island	\$3,667	\$56	\$45	\$26	\$127
South Carolina	\$20,470	\$2,498	\$114	\$85	\$2,698
South Dakota	\$509	\$58	\$4	\$2	\$63
Tennessee	\$20,513	\$1,467	\$154	\$107	\$1,727
Texas	\$30,786	\$5,624	\$297	\$231	\$6,153
Utah	\$3,238	\$390	\$21	\$13	\$423
Vermont	\$2,923	\$363	\$15	\$23	\$400
Virginia	\$27,033	\$2,208	\$151	\$110	\$2,469
Washington	\$21,099	\$1,588	\$83	\$119	\$1,790
West Virginia	\$9,036	\$1,264	\$48	\$42	\$1,354
Wisconsin	\$8,738	\$1,295	\$49	\$41	\$1,386
Wyoming	\$184	\$433	\$4	\$3	\$440
Total	\$604,167	\$65,234	\$4,857	\$3,345	\$73,437

Source: Bureau of Business Research calculations

Table 4.6: 2017 Annual Quality-of-Life Benefits by State

State	Annual Tree Services for Homeowners (Millions \$)	Total Environmental Externalities (Millions \$)	Annual Quality-of-life Benefits (Millions \$)
Alabama	\$939	\$3,675	\$4,614
Alaska	\$2	\$0	\$2
Arizona	\$46	\$184	\$230
Arkansas	\$521	\$2,594	\$3,115
California	\$917	\$3,221	\$4,138
Colorado	\$365	\$603	\$967
Connecticut	\$537	\$472	\$1,009
Delaware	\$110	\$93	\$203
Dist. of Columbia	\$42	\$9	\$51
Florida	\$2,017	\$4,432	\$6,449
Georgia	\$1,757	\$4,739	\$6,496
Hawaii	\$1	\$0	\$1
Idaho	\$82	\$777	\$859
Illinois	\$560	\$676	\$1,236
Indiana	\$370	\$652	\$1,022
Iowa	\$85	\$314	\$399
Kansas	\$104	\$351	\$455
Kentucky	\$632	\$1,388	\$2,020
Louisiana	\$646	\$3,222	\$3,868
Maine	\$350	\$1,583	\$1,933
Maryland	\$804	\$567	\$1,371
Massachusetts	\$1,118	\$799	\$1,917
Michigan	\$1,063	\$2,047	\$3,110
Minnesota	\$277	\$812	\$1,089
Mississippi	\$592	\$4,176	\$4,769
Missouri	\$541	\$1,094	\$1,635
Montana	\$85	\$927	\$1,012
Nebraska	\$25	\$121	\$145
Nevada	\$29	\$265	\$293
New Hampshire	\$356	\$458	\$815
New Jersey	\$1,057	\$543	\$1,600
New Mexico	\$79	\$606	\$685
New York	\$1,759	\$1,922	\$3,681
North Carolina	\$1,908	\$4,326	\$6,234
North Dakota	\$6	\$62	\$68
Ohio	\$1,132	\$1,274	\$2,406
Oklahoma	\$304	\$1,201	\$1,505
Oregon	\$604	\$2,001	\$2,605
Pennsylvania	\$1,969	\$2,218	\$4,187
Rhode Island	\$191	\$127	\$318
South Carolina	\$1,068	\$2,698	\$3,766
South Dakota	\$27	\$63	\$90
Tennessee	\$1,070	\$1,727	\$2,798
Texas	\$1,606	\$6,153	\$7,759
Utah	\$169	\$423	\$592
Vermont	\$152	\$400	\$553
Virginia	\$1,410	\$2,469	\$3,879
Washington	\$1,101	\$1,790	\$2,891
West Virginia	\$471	\$1,354	\$1,826
Wisconsin	\$456	\$1,386	\$1,842
Wyoming	\$10	\$440	\$450

Source: Bureau of Business Research calculations

5. Conclusion and Future Studies

Urban forestry and urban forests contribute to the economy and quality-of-life in communities across the United States. This study estimates the economic footprint of urban forestry employment, sales, and services and quality-of-life contributions of urban forests in all 50 states, the District of Columbia, and the nation for the year 2017. Nationwide, the total economic footprint of urban forestry in 2017 was \$64.0 billion. The footprint includes employee compensation of \$25.1 billion spread over an estimated 502,000 jobs. The largest state economic footprint is seen in California, Florida, New York, and Texas, which have the largest volume of households and businesses which require tree services. The largest economic footprint on a per capita basis is found in states in the Northeast, coastal Northwest, or industrial Midwest of the country.

In terms of quality-of-life, tree cover in the United States is found to increase the value of private homes in urban areas by \$604.2 billion in 2017. This property value increase to homeowners is valued at \$31.5 billion per year. There are also annual benefits to society at large from the sequestration of carbon, pollution mitigation and hydrology. These benefits total \$73.4 billion in 2017. The total annual value of quality-of-life benefits from urban forests is \$105.0 billion.

The study also generates estimates of the 2017 economic footprint and quality-of-life benefits for each individual state and the District of Columbia. Results of the study as a result are useful for comparing economic contributions of urban forestry across states for that snapshot in time. Study results also can be used to project how the economic footprint of urban forestry would change in response to an increase in urban forestry spending across U.S. states.

A. Recommendations for Future Studies

To develop the estimates contained in this report, this study drew on a rich set of data resources available from the United States Bureau of Census and the Arbor Day Foundation.

The Bureau of Census conducts and releases the Economic Census. That census provides state level information on employment, sales, payroll, and product lines of businesses in detailed industries every five years, including industries where businesses are most heavily involved in urban forestry. The study utilized the 2017 Economic Census.

The study also drew on administrative data and survey contracts from the Arbor Day Foundation. The Tree City USA, Tree Line USA and Tree Campus USA programs engage with individuals and units in city governments, utilities, and universities and regularly collect administrative data on urban forestry activity. This administrative data are supplemented through surveys, often using the contacts that the Arbor Day Foundation has already developed.

These data resources enable the development of a comprehensive report every five years on the value of urban forestry activities and benefits in all 50 states and the nation. The use of a consistent methodology also fosters comparisons among states. However, the current study is not meant to replace studies conducted at the state or multi-state level by other organizations. These individual state or regional studies may be designed to incorporate the unique features of each state's urban forestry sector.

The current study methodology also can be improved over time. In particular, future studies of urban forestry in the U.S. can address several limitations of the current study.

- 1) The 2017 Economic Census did not update sales by product line at the state level in key urban forestry industries. As a result, the research team needed to apply 2012 product lines shares to 2017 industry data. In the future, the Bureau of Census may expand its state level product line series to include more industries, including key service industries involved in urban forestry. Alternatively, researchers may be able to develop state or multi-state level product line information in relevant industries through modeling or by gaining access to Economic Census micro-level data.
- 2) Survey response rates in the current study were likely impacted by the COVID-19 Pandemic. Surveys were conducted primarily during 2020 and many city, county, university and utility employees were working from home during this period, or otherwise had their employment situation disrupted. These circumstances limited survey response, particularly through mid-2020. The research team was able to increase survey response by extending the survey period into early 2021 and by re-contacting survey recipients; however, future surveys under more normalized conditions would achieve even higher response rates.
- 3) While the study benefited greatly from contacts and administrative data available due to the Tree City USA, Tree Line USA and Tree Campus USA programs, researchers lacked data and contact information for county governments and for non-participating cities, utilities, and universities. The lack of contact information reduced survey response rates for county governments and non-participating cities. The lack of contacts also meant that the study could only measure urban forestry activity in universities and utilities participating in Arbor Day Foundation programs. In preparation for a future study, the research team should work with professional associations and take other steps to develop lists of local government, utility and university officials who manage urban forestry programs.

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Appendix 1. Economic Impact Methodology

This appendix describes the methodology to evaluate the economic footprint and economic benefits of urban forestry in each state and the District of Columbia. Economic footprint analysis is based on the sales, employee compensation and employment in private sector industries and units of local government involved in urban forestry. The footprint reflects both direct economic activity within those industries and agencies and the spillover of economic activity to other industries within the economy. Economic benefits reflect the quality-of-life and cost-of-living benefits of trees to homeowners as well as environmental benefits to society as whole.

Economic footprint analysis examines the level of economic activity in six private sector industries, city and county governments, and universities and utilities that participate in programs of the Arbor Day Foundation. The direct employment and sales in these industries and agencies represent the bulk of the economic footprint from urban forestry on state economies. Private industries include tree producers such as nurseries and support businesses, wholesale and retail businesses that sell trees, landscaping services, and landscape architects. Local government agencies involved in urban forestry included city governments and county governments. Universities and electric utilities are sometimes part of the public sector but can also be part of private industries.

The industries described above are the key players in the production, sales and use of trees and other urban forestry products. However, some have product lines which extend beyond urban forestry. Nursery and garden stores, for example, sell a variety of garden products. Urban forestry is a significant portion of sales but not the entirety of sales. The current study works to isolate the portion of industry sales that is directly related to urban forestry. That portion of industry activity is used to assess the footprint of urban forestry in each state's economy.

Urban forestry activity in each state itself relies on support from the local economy and its economic base, with economic base being the industries which export goods and services around the country and the world. Nonetheless, it is worthwhile to measure the economic footprint of urban forestry industries, which can be measured in terms of businesses sales, employee compensation, and employment in each state. There also can be merit in looking at the additional economic activity in other industries which are patronized by urban forestry businesses and patronized by the employees of urban forestry businesses, as well as local government agencies, universities and utilities involved in urban forestry, and their employees.

A. Economic Footprint Due to Private Industry Activity

The economic assessment requires information on industry direct sales and services (business sales), employee compensation (wages and benefits) and employment for private sector industries involved with urban forestry. Information for most private sector urban forestry industries is provided by 2017 Economic Census or the 2017 Census of Agriculture. The National Compensation Survey and Quarterly Census of Employment and Wages from the United States Bureau of Labor Statistics are others. These sources provide information on the direct economic footprint of private sector urban forestry businesses.

Industry Information from the 2017 Economic Census

Data on the level of state economic activity in four of six private industries is gathered based on the 2017 U.S. Economic Census, from the U.S. Census Bureau. The Economic Census provides state information by detailed industry every five years for key economic variables such as industry sales, employee compensation and employment. The data source also provides information, often at the state level, about the share of industry sales in alternative product lines. The latter feature is useful to determine the share of activity in each industry which relates to urban forestry. The trove of detailed data is only available each five years from the U.S. Economic Census. Data from the 2017 U.S. Economic Census is being released in late 2019 and during 2020 and is therefore newly available to create a comprehensive and comparable measure on the economic footprint of urban forestry businesses in each of the 50 states and the District of Columbia.

For some states, the 2017 Economic Census information is not disclosed by the Bureau of Census for industry sales, wages and employment, and data are taken from another source. That alternative source is the Quarterly Census of Employment and Wages from the United States Department of Labor. That source provides estimates of employment and wages. Annual sales are estimated, when necessary, by utilizing the ratio of annual sales to annual wages in surrounding states. That ratio was applied to state wages to provide an estimate of annual sales. Table A1.1 shows the states for each industry where employment, annual wages or annual sales were not disclosed and needed to be estimated.

Table A1.1: States where 2017 Industry Sales, Employment and Wages Were Estimated

Industry (NAICS)	States Where Annual Sales Was Estimated	States Where Employment and Annual Wages Are Estimated
Nursery and Florist Wholesale (NAICS 42493)	Delaware, District of Columbia, Montana, New Mexico, North Dakota, Rhode Island, Wyoming	Wyoming
Lawn and Garden Equipment and Supply Stores (4442)	None	None
Landscape Architecture Services (54132)	Delaware, Iowa, West Virginia, Wyoming	None
Landscaping Services (56173)	None	None

Industry Information from the 2017 Census of Agriculture and Quarterly Census of Employment and Wages

Data for two of the six private industries—Nursery and Tree Production and Support Activities for Forestry—were not available in the Economic Census. Alternative sources, however, are available for state data in both industries. Industry employment and annual wage in 2017 for both industries is available from the Quarterly Census of Employment Wages from the United States Department of Agriculture. Sales for 2017 in the Nursery and Tree Production industry is available from the 2017 Census of Agriculture. Sales for 2017 in the Support Activities for Forestry industry in each state are estimated based on ratios between industry direct sales and services and wages available from IMPLAN.

For some states, employment and wage data were not disclosed in the Quarterly Census of Employment and Wages. In these cases, employment and wages are estimated using the following procedure. Where disclosed, data on employment and wages in the previous or following year, or both, are used to provide estimates, adjusting for the difference in the number of industry establishments in those years and 2017. When employment and wage data are not disclosed in these other years, employment and wages are estimated based on the jobs per establishment and wages per establishment in neighboring states. Table A1.2 shows the states where employment and wages is estimated for each industry.

In three states, 2017 Census of Agriculture information on sales is not disclosed by U.S. Department of Agriculture for individual states. In these states, annual sales are estimated by utilizing the ratio of annual sales to annual wages in surrounding states. Table A1.2 also shows the states where annual sales are estimated.

Table A1.2: States where 2017 Agricultural Industry Sales, Employment and Wages Were Estimated

Industry (NAICS)	States Where Annual Sales Was Estimated	States Where Employment and Annual Wages Are Estimated
Nursery and Tree Products (111421)	Nevada, West Virginia, Wyoming	Alaska, Kansas, Kentucky, Nevada, Wyoming
Support Activity For Forestry (11531)	None	Alaska, Connecticut, Delaware, Hawaii, Kansas, Nebraska, Nevada,

Employee Benefits from the National Compensation Survey of the United States Department of Labor

Employee compensation includes employee benefits as well as wages. Benefit information is not available from the 2017 Economic Census or the Quarterly Census of Employment and Wages. However, benefit estimates are available for most industries from the National Compensation Survey of the United States Department of Labor. That survey gathers information on the value of annual benefits and the value of annual wages at the national level in industry groups such as wholesale trade, retail trade, professional services and administrative services. A ratio of benefits to wages is estimated for each of these industry groups and then applied, when feasible, to the state wages in each of the six private sector industries. The result is an estimate of the value of industry benefits in each state. Measured wages and estimated benefits are summed to yield employee compensation.

Table A1.3 shows the primary source of employee benefit information for each industry. The table also summarizes sources for annual sales, annual wage and employment. Note that the National Compensation Survey does not cover the Nursery and Tree Production and Support Activity for Forestry industries. The Support Activity for Forestry industry is composed of professional, scientific and technical services activities such as estimating timber, forest management plans, pest control, re-forestation and timber valuation.⁷ As a result, benefit rates for the professional, scientific and technical services industry are used for this industry. Benefit rates for Nursery and Tree Production activity are based on university research on benefit rates in agricultural industries.

⁷ The industry also includes firefighting, but these activities would be associated with logging activity rather than urban forestry.

Table A1.3: Sources of State Data on Industry Sales, Wages, Employment and Benefits

Industry (NAICS)	Annual Sales	Annual Wage	Employment	Benefit
Nursery and Tree Products (111421)	Census of Agriculture	Quarterly Census of Employment and Wages	Quarterly Census of Employment and Wages	University of Iowa
Support Activity For Forestry (11531)	IMPLAN	Quarterly Census of Employment and Wages	Quarterly Census of Employment and Wages	National Compensation Survey
Nursery and Florist Wholesale (NAICS 42493)	Economic Census	Economic Census	Economic Census	National Compensation Survey
Lawn and Garden Equipment (4442)	Economic Census	Economic Census	Economic Census	National Compensation Survey
Landscape Architecture Services (54132)	Economic Census	Economic Census	Economic Census	National Compensation Survey
Landscaping Services (56173)	Economic Census	Economic Census	Economic Census	National Compensation Survey

Share of Industry Activity That is Urban Forestry

For many of these six private sector industries, the Economic Census series also provides information on the share of sales by product market. The information is not yet available from the 2017 Economic Census but is available from the 2012 Economic Census. Specific product markets relate to urban forestry, with categories listed in the Table 2.4. Wholesale, retail and landscaping services relate to trees and outdoor nursery stock are related to urban forestry rather than logging. The share of sales in the listed product categories is provided for each state in the Economic Census.⁸ The median share of sales among states is listed in the Table below. The median share for the Nursery and Wholesale Florist industry was 37.5 percent but just 10.0 percent for the Lawn and Garden Equipment and Supplies stores. The median state share for landscaping services was 31.1 percent. These sales shares are applied to total industry activity in each state to yield industry activity related to urban forestry. The share of sales related urban forestry is multiplied by business sales (i.e., direct sales and services), value-added, employee compensation and employment. The result is an estimate of the amount of industry activity in each state related to urban forestry for each of the six private sector industries.

⁸ In the handful of cases it was not provided, it is estimated based on the average share of sales in surrounding states.

Table A1.4: Sources of Urban Forestry Shares for Each Private Sector Industry

Industry (NAICS)	Name of Tree-Related Product Market	Median Share of Industry Sales Which is Tree-Related	Source
Nursery and Tree Products (111421)	Tree-Related	44.4%	University of Florida ¹
Support Activity For Forestry (11531)	Urban Forestry Share of Total Forestry	43.7% ²	Quarterly Census of Employment and Wages
Nursery and Florist Wholesale (NAICS 42493)	Live Trees, Plants and Nursery Stock	37.5%	Economic Census
Lawn and Garden Equipment and Supply Stores (4442)	Outdoor Nursery Stock	10.0%	Economic Census
Landscape Architecture Services (54132)	Tree-Related	50.3%	University of Florida ¹
Landscaping Services (56173)	Exterior Landscaping Services – Tree, Ornamental Plant, Shrub Services	31.1%	Economic Census

¹Hodges, Alan and Christina Court, 2019. Economic Contributions of Urban Forestry in Florida in 2017, University of Florida – IFAS, Food & Resource Economics Department (May). Available at <https://fred.ifas.ufl.edu/DEStudio/html/EconomicImpactAnalysis/EconomicContributionsFloridaUrbanForestry.pdf>

²Share of services related to urban forestry relative to logging in each state. Estimates for each state based on the share of private sector tree-related wages in urban forestry. Wages related to urban forestry in the Nursery and Tree Production (111421) sector was divided by the summation of those wages and wages in the state logging industry. Wage data were taken from the Quarterly Census of Employment and Wages.

The share of sales by product category was not provided in the Economic Census for Landscape Architecture services but was estimated based on surveys in a recent study by the University of Florida (Hodges and Court, 2019). The estimated share of sales of 50.3 percent in that study is applied to all states. The University of Florida source also was used to estimate that 44.4 percent of Nursery and Tree production is tree-related, rather than related to plant sales. That share is also applied to all states.

The relevant shares for Support Activities for Forestry were estimated. Such support activities could be related to growing trees for primarily urban use in a tree-farm or nursery setting, or services for the logging sector. Shares were assigned to urban forestry in each states by comparing the total activity, as measured by wages, in nursery and tree production (tree-related portion only) and logging. Specifically, wages related to urban forestry in the Nursery and Tree Production (111421) sector was divided by the summation of those wages and wages in the state logging industry. The median share for states was 43.7 percent. Wage data were taken from the Quarterly Census of Employment and Wages.

B. Economic Footprint Due to Local Government, Utility and University Activity

Spending on urban forestry is undertaken by local government agencies such as municipalities and counties as well as at utilities and universities. This spending accounts for a meaningful portion of the economic activity associated with urban and community forestry, as local government plants, maintains, removes, and manages trees within their jurisdiction. It is therefore critical to consider such spending in any economic impact analysis of urban and community forestry.

To obtain the data necessary to measure the impact of local government, utility and university spending on urban and community forestry in the United States, it was necessary to conduct a novel data collection effort. The research team chose to focus its efforts on obtaining 2017 public urban forestry spending information from municipalities, counties, and college campuses. Data from utilities were also obtained, as these organizations fill a mixed, public and private role in the states. Together, these data sources allow for an estimation of the public-sector portion of the impact of urban and community forestry in the United States.

Working with the Arbor Day Foundation, the UNL BBR obtained administrative records for municipalities that are part of the Tree City USA program. The Arbor Day Foundation also provided data on colleges and universities that are part of the Tree Campus USA program and utilities that are part of the Tree Line USA program. Beyond those three sources of data, the UNL BBR sought data from communities that are not part of the Tree City USA program and counties that may have spent dollars on urban and community forestry. The UNL BBR piloted the survey with several governmental agencies prior to administration of the survey. More detail on each of these efforts is provided below.

In general, the survey data from local governments, utilities and universities were used to compute levels of urban forestry spending by these entities in each state. Because we measured the extent to which public agencies relied on contractors, this proportion of spending was subtracted from total spending as this would be considered private expenditures likely captured by Economic Census data. A per capita amount of urban forestry spending was computed for these local government entities.

Tree City USA Communities. Administrative records for 3,552 Tree City USA communities were obtained from the Arbor Day Foundation. Data included the contact information for the forester (or equivalent position) in each community. This information was used to deliver an online survey via Qualtrics.com. The administrative records also included 2017 spending information for each community across the following areas: tree planting, tree removal, tree maintenance, tree management, utility spending in relation to tree activities, and “other” spending. Because researchers already possessed administrative spending data, it was not necessary to ask each survey respondent to provide spending figures. Instead, respondents were presented with their spending total across each area and were then asked to break that spending down into relevant percentages. For example, if a community spent \$1,000,000 in tree planting activities in 2017, the respondent was asked to report how those \$1,000,000 dollars were spent, in terms of percentages, across the following categories: labor, planting equipment, chemicals and fertilizer, purchasing of trees, and “other”. Similar logic was followed for tree removal, tree maintenance, tree management, utility spending in relation to tree activities, and “other” spending. Because we know that many communities contract work out to private firms, we also asked respondents to indicate the total amount of tree-related work that is contracted out. This percentage was applied to total spending amounts and subtracted from the proportion of spending on urban forestry undertaken by public agencies. As noted above, Qualtrics survey software was used to host and

distribute the online survey. A copy of the survey can be found here:

https://unlcba.az1.qualtrics.com/jfe/preview/SV_d6HX4x7KzACw0u1?Q_CHL=preview&Q_SurveyVersionID=current.

The survey was distributed generally following the best practices outlined by Dillman, Smyth, and Christian (2014). Specifically, 3,547 recipients received a pre-notification about the survey in May 2020. Of these 3,547 emails, 32 emails failed, and another 186 emails bounced back. This left a final number of 3,329 individuals who received the survey invitation. Approximately one week later, the same individuals received a survey invitation that included the link to the survey. Approximately three weeks later, a reminder email including a link to complete the survey was distributed to all invitees. During the fall and summer, the UNL BBR continued to monitor the data collection related to tree cities and other public entities. Unsatisfied with the number of responses received, the BBR, in consultation with the Arbor Day Foundation, decided to send one final survey reminder to individuals in January 2021.

In total, the survey was accessed 1,545 times. After screening for individuals who accessed the survey multiple times, we see that 1,219 unique individuals accessed the survey (36.6% of the total). However, not all respondents input data into the survey fields; some individuals “clicked through” the survey without completing any fields. After dropping individuals who did not input any data, we were left with 839 individuals who provided data (25.5% of the total).

Arbor Day Foundation Tree City Survey

Start of Block: Default Question Block

Q1

The purpose of this study is estimate the economic benefits of urban forests and forestry in the United States. The study is being conducted by the University of Nebraska-Lincoln Bureau of Business Research in collaboration with the Arbor Day Foundation. Because localities put forth considerable effort toward planting, maintaining, and removing trees in urban areas, a large part of this effort is understanding the spending undertaken by municipalities and other local governments. This survey is designed to capture this important information. In the following pages, we will ask you several questions about spending your municipality reported to the Arbor Day Foundation Tree City USA program in 2017.

Again, the results of the study will allow researchers to estimate the economic impact of urban forestry in the U.S. Your participation in the study is critical, as it will allow researchers to obtain the most accurate estimates possible. This information will, in turn, inform policy recommendations and will help educate the public about the importance of urban forestry in the U.S.

Thank you for your willingness to participate in this important study.

Q20 This survey is for $\{e://Field/City\}$, $\{e://Field/State\}$. Please answer accordingly, thank you.

Page Break

Q2 In 2017, you indicated your city spent $\$ \{e://Field/Tree\%20Planting\}$ on Tree Planting activities. To the best of your knowledge, please indicate how these funds were allocated to each of the following categories (based on percentage). Please make sure your percentages add up to 100. If the total spent on Tree Planting is \$0, please skip ahead to next question.

Labor Costs (including supervision and administration) : _____

Planting Equipment : _____

Chemicals and Fertilizers : _____

Purchasing of Trees : _____

Other : _____

Total : _____

Q3 In 2017, you indicated your city spent $\$ \{e://Field/Tree\%20Maintenance\}$ on Tree Maintenance activities. Tree Maintenance activities are tasks you or your contractors perform to keep trees healthy. To the best of your knowledge, please indicate how these funds were allocated to each of the following categories (based on percentage). Please make sure your percentages add up to 100. If the total spent on Tree Maintenance is \$0, please skip ahead to next question.

Labor Costs (including supervision and administration) : _____

Mulch : _____

Chemicals and Fertilizers : _____

Equipment (Saws, Shears, or Other Tools) : _____

Watering : _____

Storm Cleanup : _____

Other : _____

Total : _____

Q4 In 2017, you indicated your city spent $\$ \{e://Field/Tree\%20Removal\}$ on Tree Removal activities. To the best of your knowledge, please indicate how these funds were allocated to each of the following

categories (based on percentage). Please make sure your percentages add up to 100. If the total spent on Tree Removal is \$0, please skip ahead to next question.

Labor Costs : _____
Tree Removal Supplies and Equipment : _____
Stump Removal Supplies and Equipment : _____
Disposal Services : _____
Other : _____
Total : _____

Q5 In 2017, you indicated your city spent $\$ \{e://Field/Utility\}$ on Utility activities in relation to city trees. To the best of your knowledge, please indicate how these funds were allocated to each of the following categories (based on percentage). Please make sure your percentages add up to 100. If the total spent on Utilities is \$0, please skip ahead to next question.

Water : _____
Electric/Power (ex. working to avoid power lines) : _____
Other : _____
Total : _____

Q6 In 2017, you indicated your city spent $\$ \{e://Field/Management\}$ on Tree Management activities. Tree Management activities are all the administrative costs of the program, but also include tree inventory work, report-writing costs, permitting, and meetings not related to tree planting or tree care. To the best of your knowledge, please indicate how these funds were allocated to each of the following categories (based on percentage). Please make sure your percentages add up to 100. If the total spent on Tree Management is \$0, please skip ahead to next question.

Administrative Costs : _____
Tree Inventory Work : _____
Report-Writing Costs : _____
Permitting : _____
Meetings (not related to tree planting or tree care) : _____
Other : _____
Total : _____

Page Break

Q7 Please indicate what percentage of your city's tree-related activities, in 2017, were contracted versus in-house.

Contracted : _____

In-house : _____

Total : _____

Page Break

Q12 In 2017, did your city have a tree canopy goal?

Yes

No

Not Sure

Q13 As of 2020, is your city on track to meet that goal?

Yes

No

Not Sure

No Tree Canopy Goal

Q14 Since 2017, have your city's tree related activities increased or decreased?

- Increased
 - Decreased
 - Not Sure
-

Q15 Since 2017, has economic growth in your city increased or decreased?

- Increased
 - Decreased
 - Not Sure
-

Q22 Thank you for your time in completing this survey, [\\${e://Field/RecipientFirstName}](#)!

End of Block: Default Question Block

Non-Tree City USA Communities. To obtain or estimate spending data on all municipalities in the U.S., it was necessary to gather data from communities beyond just those communities in the Tree City USA program. To our knowledge, no administrative data exist related to public urban forestry spending for these communities. Therefore, a novel data collection effort was warranted. To collect data on these communities, the UNL BBR obtained a list of all places within the 50 states in the U.S. from the U.S. Census Bureau. The survey was designed to elicit information on the following types of 2017 expenditures: tree planting, tree removal, tree maintenance, tree management, and utilities. Respondents were asked to indicate the total amount of tree-related work that is contracted out. A copy of the survey can be found here:

https://unlcba.az1.qualtrics.com/jfe/preview/SV_8hTGfVJ7N4pyFXT?Q_CHL=preview&Q_SurveyVersionID=current.

To identify the survey population, the UNL BBR first removed all communities in the Tree City USA program from the Census Bureau list. Next, the UNL BBR eliminated those communities from the list that were below the population of 10,000 in 2017. The rationale was twofold: 1) communities under 10,000 are unlikely to expend substantial dollars toward urban and community forestry, and 2) it would have been unrealistic to survey nearly 20,000 communities in the U.S. A random sample of 50% of the remaining communities were retained for inclusion into the data collection effort. This process resulted in 650 communities that were targeted to receive the survey invitation. Contact information for personnel in these communities was gathered by the UNL BBR. In general, personnel at parks and recreation departments were targeted.

Once again, the Qualtrics mailer was utilized. A pre-notification was delivered to invitees in June 2020, with a formal survey invitation delivered about a week later. With the initial mailing, 84 emails “bounced back” to the sender. This left 566 communities that received the survey invitation (assuming that the contact information obtained via a public search was for the appropriate person in that locality). A reminder email was delivered in July 2020. Because of the relatively low response rate among this population, additional reminders were delivered in September 2020 and November 2020. To further boost response rates, research assistants at the UNL BBR personally reached out non-respondents via email and telephone during November and December 2020. In the end, 112 individuals opened the survey (19.8% of the total). Of those, 108 (19.1% of the total) input data into the survey form. After adjusting for contracting out, data from responding communities was used to estimate per person, in-house spending on urban forestry for tree planting, tree maintenance, tree removal, tree program management and utilities. Per person spending was used to estimate spending by category in non-responding communities.

Arbor Day Foundation Non-Tree City Survey

Start of Block: Default Question Block

Q24

The purpose of this study is estimate the economic benefits of urban forests and forestry in the United States. The study is being conducted by the University of Nebraska-Lincoln Bureau of Business Research in collaboration with the Arbor Day Foundation Tree City USA Program. Because localities put forth considerable effort toward planting, maintaining, and removing trees in urban areas, a large part of this effort is understanding the spending undertaken by municipalities and other local governments. This survey is designed to capture this important information. In the following pages, we will ask you several questions about spending your municipality may have done in relation to tree activities.

Again, the results of the study will allow researchers to estimate the economic impact of urban forestry in the U.S. Your participation in the study is critical, as it will allow researchers to obtain the most accurate estimates possible. This information will, in turn, inform policy recommendations and will help educate the public about the importance of urban forestry in the U.S.

Thank you for your willingness to participate in this important study.

Page Break

Q1 In 2017 how much did your city spend on Tree Planting activities?

Page Break

Q2 In 2017, you indicated your city spent $\${Q1/ChoiceTextEntryValue}$ on Tree Planting activities. To the best of your knowledge, please indicate how these funds were allocated to each of the following categories (based on percentage). Please make sure your percentages add up to 100. If the total spent on Tree Planting is \$0, please skip ahead to next question.

Labor Costs (including supervision and administration) : _____ (1)

Planting Equipment : _____ (2)

Chemicals and Fertilizers : _____ (3)

Purchasing of Trees : _____ (4)

Other : _____ (5)

Total : _____

Page Break

Q3 In 2017, how much did your city spend on Tree Maintenance activities?

Page Break

Q4 In 2017, you indicated your city spent $\${Q3/ChoiceTextEntryValue}$ on Tree Maintenance. Tree Maintenance activities are tasks you or your contractors perform to keep trees healthy. To the best of your knowledge, please indicate how these funds were allocated to each of the following categories (based on percentage). Please make sure your percentages add up to 100. If the total spent on Tree Maintenance is \$0, please skip ahead to next question.

Labor Costs (including supervision and administration) : _____ (1)

Mulch : _____ (2)

Chemicals and Fertilizers : _____ (3)

Equipment (Saws, Shears, or Other Tools) : _____ (4)

Watering : _____ (5)

Storm Cleanup : _____ (6)

Other : _____ (7)

Total : _____

Page Break

Q5 In 2017, how much did your city spend on Tree Removal activities?

Page Break

Q6 In 2017, you indicated your city spent $\${Q5/ChoiceTextEntryValue}$ on Tree Removal. To the best of your knowledge, please indicate how these funds were allocated to each of the following categories (based on percentage). Please make sure your percentages add up to 100. If the total spent on Tree Removal is \$0, please skip ahead to next question.

Labor Costs : _____ (1)

Tree Removal Supplies and Equipment : _____ (2)

Stump Removal Supplies and Equipment : _____ (3)

Disposal Services : _____ (4)

Other : _____ (5)

Total : _____

Page Break

Q7 In 2017, how much did your city spend on Utility activities in relation to city trees?

Page Break

Q8 In 2017 you indicated your city spent $\${Q7/ChoiceTextEntryValue}$ on Utility activities related to city trees. To the best of your knowledge, please indicate how these funds were allocated to each of the following categories (based on percentage). Please make sure your percentages add up to 100. If the total spent on Utilities is \$0, please skip ahead to next question.

Water : _____ (1)

Electric/Power (ex. working to avoid power lines) : _____ (2)

Administrative Costs : _____ (3)

Other : _____ (4)

Total : _____

Page Break

Q9 In 2017, how much did your city spend on Tree Management activities?

Page Break

Q10 In 2017 you indicated your city spent $\${Q9/ChoiceTextEntryValue}$ on Tree Management activities. Tree Management activities are all the administrative costs of the program, but also include tree inventory work, report-writing costs, permitting, and meetings not related to tree planting or tree care. To the best of your knowledge, please indicate how these funds were allocated to each of the following categories (based on percentage). Please make sure your percentages add up to 100. If the total spent on Tree Management is \$0, please skip ahead to next question.

- Administrative Costs (1)
- Tree Inventory Work (2)
- Report-Writing Costs (3)
- Permitting (4)
- Meetings (not related to tree planting or tree care) (5)

Page Break



Q13 Please indicate what percentage of your city's tree-related activities, in 2017, were contracted versus in-house.

Contracted : _____ (1)

In-house : _____ (2)

Total : _____

Page Break

Q15 In 2017, did your city have a tree canopy goal?

- Yes (1)
 - No (2)
 - Not Sure (3)
-

Q17 As of 2020, is your city on track to meet that goal?

- Yes (1)
 - No (2)
 - Not Sure (3)
 - No Tree Canopy Goal (4)
-

Page Break

Q19 Since 2017, have your city's tree related activities increased or decreased?

- Increased (1)
 - Decreased (2)
 - Not Sure (3)
-

Q21 Since 2017, has economic growth in your city increased or decreased?

- Increased (1)
 - Decreased (2)
 - Not Sure (3)
-

Q20 In 2017, did your city utilize volunteer labor for any Tree Planting, Maintenance, or Removal activities?

- Yes (1)
 - No (2)
-

Q22 If your city did utilize volunteer labor, approximately how many hours of labor were donated by volunteers?

Q23 Thank you for your time in completing this survey!

End of Block: Default Question Block

Counties. While there is likely wide variation in the expenditures of counties toward urban and community forestry in the U.S., it is necessary to obtain this information for a total picture of public spending is to be obtained. No existing public database of county-level spending related to urban forestry exists, so it was necessary to undertake a data collection effort to obtain this information. Much like the non-Tree City USA survey, the survey was designed to elicit information on the following types of expenditures: tree planting, tree removal, tree maintenance, tree management, and utilities. Respondents were asked to indicate the total amount of tree-related work that is contracted out. A copy of the survey can be found here:
https://unlcba.az1.qualtrics.com/jfe/preview/SV_6zZboM64vUvV9k1?Q_CHL=preview&Q_SurveyVersionID=current.

To begin the process of identifying counties to survey, a comprehensive datafile of U.S. counties, parishes, boroughs, and census areas was obtained from the U.S. Census Bureau. A random selection of 50% of these entities was obtained (no stratification by population was conducted). This resulted in 1,508 entities; contact information for these entities was again obtained by the UNL BBR. Parks and recreation personnel were targeted for invitations. A pre-notification was delivered to invitees in June 2020, with a formal survey invitation delivered about a week later; 131 emails “bounced back” through this initial effort. Reminder emails were delivered in July 2020. Because of the relatively low response rate, additional reminder emails were delivered in January 2021. This effort resulted in 208 unique individuals who opened the survey (15.1% of the total). Of those, 103 respondents input data into the survey form (7.5% of the total). After adjusting for contracting out, data from responding counties was used to estimate per person, in-house spending on urban forestry for tree planting, tree maintenance, tree removal, tree program management and utilities. Per person spending was used to estimate spending by category in non-responding counties.

Arbor Day Foundation Tree County Survey

Start of Block: Default Question Block

Q2

The purpose of this study is estimate the economic benefits of urban forests and forestry in the United States. The study is being conducted by the University of Nebraska-Lincoln Bureau of Business Research in collaboration with the Arbor Day Foundation. Because localities put forth considerable effort toward planting, maintaining, and removing trees in urban areas, a large part of this effort is understanding the spending undertaken by counties and other local governments. This survey is designed to capture this important information. In the following pages, we will ask you several questions about spending your county may have done in relation to tree activities in urban areas.

Again, the results of the study will allow researchers to estimate the economic impact of urban forestry in the U.S. Your participation in the study is critical, as it will allow researchers to obtain the most accurate estimates possible. This information will, in turn, inform policy recommendations and will help educate the public about the importance of urban forestry in the U.S.

Thank you for your willingness to participate in this important study.

Page Break

Q3 In 2017 how much did your county spend on Tree Planting activities in urban areas?

Page Break

Q4 In 2017, you indicated your county spent $\${Q3/ChoiceTextEntryValue}$ on Tree Planting activities. To the best of your knowledge, please indicate how these funds were allocated to each of the following categories (based on percentage). Please make sure your percentages add up to 100. If the total spent on Tree Planting is \$0, please skip ahead to next question.

Labor Costs (including supervision and administration) : _____

Planting Equipment : _____

Chemicals and Fertilizers : _____

Purchasing of Trees : _____

Other : _____

Total : _____

Page Break

Q5 In 2017, how much did your county spend on Tree Maintenance activities in urban areas?

Page Break

Q6 In 2017, you indicated your county spent $\${Q5/ChoiceTextEntryValue}$ on Tree Maintenance. Tree Maintenance activities are tasks you or your contractors perform to keep trees healthy. To the best of your knowledge, please indicate how these funds were allocated to each of the following categories (based on percentage). Please make sure your percentages add up to 100. If the total spent on Tree Maintenance is \$0, please skip ahead to next question.

Labor Costs (including supervision and administration) : _____

Mulch : _____

Chemicals and Fertilizers : _____

Equipment (Saws, Shears, or Other Tools) : _____

Watering : _____

Storm Cleanup : _____

Other : _____

Total : _____

Page Break

Q7 In 2017, how much did your county spend on Tree Removal activities in urban areas?

Page Break _____

Q8 In 2017, you indicated your county spent $\${Q7/ChoiceTextEntryValue}$ on Tree Removal. To the best of your knowledge, please indicate how these funds were allocated to each of the following categories (based on percentage). Please make sure your percentages add up to 100. If the total spent on Tree Removal is \$0, please skip ahead to next question.

Labor Costs : _____

Tree Removal Supplies and Equipment : _____

Stump Removal Supplies and Equipment : _____

Disposal Services : _____

Other : _____

Total : _____

Page Break _____

Q9 In 2017, how much did your county spend on Utility activities in relation to county trees in urban areas?

Page Break _____

Q10 In 2017 you indicated your county spent $\${Q9/ChoiceTextEntryValue}$ on Utility activities related to county trees. To the best of your knowledge, please indicate how these funds were allocated to each of the following categories (based on percentage). Please make sure your percentages add up to 100. If the total spent on Utilities is \$0, please skip ahead to next question.

Water : _____

Electric/Power (ex. working to avoid power lines) : _____

Administrative Costs : _____

Other : _____

Total : _____

Page Break

Q11 In 2017, how much did your county spend on Tree Management activities in urban areas?

Page Break

Q12 In 2017 you indicated your county spent $\${Q11/ChoiceTextEntryValue}$ on Tree Management activities. Tree Management activities are all the administrative costs of the program, but also include tree inventory work, report-writing costs, permitting, and meetings not related to tree planting or tree care. To the best of your knowledge, please indicate how these funds were allocated to each of the following categories (based on percentage). Please make sure your percentages add up to 100. If the total spent on Tree Management is \$0, please skip ahead to next question.

- Administrative Costs
- Tree Inventory Work
- Report-Writing Costs
- Permitting
- Meetings (not related to tree planting or tree care)

Page Break



Q13 Please indicate what percentage of your county's tree-related activities, in 2017, were contracted versus in-house.

Contracted : _____

In-house : _____

Total : _____

Page Break

Q14 In 2017, did your county have a tree canopy goal?

Yes

No

Not Sure

Q15 As of 2020, is your county on track to meet that goal?

Yes

No

Not Sure

No Tree Canopy Goal

Page Break

Q16 Since 2017, have your county's tree related activities increased or decreased?

- Increased
 - Decreased
 - Not Sure
-

Q17 Since 2017, has economic growth in your county increased or decreased?

- Increased
 - Decreased
 - Not Sure
-

Q18 In 2017, did your county utilize volunteer labor for any Tree Planting, Maintenance, or Removal activities?

- Yes
 - No
-

Q19 If your county did utilize volunteer labor, approximately how many hours of labor were donated by volunteers?

Q20 Thank you for your time in completing this survey!

End of Block: Default Question Block

Colleges Campuses (Tree Campus USA). Colleges and universities throughout the U.S. work to plant, maintain, and remove trees. Many colleges and campuses are part of the Arbor Day Foundation Tree Campus USA program (now known as Tree Campus Higher Education). The UNL BBR assessed the impact of college and university spending by obtaining Tree Campus USA data from the Arbor Day Foundation. This administrative data yielded information about each campus's level of spending on tree-related activities in 2017, as well as contact information for the campus point of contact. Because the administrative expenditure data were not broken down into spending across categories, the UNL BBR developed a survey that would allow researchers to collect this information. Like other surveys, the questionnaire was designed to collect information about tree planting, tree removal, tree maintenance, tree management, and utilities. Respondents were asked to indicate the total amount of tree-related work that is contracted out. A copy of the survey can be found here:
https://unlcba.az1.qualtrics.com/jfe/preview/SV_8IZOLXqHEZIQ993?Q_CHL=preview&Q_SurveyVersionID=current.

The Arbor Day Foundation provided a list of 368 campuses that were part of the program in 2017, as well as contact information for the appropriate individual on each campus. Qualtrics was used to design and deliver the survey. A survey pre-notification was delivered in June 2020, with a survey invitation delivered a week after. A total of 31 emails "bounced back" in this case. As with other survey efforts, an attempt to increase response rates was made; this was accomplished by sending additional survey reminders in December 2020 and January 2021. In the end, a total of 47 respondents opened the survey and input data into the survey form (14.0%). After adjusting for contracting out, data from responding campuses was used to estimate the percentage of total tree-related spending that occurred in-house on tree planting, tree removal, tree maintenance, tree management and utilities. The percentages for in-house spending were then applied to total spending by non-responding universities which participate in the Tree Campus USA program.

Arbor Day Tree Campus Survey

Start of Block: Default Question Block

Q24

The purpose of this study is estimate the economic benefits of urban forests and forestry in the United States. The study is being conducted by the University of Nebraska-Lincoln Bureau of Business Research in collaboration with the Arbor Day Foundation Tree City USA Program. Because localities put forth considerable effort toward planting, maintaining, and removing trees in urban areas, a large part of this effort is understanding the spending undertaken by municipalities and other local governments, including college campuses. This survey is designed to capture this important information. In the following pages, we will ask you several questions about spending your campus may have done in relation to tree activities. We ask that you please report spending from the 2017 Calendar Year, to align with other data being analyzed as part of this project.

Again, the results of the study will allow researchers to estimate the economic impact of urban forestry in the U.S. Your participation in the study is critical, as it will allow researchers to obtain the most accurate estimates possible. This information will, in turn, inform policy recommendations and will help educate the public about the importance of urban forestry in the U.S.

Thank you for your willingness to participate in this important study.

Page Break

Q1 In 2017 how much did your campus spend on Tree Planting activities?

Page Break

Q2 In 2017, your campus spent $\$ \{Q1/ChoiceTextEntryValue\}$ on Tree Planting activities. To the best of your knowledge, please indicate how these funds were allocated to each of the following categories (based on percentage). Please make sure your percentages add up to 100. If the total spent on Tree Planting is \$0, please skip ahead to next question.

Labor Costs (including supervision and administration) : _____

Planting Equipment : _____

Chemicals and Fertilizers : _____

Purchasing of Trees : _____

Other : _____

Total : _____

Page Break

Q3 In 2017, how much did your campus spend on Tree Maintenance activities?

Page Break

Q4 In 2017, you indicated your city spent $\${Q3/ChoiceTextEntryValue}$ on Tree Maintenance. Tree Maintenance activities are tasks you or your contractors perform to keep trees healthy. To the best of your knowledge, please indicate how these funds were allocated to each of the following categories (based on percentage). Please make sure your percentages add up to 100. If the total spent on Tree Maintenance is \$0, please skip ahead to next question.

Labor Costs (including supervision and administration) : _____

Mulch : _____

Chemicals and Fertilizers : _____

Equipment (Saws, Shears, or Other Tools) : _____

Watering : _____

Storm Cleanup : _____

Other : _____

Total : _____

Page Break

Q5 In 2017, how much did your campus spend on Tree Removal activities?

Page Break

Q6 In 2017, you indicated your city spent $\${Q5/ChoiceTextEntryValue}$ on Tree Removal. To the best of your knowledge, please indicate how these funds were allocated to each of the following categories (based on percentage). Please make sure your percentages add up to 100. If the total spent on Tree Removal is \$0, please skip ahead to next question.

Labor Costs : _____

Tree Removal Supplies and Equipment : _____

Stump Removal Supplies and Equipment : _____

Disposal Services : _____

Other : _____

Total : _____

Page Break

Q7 In 2017, how much did your campus spend on Utility activities in relation to city trees?

Page Break

Q8 In 2017 you indicated your city spent $\${Q7/ChoiceTextEntryValue}$ on Utility activities related to city trees. To the best of your knowledge, please indicate how these funds were allocated to each of the following categories (based on percentage). Please make sure your percentages add up to 100. If the total spent on Utilities is \$0, please skip ahead to next question.

Water : _____

Electric/Power (ex. working to avoid power lines) : _____

Administrative Costs : _____

Other : _____

Total : _____

Page Break

Q9 In 2017, how much did your campus spend on Tree Management activities?

Page Break

Q10 In 2017 you indicated your city spent $\${Q9/ChoiceTextEntryValue}$ on Tree Management activities. Tree Management activities are all the administrative costs of the program, but also include tree inventory work, report-writing costs, permitting, and meetings not related to tree planting or tree care. To the best of your knowledge, please indicate how these funds were allocated to each of the following categories (based on percentage). Please make sure your percentages add up to 100. If the total spent on Tree Management is \$0, please skip ahead to next question.

- Administrative Costs
- Tree Inventory Work
- Report-Writing Costs
- Permitting
- Meetings (not related to tree planting or tree care)

Page Break



Q13 Please indicate what percentage of your campus 's tree-related activities, in 2017, were contracted versus in-house.

Contracted : _____

In-house : _____

Total : _____

Page Break

Q15 In 2017, did your campus have a tree canopy goal?

- Yes
 - No
 - Not Sure
-

Q17 As of 2020, is your campus on track to meet that goal?

- Yes
 - No
 - Not Sure
 - No Tree Canopy Goal
-

Page Break

Q19 Since 2017, have your campus 's tree related activities increased or decreased?

- Increased
 - Decreased
 - Not Sure
-

Q20 In 2017, did your campus utilize volunteer labor for any Tree Planting, Maintenance, or Removal activities?

Yes

No

Q22 If your campus did utilize volunteer labor, approximately how many hours of labor were donated by volunteers?

Q23 Thank you for your time in completing this survey!

End of Block: Default Question Block

Utilities (Tree Line USA). Utilities engage in a variety of vegetation management activities in the U.S. To estimate the impact of this spending, the UNL BBR worked with the Arbor Day Foundation to obtain a list of utilities that are part of the Tree Line USA program. This administrative data contained contact information for those utilities that participate in the program. The list contained 155 utilities that were part of the program in 2017. Once again, the UNL BBR developed a survey designed to capture urban forestry expenditures for this population. However, the survey was slightly less detailed than with other entities. Specifically, utilities were asked to report their expenditures on “tree and vegetation management” and were then asked to break that spending out by labor costs, training, tree planting and education, chemicals and fertilizers, equipment, disposal services, and other. A pre-notification and survey invitation were delivered to invitees in August 2020. A total of 16 emails “bounced back”. Survey reminders were delivered in December 2020 and January 2021. A total of 46 individuals opened the survey invitation and input data into the questionnaire (33.1%). A copy of the survey can be found here:
https://unlcba.az1.qualtrics.com/jfe/preview/SV_1ZdORr0s5FhksJf?Q_CHL=preview&Q_SurveyVersionID=current.

After adjusting for contracting out, data from responding utilities was used to estimate in-house spending per customer on tree and vegetation management. Per customer spending estimates were then applied to non-responding utilities which participate in the Tree Line USA program.

Economic Footprint Analysis. The five surveys yielded estimates of in-house spending on urban forestry in Tree City USA communities, other cities and counties, as well as in utilities and universities that participate in Arbor Day Foundation programs in all 50 states and the District of Columbia. Information also was available in sufficient detail to differentiate between spending on tree services, tree program management, urban forestry equipment and utilities. These in-house spending estimates at the state level were used to make estimates of the economic footprint.

Tree Line USA Survey

Start of Block: Default Question Block

Q3

The purpose of this study is estimate the economic benefits of urban forests and forestry in the United States. The study is being conducted by the University of Nebraska-Lincoln Bureau of Business Research in collaboration with the Arbor Day Foundation. Because utility companies put forth considerable effort toward maintaining and removing trees in urban and developed areas, a large part of this effort is understanding the spending undertaken by utility companies in the U.S. This survey is designed to capture this important information. In this short survey, we will ask you several questions about spending your business reported to the Arbor Day Foundation Tree City USA program in 2017.

Again, the results of the study will allow researchers to estimate the economic impact of urban forestry in the U.S. Your participation in the study is critical, as it will allow researchers to obtain the most accurate estimates possible. This information will, in turn, inform policy recommendations and will help educate the public about the importance of urban forestry in the U.S.

Thank you for your willingness to participate in this important study.

Q10 In 2017, how much did your utility spend on Tree and Vegetation Management activities? Tree and Vegetation Management activities are tasks you or your contractors perform to properly trim, prune, or remove trees around utility assets.



Q9 Please indicate what percentage of your utilities tree-related activities, in 2017, were contracted versus in-house. Please make sure your percentages add up to 100.

Contracted : _____

In-house : _____

Total : _____

Page Break



Q5 In 2017, you indicated your company spent $\${Q10/ChoiceTextEntryValue}$ on Tree and Vegetation Management activities. To the best of your knowledge, please indicate how these funds were allocated to each of the following categories (based on percentage). Please make sure your percentages add up to 100.

Labor Costs (Salaries for employees, supervision, and administration) : _____

Training : _____

Tree Planting and Education (This is the line funding reported on your Tree Line USA application) :

Chemicals and Fertilizers : _____

Equipment (Tree Removal, Stump Removal, Saws, Shears, or Other Tools) : _____

Disposal Services : _____

Other : _____

Total : _____

End of Block: Default Question Block

C. Economic Multipliers

Industry activity related to urban forestry can be described as the direct economic footprint of urban forestry. This direct activity also spills over to the larger economy by supporting spending in other industries. The spillover to other industries occurs for two reasons. First, urban forestry industries purchase supplies and services, sometimes from other businesses within the state. Second, employees of urban forestry businesses spend their paychecks on the various components of household budgets such as housing, food, retail, entertainment and recreation, insurance, transportation, and the like. The magnitude of these spillovers is generally determined by the size of a state's economy. Urban forestry businesses are more likely to purchase supplies from an in-state business if the state economy is larger.

The magnitude of the spillover can be captured with economic multipliers. Economic multipliers show the ratio of total economic activity to the direct economic footprint. A direct sales and services (i.e., business sales) multiplier captures the total economic footprint in each state for every \$1 dollar of direct economic footprint at an urban forestry business. For example, a direct sales and services multiplier of 2.0 would imply that \$10,000 of direct sales and services in an urban forestry business would lead to a total economic footprint of \$20,000: \$10,000 in urban forestry and another \$10,000 in the other industries in the economy. An employee compensation multiplier shows the total compensation footprint for each \$1 of employee compensation at an urban forestry business. An employment multiplier shows the total employment footprint in the state economy for each 1 job in an urban forestry business. For example if the employment multiplier is 1.5, then a direct employment footprint of 10 jobs would yield 5 jobs in the other industries of the economy.

IMPLAN is a software package that estimates economic multipliers for any local economy whether a state, a county, or combinations of states and counties. Multipliers calculated using IMPLAN reflect a specific industry and the state economy where that industry is located. Using the IMPLAN model, economic multipliers for direct sales and services, employee compensation, and employment were calculated for all urban forestry industries for each of the 50 states and the District of Columbia.

D. Benefits of Urban Forestry

We examine two broad categories of economic benefits: the impact of tree cover on property values and the benefits that trees provide by mitigating social costs related to health concerns and flooding. Tree cover impacts property values in a number of ways. It helps conserve energy, provides shade and privacy, screens visual affronts from undesirable land use, enhances landscape aesthetics, and encourages desirable populations of wildlife. Property values, however, reflect only the value of trees to the owners of property. Trees also provide several external benefits to society. These include aesthetics, protection from erosion, and health impacts through sequestration of carbon and other emissions.

A number of studies estimate the impact of tree cover on property values. These studies typically use a hedonic approach that identifies different factors affecting property values and the marginal impact of each factor. Many of the studies focus on particular areas of the country. Mei et al. (2017) find that tree cover has a positive impact of residential property values in five California communities. Anderson and Cordell (1988) look at the impact in Athens, Georgia. Dombrow, et al, (2000) estimate the impacts in Baton Rouge, Louisiana. An older study by Sydor, et al., (2005) finds that each percentage increment in relative tree cover on a property increased its value by \$296. Siriwardena, et al., (2016) review a number

of more current studies that examine the impact trees may have on property values. They find that “the average implicit price for a 1% change in tree cover is \$239 [in year 2013 dollars]” (p. 73). Their study is the most recent found to aggregate the myriad of geographical area studies into a generalized incremental value for tree cover.

Other studies examine the impact that local parks, greenways and urban forests have on nearby residential property values. Crompton (2004) has a comprehensive review of the earlier literature examining the impact that urban parkland and other urban amenities may have on property values and the overall tax base. Corrill, et al., (1978) examine the effects of greenbelts in Boulder, Colorado, finding that home prices fall as the distance from a greenbelt increases. Tyrväinan and Miettinen (2000) find that the proximity of forested areas can impact private property values in Salo, Finland. Schläpfer, et al., (2015) find that proximity to “undisturbed” areas (urban forests) has a positive impact on rents in Switzerland. Baranzini and Schaerer (2011) examine the impact of landscape views using individual apartment-level data in Geneva, Switzerland. They find the conflicting results that while a view of trees lowers rental values, a greater tree-covered surface nearby increases rents. A recent individual tree appraisal tool developed by Purdue University estimates that trees can make up as much as 15 percent of a property’s value. Since the Purdue tool values individual trees, it is not really applicable to this nationwide study. Wolf (2010) provides a more comprehensive review of literature that values urban properties based on a number of urban nature amenities. Unfortunately, the study does not provide a general measure of value useful to valuing urban tree cover across a number of states.

There are also public benefits of trees in public places. This includes trees in parks and other open spaces, or lining the sides of streets, highways, railways and rivers. The Helliwell system (Helliwell, 1967) estimates the visual amenity of trees. Valuing trees via the Helliwell system requires significant detailed information about tree size, life expectancy, position in the landscape, tree cover and suitability. Other tools have been developed that estimate the replacement cost of a tree. (See, for example, Cullen, 2007). These tools, however, do not estimate the public benefits of a tree. Doick, et al., (2018) discuss a number of tools available to value trees, either individually or as a population of trees. The tool they review (CAVAT) is used in the UK to defend trees from loss due to development as well as gain compensation for trees that are removed or damaged. However, it requires significant detail well beyond the scope of a national study and has come under some criticism as a “valuation” tool. (See Price, 2020.)

The impact on property values for this study is estimated in the following manner. Siriwardena, et al., (2016) estimate that each one percent of tree cover on a property increases its value by \$239 in year 2013 dollars. The Consumer Price Index (CPI) is used to convert that to \$251 in year 2017 dollars. The U.S. Census Bureau compiles data from the 2018 American Community Survey to estimate the number of owner occupied housing units in each state, as well as in each urban county within a state.⁹ Data from i-Tree Landscape indicate the average level of canopy cover in each of these urban counties as well as in each state. For each urban county, the percentage of tree cover is multiplied by \$251 dollars and by the number of owner occupied dwellings to estimate the impact of tree cover on property values in the county. Then the number of owner occupied dwellings in the state is reduced by the number in each of a state’s urban counties to derive an estimate of the number of owner occupied dwellings in non-urban counties within the state. The number of non-urban owner occupied dwellings in a state is multiplied by \$251 and then by the statewide average tree cover. This figure is combined with the values for each urban county to estimate the impact that tree cover has on property values in each state.

⁹ <https://data.census.gov/cedsci>.

The external environment benefits of urban forestry (environmental benefits which flow to others besides the homeowner) are drawn from another source. In particular, the USDA Forest Service, in conjunction with several partners, including The Arbor Day Foundation, has developed the i-Tree Landscape web application.¹⁰ Among other things, i-Tree Landscape estimates the impact of tree cover on carbon sequestration, pollutant removal and hydrologic impacts. It also uses imaging to estimate tree cover in areas as small as a county or as large as a multi-state area. We make use of i-Tree Landscape to estimate the impact of tree cover on property values, as well as the benefits from carbon sequestration, pollutant removal and hydrologic impacts.

The i-Tree Landscape web application is used to estimate the dollar value of carbon sequestration, pollutant removal and hydrologic impacts for each state for the year 2018. Values are converted to 2017 values using the change in the Consumer Price Index between 2017 and 2018. The web application's reference section describes its estimation processes, which are briefly summarized as follows.¹¹ Carbon storage and sequestration estimates are partitioned by forest and non-forest areas. For forest areas, total carbon storage and net annual sequestration are derived from U.S. Forest Service Forest Inventory and Analysis (FIA) data for each county. For non-forest areas, total carbon storage and net annual sequestration are estimated using values from urban forests (Nowak et al., 2013). Net annual sequestration encompasses carbon accumulation from tree growth minus estimated carbon lost through decomposition due to tree mortality. Air pollution removal values are based on procedures detailed in Nowak et al. (2014). Estimates of transpiration, precipitation interception, and avoided runoff for each county in the conterminous United States in 2010 are developed using the i-Tree Eco model and local leaf area indices and weather data. For methods, see Hirabayashi (2015), Hirabayashi and Endreny (2015) and Hirabayashi and Nowak (2015).

¹⁰ See <https://www.i-Treetools.org/cta-tree-benefits>.

¹¹ See <https://landscape.i-Treetools.org/references/data/#tree-benefits>.

Appendix 2: Detailed Economic Footprint Tables

Table A2.1: 2017 Direct Per Capita Economic Footprint of Urban Forestry by State

State	Direct Footprint Output Per Capita (\$)	Direct Footprint Employment Per 1,000 Persons
Alabama	\$124	1.29
Alaska	\$48	0.52
Arizona	\$75	0.85
Arkansas	\$35	0.40
California	\$102	1.03
Colorado	\$124	1.11
Connecticut	\$172	1.43
Delaware	\$282	2.72
Dist. of Columbia	\$41	0.30
Florida	\$106	1.12
Georgia	\$60	0.58
Hawaii	\$111	1.22
Idaho	\$83	0.89
Illinois	\$150	1.25
Indiana	\$86	0.89
Iowa	\$97	0.88
Kansas	\$123	1.32
Kentucky	\$79	0.71
Louisiana	\$52	0.50
Maine	\$158	1.43
Maryland	\$140	1.41
Massachusetts	\$180	1.30
Michigan	\$105	0.97
Minnesota	\$103	0.92
Mississippi	\$52	0.54
Missouri	\$78	0.87
Montana	\$54	0.52
Nebraska	\$80	0.79
Nevada	\$49	0.57
New Hampshire	\$195	1.83
New Jersey	\$119	0.97
New Mexico	\$48	0.59
New York	\$156	1.17
North Carolina	\$111	1.09
North Dakota	\$74	0.68
Ohio	\$135	1.32
Oklahoma	\$119	1.36
Oregon	\$196	2.16
Pennsylvania	\$140	1.20
Rhode Island	\$105	0.91
South Carolina	\$52	0.58
South Dakota	\$61	0.58
Tennessee	\$86	0.88
Texas	\$92	0.88
Utah	\$57	0.62
Vermont	\$158	1.27
Virginia	\$119	1.25
Washington	\$132	1.35
West Virginia	\$21	0.25
Wisconsin	\$91	0.89
Wyoming	\$61	1.01

Source: Bureau of Business Research calculations

Table A2.2: 2017 Direct Economic Footprint of Urban Forestry by Industry and State Employee Compensation (Millions \$)

State	Private – Nursery and Tree Products	Private – Support Activities for Forestry	Private – Nursery & Florist Wholesalers	Private – Lawn & Garden Equipment and Supply Stores	Private – Landscape Architecture Services	Private – Landscaping Services	Public – Tree City USA	Public – Other Cities	Public – Counties	Mixed – Tree Campus USA	Mixed – Tree Line USA
Alabama	\$27.0	\$7.0	\$13.1	\$7.5	\$2.9	\$196.5	\$9.4	\$1.2	\$0.5	\$1.0	\$2.0
Alaska	\$0.8	\$0.1	\$0.1	\$0.6	\$0.7	\$12.8	\$0.6	\$0.2	\$0.1	\$0.0	\$0.3
Arizona	\$14.1	\$3.0	\$15.6	\$16.3	\$26.7	\$154.0	\$5.6	\$1.6	\$0.6	\$0.2	\$3.4
Arkansas	\$4.6	\$1.9	\$1.8	\$4.6	\$1.1	\$31.9	\$2.7	\$1.1	\$0.3	\$0.1	\$0.1
California	\$256.3	\$73.2	\$155.2	\$96.0	\$257.8	\$1,047.7	\$62.1	\$16.2	\$3.7	\$1.0	\$13.6
Colorado	\$16.6	\$6.8	\$6.1	\$30.5	\$55.0	\$200.6	\$12.4	\$0.9	\$0.5	\$0.5	\$0.3
Connecticut	\$20.3	\$0.9	\$11.3	\$14.1	\$9.6	\$203.6	\$3.6	\$1.0	\$0.3	\$0.5	\$0.0
Delaware	\$1.9	\$0.5	\$0.4	\$2.3	\$3.2	\$119.4	\$0.4	\$0.2	\$0.1	\$0.0	\$0.8
Dist. of Columbia	\$0.0	\$0.0	\$2.6	\$0.4	\$5.0	\$1.9	\$5.3	\$0.0	\$0.0	\$0.2	\$0.5
Florida	\$172.6	\$28.0	\$131.4	\$21.7	\$77.0	\$515.0	\$30.6	\$5.7	\$1.9	\$2.5	\$5.5
Georgia	\$35.8	\$8.7	\$21.5	\$12.1	\$21.7	\$147.1	\$11.3	\$1.7	\$1.0	\$1.0	\$3.8
Hawaii	\$5.2	\$0.6	\$1.2	\$0.2	\$9.3	\$57.6	\$4.3	\$0.2	\$0.1	\$0.0	\$0.0
Idaho	\$7.7	\$2.5	\$0.9	\$3.7	\$4.7	\$39.2	\$2.4	\$0.2	\$0.2	\$0.0	\$0.8
Illinois	\$30.2	\$1.8	\$181.0	\$24.2	\$41.6	\$552.9	\$47.1	\$4.4	\$1.2	\$1.5	\$6.0
Indiana	\$10.4	\$0.8	\$8.7	\$6.4	\$6.2	\$215.4	\$6.8	\$1.9	\$0.6	\$0.6	\$1.7
Iowa	\$4.8	\$0.3	\$2.3	\$2.8	\$4.0	\$101.1	\$4.9	\$0.9	\$0.3	\$0.6	\$1.9
Kansas	\$5.6	\$0.2	\$3.4	\$4.6	\$3.5	\$143.5	\$9.1	\$0.4	\$0.3	\$0.3	\$1.1
Kentucky	\$4.1	\$0.6	\$8.9	\$12.6	\$4.0	\$97.8	\$2.7	\$1.0	\$0.4	\$1.3	\$0.2
Louisiana	\$11.7	\$2.0	\$2.3	\$10.3	\$7.1	\$48.6	\$3.4	\$1.8	\$0.4	\$0.5	\$4.5
Maine	\$1.4	\$0.2	\$1.6	\$3.8	\$2.8	\$75.8	\$0.7	\$0.3	\$0.1	\$0.0	\$1.0
Maryland	\$21.2	\$1.0	\$48.3	\$21.8	\$22.5	\$267.3	\$11.6	\$0.3	\$0.6	\$0.4	\$0.0
Massachusetts	\$16.7	\$3.4	\$43.0	\$34.0	\$70.7	\$355.9	\$14.9	\$1.0	\$0.6	\$0.4	\$0.0
Michigan	\$41.4	\$3.0	\$45.2	\$18.2	\$17.3	\$312.0	\$13.2	\$1.9	\$0.9	\$0.8	\$0.2
Minnesota	\$28.7	\$2.4	\$17.6	\$8.1	\$11.3	\$163.0	\$15.8	\$1.5	\$0.6	\$0.1	\$4.9
Mississippi	\$4.6	\$2.0	\$4.5	\$4.3	\$1.1	\$42.9	\$0.8	\$1.3	\$0.3	\$0.1	\$0.0
Missouri	\$18.7	\$2.2	\$3.2	\$9.4	\$9.3	\$166.8	\$9.5	\$1.5	\$0.8	\$0.3	\$5.8

Appendix Table A2.2: 2017 Direct Economic Footprint of Urban Forestry by Industry and State Employee Compensation (Millions \$) (Continued)

State	Private – Nursery and Tree Products	Private – Support Activities for Forestry	Private – Nursery & Florist Wholesalers	Private – Lawn & Garden Equipment and Supply Stores	Private – Landscape Architecture Services	Private – Landscaping Services	Public – Tree City USA	Public – Other Cities	Public – Counties	Mixed – Tree Campus USA	Mixed – Tree Line USA
Montana	\$2.3	\$4.6	\$0.2	\$2.1	\$1.7	\$12.9	\$1.0	\$0.2	\$0.1	\$0.0	\$0.0
Nebraska	\$5.5	\$0.3	\$1.6	\$2.8	\$2.1	\$46.8	\$2.3	\$0.2	\$0.1	\$0.6	\$0.9
Nevada	\$2.2	\$0.4	\$2.9	\$20.7	\$4.5	\$37.1	\$1.9	\$1.3	\$0.3	\$0.3	\$0.0
New Hampshire	\$2.1	\$1.2	\$1.6	\$6.8	\$2.0	\$99.7	\$1.3	\$0.2	\$0.1	\$0.0	\$0.0
New Jersey	\$28.6	\$0.3	\$35.5	\$30.0	\$25.3	\$294.0	\$14.3	\$1.2	\$1.1	\$0.1	\$0.8
New Mexico	\$4.0	\$6.4	\$5.3	\$4.9	\$3.4	\$25.9	\$0.8	\$1.0	\$0.2	\$0.0	\$0.0
New York	\$29.8	\$2.7	\$36.0	\$40.1	\$80.1	\$1,045.0	\$38.6	\$3.5	\$1.9	\$2.1	\$12.6
North Carolina	\$35.9	\$9.0	\$27.6	\$23.9	\$31.2	\$333.9	\$19.9	\$1.9	\$0.9	\$0.6	\$0.2
North Dakota	\$0.6	\$0.0	\$0.2	\$0.6	\$0.7	\$17.8	\$3.3	\$0.1	\$0.1	\$0.1	\$0.5
Ohio	\$41.3	\$3.9	\$31.5	\$32.6	\$11.7	\$540.2	\$17.7	\$3.1	\$1.1	\$0.9	\$9.3
Oklahoma	\$21.9	\$14.3	\$34.1	\$7.8	\$3.8	\$131.7	\$2.4	\$1.3	\$0.4	\$0.5	\$2.4
Oregon	\$139.2	\$78.7	\$20.7	\$10.1	\$19.1	\$135.4	\$7.6	\$1.0	\$0.3	\$0.3	\$2.8
Pennsylvania	\$28.5	\$6.8	\$32.5	\$24.6	\$41.3	\$594.6	\$7.6	\$3.4	\$1.2	\$1.1	\$3.1
Rhode Island	\$4.4	\$0.0	\$4.2	\$4.5	\$2.3	\$34.2	\$1.3	\$0.1	\$0.1	\$0.0	\$0.0
South Carolina	\$20.7	\$4.7	\$8.3	\$9.9	\$10.4	\$58.3	\$3.8	\$1.2	\$0.4	\$0.4	\$0.0
South Dakota	\$0.3	\$0.0	\$2.8	\$0.7	\$1.2	\$15.0	\$1.6	\$0.2	\$0.1	\$0.3	\$0.0
Tennessee	\$25.2	\$5.5	\$5.9	\$13.4	\$13.1	\$171.9	\$7.1	\$1.4	\$0.6	\$0.4	\$2.0
Texas	\$62.7	\$6.9	\$73.0	\$65.1	\$89.8	\$790.8	\$18.1	\$8.4	\$2.6	\$2.3	\$9.6
Utah	\$6.6	\$1.4	\$3.7	\$10.0	\$6.5	\$44.1	\$4.5	\$0.8	\$0.3	\$0.3	\$0.2
Vermont	\$0.9	\$0.6	\$0.7	\$2.1	\$2.6	\$35.0	\$0.4	\$0.1	\$0.1	\$0.2	\$0.0
Virginia	\$30.2	\$3.8	\$13.8	\$30.3	\$25.0	\$350.8	\$11.4	\$1.7	\$0.8	\$0.8	\$4.3
Washington	\$44.2	\$14.2	\$53.0	\$23.0	\$25.6	\$301.3	\$14.1	\$2.4	\$0.7	\$0.3	\$5.4
West Virginia	\$0.5	\$0.1	\$2.0	\$1.7	\$0.6	\$11.8	\$0.4	\$0.6	\$0.2	\$0.0	\$0.0
Wisconsin	\$16.1	\$3.2	\$6.9	\$9.9	\$8.4	\$158.6	\$18.4	\$1.0	\$0.5	\$0.1	\$2.7
Wyoming	\$0.0	\$0.0	\$0.7	\$0.5	\$1.2	\$11.6	\$1.1	\$0.1	\$0.0	\$0.0	\$0.0

Source: Bureau of Business Research calculations

Table A2.3: 2017 Direct Economic Footprint of Urban Forestry by Industry and State Employment

State	Private – Nursery and Tree Products	Private – Support Activities for Forestry	Private – Nursery & Florist Wholesalers	Private – Lawn & Garden Equipment and Supply Stores	Private – Landscape Architecture Services	Private – Landscaping Services	Public – Tree City USA	Public – Other Cities	Public – Counties	Mixed – Tree Campus USA	Mixed – Tree Line USA
Alabama	747	101	222	210	39	4,700	177	26	10	20	43
Alaska	38	1	1	15	8	301	9	5	1	1	5
Arizona	414	52	372	476	409	4,003	138	41	16	5	88
Arkansas	119	16	40	125	17	800	57	25	7	2	3
California	6,334	1,017	2,695	2,435	2,971	23,461	1,035	310	71	20	262
Colorado	401	102	93	758	600	4,006	220	23	12	13	9
Connecticut	494	15	171	325	111	3,905	66	19	7	10	0
Delaware	51	6	8	48	61	2,398	8	4	2	0	17
Dist. of Columbia	0	0	23	9	58	38	70	0	0	3	7
Florida	4,991	345	2,376	575	1,079	13,106	643	141	47	60	137
Georgia	932	114	420	393	294	3,408	236	45	25	26	103
Hawaii	171	13	27	6	84	1,341	84	3	2	1	0
Idaho	232	51	28	117	61	952	61	4	3	0	19
Illinois	773	32	2,295	586	476	10,750	756	85	23	29	115
Indiana	308	20	184	175	91	4,907	153	43	14	15	41
Iowa	138	7	51	67	50	2,259	99	19	6	12	42
Kansas	151	5	56	139	49	3,204	185	10	6	6	24
Kentucky	112	15	146	354	59	2,332	55	24	10	32	6
Louisiana	354	33	53	291	115	1,237	64	44	11	14	112
Maine	45	3	24	103	35	1,637	19	7	3	0	26
Maryland	508	13	1,202	517	260	5,791	207	6	11	7	0
Massachusetts	369	49	459	725	656	6,422	215	19	12	8	0
Michigan	1,276	58	1,038	456	211	6,281	285	42	21	18	3
Minnesota	728	50	261	171	135	3,394	262	27	10	1	89
Mississippi	145	31	107	135	28	1,119	19	27	6	2	0
Missouri	483	46	86	253	146	3,936	201	33	17	7	130

Table A2.3: 2017 Direct Economic Footprint of Urban Forestry by Industry and State Employment (Continued)

State	Private – Nursery and Tree Products	Private – Support Activities for Forestry	Private – Nursery & Florist Wholesalers	Private – Lawn & Garden Equipment and Supply Stores	Private – Landscape Architecture Services	Private – Landscaping Services	Public – Tree City USA	Public – Other Cities	Public – Counties	Mixed – Tree Campus USA	Mixed – Tree Line USA
Montana	82	47	7	62	23	301	23	5	2	1	0
Nebraska	149	6	36	67	31	1,141	48	5	3	13	22
Nevada	36	9	74	503	51	928	41	31	6	8	0
New Hampshire	60	7	53	163	33	2,125	23	4	3	1	0
New Jersey	705	5	622	619	354	6,029	224	22	20	1	15
New Mexico	130	85	146	154	51	622	16	23	4	0	0
New York	689	38	589	948	885	18,946	547	64	34	38	232
North Carolina	981	125	567	749	409	7,985	336	45	23	14	4
North Dakota	21	0	10	13	7	380	68	2	1	2	11
Ohio	1,076	47	637	904	171	11,883	321	68	23	20	202
Oklahoma	636	140	843	224	68	3,251	54	34	9	12	62
Oregon	3,589	1,287	445	244	261	2,895	142	19	7	5	55
Pennsylvania	843	104	553	672	479	12,413	127	77	27	26	72
Rhode Island	94	0	81	97	30	638	19	3	2	0	0
South Carolina	567	71	136	298	161	1,529	84	30	11	10	0
South Dakota	17	1	47	19	22	346	41	5	2	8	0
Tennessee	719	119	108	365	201	4,175	141	33	14	10	50
Texas	1,738	110	1,385	1,823	1,160	17,899	322	207	65	57	243
Utah	223	15	77	326	91	1,069	89	16	6	6	4
Vermont	35	11	10	46	34	643	8	3	1	5	0
Virginia	836	62	301	807	345	7,956	156	32	15	14	82
Washington	1,292	206	919	564	290	6,488	174	33	10	5	75
West Virginia	19	2	49	56	10	298	8	14	4	0	0
Wisconsin	470	52	128	237	139	3,588	416	24	13	2	64
Wyoming	267	0	13	14	14	254	20	2	1	0	0

Source: Bureau of Business Research calculations

Table A2.4: 2017 Total Per Capita Economic Footprint of Urban Forestry by State

State	Total Footprint Output Per Capita (\$)	Total Footprint Employment Per 1,000 Persons
Alabama	\$209	1.73
Alaska	\$77	0.69
Arizona	\$144	1.36
Arkansas	\$56	0.53
California	\$197	1.66
Colorado	\$238	1.74
Connecticut	\$289	1.95
Delaware	\$448	3.48
District of Columbia	\$56	0.40
Florida	\$208	1.86
Georgia	\$113	0.90
Hawaii	\$193	1.61
Idaho	\$137	1.27
Illinois	\$279	1.95
Indiana	\$148	1.22
Iowa	\$156	1.19
Kansas	\$202	1.77
Kentucky	\$131	0.95
Louisiana	\$88	0.76
Maine	\$267	1.98
Maryland	\$232	2.01
Massachusetts	\$327	1.93
Michigan	\$191	1.46
Minnesota	\$193	1.44
Mississippi	\$84	0.70
Missouri	\$138	1.27
Montana	\$91	0.72
Nebraska	\$132	1.10
Nevada	\$84	0.82
New Hampshire	\$329	2.49
New Jersey	\$206	1.42
New Mexico	\$77	0.81
New York	\$262	1.60
North Carolina	\$199	1.57
North Dakota	\$119	0.94
Ohio	\$245	1.94
Oklahoma	\$204	2.04
Oregon	\$342	3.26
Pennsylvania	\$256	1.74
Rhode Island	\$175	1.30
South Carolina	\$89	0.83
South Dakota	\$98	0.80
Tennessee	\$149	1.21
Texas	\$179	1.37
Utah	\$108	0.95
Vermont	\$252	1.69
Virginia	\$198	1.77
Washington	\$230	1.97
West Virginia	\$31	0.34
Wisconsin	\$159	1.28
Wyoming	\$90	1.24

Source: Bureau of Business Research calculations

Table A2.5: 2017 Total Economic Footprint of Urban Forestry by Industry and State Employee Compensation (Millions \$)

State	Private – Nursery and Tree Products	Private – Support Activities for Forestry	Private – Nursery & Florist Wholesalers	Private – Lawn & Garden Equipment and Supply Stores	Private – Landscape Architecture Services	Private – Landscaping Services	Public – Tree City USA	Public – Other Cities	Public – Counties	Mixed – Tree Campus USA	Mixed – Tree Line USA
Alabama	\$44.8	\$8.5	\$21.0	\$11.8	\$4.4	\$290.3	\$12.7	\$1.8	\$0.7	\$1.3	\$4.1
Alaska	\$1.2	\$0.2	\$0.2	\$0.9	\$1.0	\$17.1	\$0.8	\$0.3	\$0.1	\$0.1	\$0.8
Arizona	\$24.3	\$4.0	\$28.2	\$30.0	\$49.5	\$242.1	\$8.4	\$2.5	\$1.0	\$0.3	\$6.4
Arkansas	\$6.8	\$2.3	\$2.8	\$7.3	\$1.8	\$45.0	\$3.4	\$1.5	\$0.4	\$0.1	\$0.2
California	\$470.2	\$98.0	\$293.0	\$178.6	\$469.5	\$1,654.2	\$90.6	\$25.2	\$5.8	\$1.5	\$39.4
Colorado	\$27.6	\$9.1	\$11.1	\$56.3	\$97.5	\$306.9	\$17.3	\$1.3	\$0.7	\$0.7	\$0.8
Connecticut	\$35.5	\$1.1	\$18.8	\$23.9	\$16.7	\$292.7	\$5.2	\$1.4	\$0.5	\$0.7	\$0.0
Delaware	\$2.6	\$0.6	\$0.6	\$3.6	\$5.1	\$160.4	\$0.6	\$0.3	\$0.1	\$0.0	\$1.4
Dist. of Columbia	\$0.0	\$0.0	\$3.5	\$0.5	\$7.1	\$2.4	\$6.1	\$0.0	\$0.0	\$0.2	\$0.9
Florida	\$300.2	\$37.7	\$248.4	\$40.6	\$148.6	\$826.3	\$46.3	\$9.0	\$3.1	\$3.8	\$14.8
Georgia	\$64.4	\$11.4	\$38.2	\$22.1	\$39.2	\$235.8	\$16.2	\$2.7	\$1.5	\$1.5	\$8.5
Hawaii	\$6.8	\$0.7	\$2.1	\$0.4	\$14.9	\$81.2	\$6.1	\$0.2	\$0.2	\$0.1	\$0.0
Idaho	\$10.7	\$3.1	\$1.4	\$5.8	\$7.8	\$55.2	\$3.2	\$0.2	\$0.2	\$0.0	\$1.4
Illinois	\$47.5	\$2.4	\$324.8	\$46.3	\$77.0	\$850.3	\$65.8	\$6.7	\$1.9	\$2.2	\$16.3
Indiana	\$15.2	\$1.1	\$14.4	\$11.0	\$10.5	\$314.7	\$9.5	\$2.7	\$0.9	\$0.9	\$3.6
Iowa	\$7.6	\$0.4	\$3.5	\$4.5	\$6.1	\$139.4	\$6.5	\$1.2	\$0.4	\$0.8	\$4.6
Kansas	\$7.3	\$0.3	\$5.6	\$7.5	\$5.5	\$200.4	\$12.7	\$0.6	\$0.4	\$0.4	\$3.1
Kentucky	\$6.6	\$0.7	\$14.5	\$20.2	\$6.3	\$138.3	\$3.6	\$1.4	\$0.6	\$1.8	\$0.4
Louisiana	\$18.1	\$2.5	\$3.7	\$16.2	\$11.2	\$72.5	\$5.7	\$2.6	\$0.6	\$0.8	\$12.3
Maine	\$2.3	\$0.3	\$2.7	\$6.4	\$4.8	\$111.5	\$1.0	\$0.4	\$0.2	\$0.0	\$2.2
Maryland	\$33.4	\$1.2	\$81.7	\$36.4	\$37.3	\$377.3	\$15.7	\$0.5	\$0.8	\$0.5	\$0.0
Massachusetts	\$27.4	\$4.6	\$74.9	\$59.6	\$126.1	\$537.3	\$20.9	\$1.5	\$1.0	\$0.6	\$0.0
Michigan	\$65.8	\$4.0	\$78.2	\$32.1	\$29.2	\$472.1	\$19.5	\$2.9	\$1.4	\$1.2	\$0.4
Minnesota	\$48.4	\$3.2	\$31.6	\$14.9	\$20.8	\$255.1	\$23.2	\$2.3	\$0.9	\$0.1	\$13.9
Mississippi	\$7.0	\$2.5	\$7.0	\$6.5	\$1.7	\$60.9	\$1.1	\$1.8	\$0.4	\$0.2	\$0.0
Missouri	\$32.8	\$2.9	\$5.5	\$16.4	\$15.6	\$250.8	\$13.9	\$2.2	\$1.2	\$0.4	\$14.5

Table A2.5: 2017 Total Economic Footprint of Urban Forestry by Industry and State Employee Compensation (Millions \$) (Continued)

State	Private – Nursery and Tree Products	Private – Support Activities for Forestry	Private – Nursery & Florist Wholesalers	Private – Lawn & Garden Equipment and Supply Stores	Private – Landscape Architecture Services	Private – Landscaping Services	Public – Tree City USA	Public – Other Cities	Public – Counties	Mixed – Tree Campus USA	Mixed – Tree Line USA
Montana	\$3.2	\$5.8	\$0.4	\$3.2	\$2.9	\$18.3	\$1.3	\$0.3	\$0.1	\$0.1	\$0.0
Nebraska	\$7.2	\$0.4	\$2.6	\$4.7	\$3.3	\$67.1	\$3.3	\$0.3	\$0.2	\$0.8	\$2.7
Nevada	\$3.4	\$0.5	\$4.8	\$33.9	\$7.2	\$51.6	\$2.5	\$1.8	\$0.4	\$0.5	\$0.0
New Hampshire	\$3.6	\$1.5	\$2.5	\$11.0	\$3.4	\$143.6	\$2.1	\$0.3	\$0.2	\$0.0	\$0.0
New Jersey	\$51.4	\$0.4	\$60.6	\$52.1	\$44.3	\$425.7	\$19.7	\$1.8	\$1.6	\$0.1	\$2.1
New Mexico	\$5.4	\$7.8	\$8.6	\$7.3	\$5.0	\$35.2	\$1.0	\$1.4	\$0.3	\$0.0	\$0.0
New York	\$45.9	\$3.5	\$62.3	\$70.0	\$138.0	\$1,523.0	\$52.6	\$5.0	\$2.7	\$2.9	\$26.2
North Carolina	\$59.5	\$11.5	\$47.3	\$41.2	\$54.5	\$507.6	\$26.3	\$2.8	\$1.4	\$0.8	\$0.5
North Dakota	\$0.8	\$0.0	\$0.3	\$0.9	\$1.0	\$24.2	\$4.2	\$0.1	\$0.1	\$0.1	\$1.4
Ohio	\$63.1	\$5.1	\$56.2	\$58.1	\$20.6	\$812.2	\$24.0	\$4.7	\$1.6	\$1.3	\$24.9
Oklahoma	\$37.3	\$18.0	\$57.1	\$12.7	\$6.3	\$193.8	\$3.4	\$2.0	\$0.5	\$0.7	\$6.6
Oregon	\$222.1	\$101.1	\$35.8	\$16.9	\$33.1	\$197.4	\$10.2	\$1.4	\$0.5	\$0.4	\$5.4
Pennsylvania	\$59.1	\$9.0	\$58.7	\$45.4	\$73.8	\$904.7	\$11.0	\$5.1	\$1.8	\$1.7	\$8.5
Rhode Island	\$6.8	\$0.0	\$6.8	\$7.3	\$3.9	\$48.2	\$1.6	\$0.2	\$0.1	\$0.0	\$0.0
South Carolina	\$50.7	\$5.8	\$13.7	\$16.2	\$17.1	\$84.7	\$5.5	\$1.7	\$0.6	\$0.5	\$0.1
South Dakota	\$0.5	\$0.1	\$4.5	\$1.1	\$1.9	\$21.3	\$2.2	\$0.3	\$0.1	\$0.4	\$0.0
Tennessee	\$60.1	\$7.2	\$10.3	\$23.0	\$22.9	\$259.1	\$10.6	\$2.1	\$0.9	\$0.6	\$4.0
Texas	\$143.9	\$9.2	\$131.5	\$118.6	\$161.8	\$1,292.5	\$31.0	\$13.3	\$4.2	\$3.6	\$26.8
Utah	\$11.1	\$1.8	\$6.4	\$17.5	\$11.6	\$65.6	\$6.5	\$1.1	\$0.4	\$0.4	\$0.5
Vermont	\$1.4	\$0.8	\$1.1	\$3.2	\$4.3	\$48.9	\$0.6	\$0.2	\$0.1	\$0.3	\$0.0
Virginia	\$53.7	\$4.8	\$23.0	\$51.7	\$40.6	\$481.3	\$15.0	\$2.3	\$1.1	\$1.0	\$10.3
Washington	\$64.4	\$18.2	\$90.4	\$38.1	\$43.5	\$440.7	\$19.5	\$3.4	\$1.0	\$0.5	\$10.6
West Virginia	\$1.5	\$0.1	\$3.2	\$2.6	\$1.0	\$15.5	\$0.5	\$0.8	\$0.2	\$0.0	\$0.0
Wisconsin	\$22.5	\$4.1	\$11.9	\$16.8	\$14.2	\$230.2	\$25.8	\$1.5	\$0.8	\$0.1	\$6.8
Wyoming	\$0.0	\$0.0	\$0.9	\$0.7	\$1.7	\$14.5	\$1.3	\$0.1	\$0.1	\$0.0	\$0.0

Source: Bureau of Business Research calculations

Table A2.6: 2017 Total Economic Footprint of Urban Forestry by Industry and State Employment

State	Private – Nursery and Tree Products	Private – Support Activities for Forestry	Private – Nursery & Florist Wholesalers	Private – Lawn & Garden Equipment and Supply Stores	Private – Landscape Architecture Services	Private – Landscaping Services	Public – Tree City USA	Public – Other Cities	Public – Counties	Mixed – Tree Campus USA	Mixed – Tree Line USA
Alabama	1,195	131	444	328	85	5,772	229	33	13	25	160
Alaska	54	1	2	22	14	377	12	6	2	1	22
Arizona	772	67	883	816	1,020	5,456	193	58	23	7	306
Arkansas	157	20	79	189	33	979	71	32	9	2	9
California	13,019	1,273	5,875	3,986	7,040	30,994	1,508	438	100	27	1,255
Colorado	672	125	216	1,275	1,493	5,547	309	32	17	17	34
Connecticut	663	19	353	505	225	5,053	90	25	9	14	0
Delaware	73	7	16	71	124	2,981	10	5	2	0	43
Dist. of Columbia	0	0	34	11	95	42	77	0	0	3	18
Florida	8,938	440	5,774	1,015	2,749	18,005	960	202	68	83	783
Georgia	1,621	143	977	659	714	4,416	320	61	34	35	384
Hawaii	219	16	50	9	174	1,704	108	4	3	1	0
Idaho	366	65	55	185	130	1,227	81	5	5	1	57
Illinois	1,131	43	5,250	954	1,133	14,534	1,064	120	33	40	590
Indiana	446	30	378	274	192	6,356	203	57	19	19	144
Iowa	230	9	101	103	102	2,831	128	25	7	16	173
Kansas	220	6	112	215	106	4,079	247	13	8	8	126
Kentucky	137	18	291	550	124	2,955	73	31	13	40	17
Louisiana	460	40	107	463	255	1,523	97	57	13	17	533
Maine	64	4	50	168	76	2,123	25	10	4	0	119
Maryland	655	15	2,404	797	559	7,394	273	8	14	9	0
Massachusetts	493	57	1,014	1,171	1,515	8,649	309	27	17	11	0
Michigan	1,925	72	2,342	755	532	8,443	391	59	29	24	19
Minnesota	1,221	63	605	285	326	4,628	369	38	14	1	468
Mississippi	212	38	201	204	53	1,332	24	33	7	3	0
Missouri	714	58	190	410	339	5,121	270	44	23	9	551

Table A2.6: 2017 Total Economic Footprint of Urban Forestry by Industry and State Employment (Continued)

State	Private – Nursery and Tree Products	Private – Support Activities for Forestry	Private – Nursery & Florist Wholesalers	Private – Lawn & Garden Equipment and Supply Stores	Private – Landscape Architecture Services	Private – Landscaping Services	Public – Tree City USA	Public – Other Cities	Public – Counties	Mixed – Tree Campus USA	Mixed – Tree Line USA
Montana	108	58	14	100	48	385	30	7	3	1	0
Nebraska	237	8	74	105	65	1,437	63	7	4	17	83
Nevada	51	10	152	802	109	1,188	58	41	8	10	0
New Hampshire	79	9	111	257	71	2,786	34	5	4	1	0
New Jersey	953	6	1,338	985	786	8,088	308	31	28	2	66
New Mexico	178	101	260	227	99	776	20	29	5	0	0
New York	925	45	1,182	1,437	1,867	24,247	733	86	46	49	729
North Carolina	1,711	153	1,239	1,216	929	10,274	459	60	30	18	20
North Dakota	32	0	18	20	14	484	86	3	2	2	46
Ohio	1,455	59	1,432	1,491	393	16,214	453	96	33	27	912
Oklahoma	1,092	170	1,732	356	145	4,121	71	45	12	16	274
Oregon	5,744	1,621	933	394	570	3,832	198	26	9	7	181
Pennsylvania	1,206	130	1,220	1,092	1,099	16,767	182	108	38	35	341
Rhode Island	121	0	169	151	62	835	26	4	3	0	0
South Carolina	817	87	282	477	363	1,940	113	40	14	12	2
South Dakota	27	1	94	30	42	432	52	6	3	10	0
Tennessee	937	142	229	593	449	5,380	193	44	19	13	136
Texas	3,081	136	3,234	3,094	2,958	23,972	508	289	91	77	1,215
Utah	350	18	176	558	213	1,452	125	23	8	8	20
Vermont	49	12	18	72	69	815	10	3	2	7	0
Virginia	1,090	71	619	1,235	764	10,518	214	43	20	19	345
Washington	2,152	252	1,845	880	617	8,325	238	45	13	6	213
West Virginia	23	2	88	81	18	373	10	18	5	0	0
Wisconsin	698	67	271	381	304	4,759	561	33	18	3	298
Wyoming	315	0	22	20	24	305	25	2	1	0	0

Source: Bureau of Business Research calculations

Table A2.7: Impact of Tree Cover on Rural and Urban Property Values

State	Statewide Property Values (Millions \$)	Urban Counties		Rural Counties	
		Property Values (Millions \$)	Percent of Statewide	Property Values (Millions \$)	Percent of Statewide
Alabama	\$17,995	\$12,609	70%	\$5,386	30%
Alaska	\$29	\$29	100%	\$0	0%
Arizona	\$877	\$856	98%	\$21	2%
Arkansas	\$9,984	\$5,236	52%	\$4,748	48%
California	\$17,570	\$16,978	97%	\$592	3%
Colorado	\$6,989	\$6,343	91%	\$647	9%
Connecticut	\$10,285	\$10,285	100%	\$0	0%
Delaware	\$2,110	\$2,110	100%	\$0	0%
Dist. of Columbia	\$805	\$805	100%	\$0	0%
Florida	\$38,657	\$36,898	95%	\$1,759	5%
Georgia	\$33,688	\$24,155	72%	\$9,532	28%
Hawaii	\$15	\$15	100%	\$0	0%
Idaho	\$1,564	\$809	52%	\$755	48%
Illinois	\$10,725	\$9,067	85%	\$1,659	15%
Indiana	\$7,092	\$4,475	63%	\$2,617	37%
Iowa	\$1,624	\$852	52%	\$772	48%
Kansas	\$1,991	\$1,637	82%	\$354	18%
Kentucky	\$12,123	\$4,212	35%	\$7,911	65%
Louisiana	\$12,387	\$8,282	67%	\$4,105	33%
Maine	\$6,701	\$4,417	66%	\$2,284	34%
Maryland	\$15,417	\$14,539	94%	\$879	6%
Massachusetts	\$21,426	\$21,303	99%	\$122	1%
Michigan	\$20,380	\$14,810	73%	\$5,571	27%
Minnesota	\$5,301	\$3,338	63%	\$1,963	37%
Mississippi	\$11,356	\$4,573	40%	\$6,783	60%
Missouri	\$10,370	\$6,550	63%	\$3,820	37%
Montana	\$1,628	\$1,238	76%	\$391	24%
Nebraska	\$472	\$334	71%	\$139	29%
Nevada	\$549	\$450	82%	\$99	18%
New Hampshire	\$6,833	\$5,782	85%	\$1,051	15%
New Jersey	\$20,267	\$20,267	100%	\$0	0%
New Mexico	\$1,508	\$1,318	87%	\$190	13%
New York	\$33,723	\$29,870	89%	\$3,853	11%
North Carolina	\$36,577	\$28,397	78%	\$8,180	22%
North Dakota	\$108	\$82	76%	\$26	24%
Ohio	\$21,698	\$17,660	81%	\$4,037	19%
Oklahoma	\$5,823	\$3,595	62%	\$2,228	38%
Oregon	\$11,579	\$10,654	92%	\$925	8%
Pennsylvania	\$37,746	\$29,649	79%	\$8,097	21%
Rhode Island	\$3,667	\$3,471	95%	\$196	5%
South Carolina	\$20,470	\$16,230	79%	\$4,240	21%
South Dakota	\$509	\$435	85%	\$74	15%
Tennessee	\$20,513	\$12,568	61%	\$7,945	39%
Texas	\$30,786	\$26,907	87%	\$3,880	13%
Utah	\$3,238	\$3,003	93%	\$235	7%
Vermont	\$2,923	\$462	16%	\$2,461	84%
Virginia	\$27,033	\$16,830	62%	\$10,203	38%
Washington	\$21,099	\$20,006	95%	\$1,092	5%
West Virginia	\$9,036	\$3,186	35%	\$5,850	65%
Wisconsin	\$8,738	\$4,659	53%	\$4,079	47%
Wyoming	\$184	\$7	4%	\$177	96%
Total	\$604,167	\$472,241	78%	\$131,926	22%

Source: Bureau of Business Research calculations

Table A2.8: Other Impacts of Tree Cover on Rural and Urban Counties

State	Value from iTree Landscape (Millions \$)					
	Urban Counties			Rural Remainder		
	Carbon	Pollution	Hydrology	Carbon	Pollution	Hydrology
Alabama	\$998	\$116	\$67	\$2,370	\$77	\$48
Alaska	\$0	\$0	\$0	\$0	\$0	\$0
Arizona	\$147	\$2	\$1	\$34	\$0	\$0
Arkansas	\$359	\$16	\$15	\$2,080	\$54	\$69
California	\$1,735	\$122	\$49	\$1,288	\$13	\$13
Colorado	\$94	\$5	\$3	\$483	\$11	\$7
Connecticut	\$285	\$122	\$64	N/A	N/A	N/A
Delaware	\$73	\$13	\$6	N/A	N/A	N/A
Dist. of Columbia	\$2	\$6	\$1	N/A	N/A	N/A
Florida	\$2,317	\$270	\$214	\$1,572	\$33	\$26
Georgia	\$843	\$247	\$171	\$3,297	\$97	\$83
Hawaii	\$0	\$0	\$0	\$0	\$0	\$0
Idaho	\$50	\$3	\$3	\$690	\$19	\$12
Illinois	\$128	\$99	\$47	\$372	\$12	\$19
Indiana	\$153	\$28	\$17	\$424	\$19	\$12
Iowa	\$39	\$2	\$3	\$256	\$6	\$9
Kansas	\$45	\$8	\$6	\$283	\$4	\$5
Kentucky	\$113	\$31	\$16	\$1,122	\$51	\$55
Louisiana	\$763	\$62	\$56	\$2,218	\$49	\$74
Maine	\$632	\$23	\$28	\$843	\$32	\$26
Maryland	\$292	\$86	\$44	\$115	\$28	\$2
Massachusetts	\$385	\$166	\$159	\$6	\$83	\$0
Michigan	\$419	\$35	\$69	\$1,380	\$88	\$56
Minnesota	\$147	\$2	\$14	\$614	\$24	\$12
Mississippi	\$508	\$14	\$21	\$3,475	\$96	\$62
Missouri	\$140	\$36	\$36	\$796	\$55	\$31
Montana	\$240	\$2	\$8	\$634	\$26	\$17
Nebraska	\$8	\$0	\$2	\$106	\$3	\$2
Nevada	\$15	\$1	\$0	\$240	\$8	\$2
New Hampshire	\$248	\$25	\$25	\$140	\$11	\$9
New Jersey	\$298	\$173	\$71	N/A	N/A	N/A
New Mexico	\$158	\$4	\$1	\$434	\$7	\$3
New York	\$940	\$236	\$117	\$544	\$66	\$19
North Carolina	\$1,809	\$78	\$121	\$2,112	\$170	\$37
North Dakota	\$5	\$0	\$0	\$54	\$2	\$1
Ohio	\$462	\$56	\$100	\$492	\$146	\$17
Oklahoma	\$176	\$7	\$15	\$930	\$55	\$17
Oregon	\$1,063	\$28	\$78	\$723	\$87	\$23
Pennsylvania	\$991	\$210	\$107	\$789	\$103	\$18
Rhode Island	\$55	\$35	\$26	\$1	\$10	\$1
South Carolina	\$1,288	\$37	\$63	\$1,210	\$78	\$23
South Dakota	\$8	\$0	\$0	\$50	\$4	\$1
Tennessee	\$320	\$41	\$63	\$1,147	\$113	\$44
Texas	\$1,325	\$69	\$164	\$4,299	\$228	\$67
Utah	\$77	\$2	\$9	\$313	\$19	\$4
Vermont	\$20	\$0	\$2	\$343	\$15	\$21
Virginia	\$466	\$36	\$60	\$1,741	\$116	\$50
Washington	\$986	\$41	\$92	\$602	\$42	\$27
West Virginia	\$167	\$6	\$9	\$1,097	\$42	\$33
Wisconsin	\$206	\$16	\$15	\$1,090	\$34	\$26
Wyoming	\$6	\$1	\$0	\$427	\$4	\$3
Total	\$21,999	\$2,618	\$2,260	\$43,235	\$2,239	\$1,086

Source: Bureau of Business Research calculations utilizing the i-Tree Landscape web application