



SOUTHERN
GROUP OF STATE
FORESTERS

URBAN FORE\$TRY

ECONOMIC ANALYSIS IN THE SOUTHERN REGION

REGIONAL REPORT



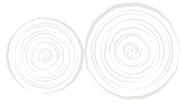


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I. EXECUTIVE SUMMARY

Urban and community forests are an integral component of cities and towns, as they not only provide critical ecosystem services to continuously increasing urban populations, but also make a substantial economic contribution to the regional economies in the United States. Urban and community forests cover over 140 million acres of urban landscape in the United States (U.S. Forest Service 2022). In addition to municipal and non-profit entities, the green and utility industries are key providers of urban and community forestry (U&CF) related services, contributing substantially to local and state economies.

Economic contribution analysis of the urban and community forestry sector helps communicate to policy makers and legislators the monetary benefits in terms of gross domestic product contribution and jobs in the specified economy. The Economic Impact Analysis for Planning (IMPLAN) software and data are commonly used to quantify direct, indirect, and induced effects based on an input-output modeling framework. While state-level and regional economic contribution analyses of the forest sector covering forest product industries widely prevail, only a few studies have estimated economic contribution of the U&CF sector in a couple of states.

THE MAIN GOAL OF THE PROJECT

Estimate economic contribution of the U&CF sector in the 13-state southern region of the United States, and prepare and disseminate the regional and state-specific reports highlighting the economic significance of U&CF in regional and state economies.

THE SPECIFIC OBJECTIVES OF THE PROJECT

- 1 Facilitate discussion and consensus on the scope of U&CF industries, methodology for analysis, and reporting
- 2 Develop and distribute relevant survey questions
- 3 Document the methodology and rationale for the selected approach in a written report
- 4 Analyze data at the regional and state levels
- 5 Produce reports summarizing the regional and state-level results
- 6 Disseminate information to stakeholders through presentations

The scope of the U&CF industries and activities in the US South was defined following rigorous discussion among project partners and six different groups: private businesses, public (county and city governments), state agencies, higher education institutions, investor-owned and cooperative utilities working in tree-line maintenance, and non-profit organizations. Data for the analysis was collected through a survey instrument specific to each group composing the U&CF sector. The survey instrument for the private sector was primarily designed to separate U&CF from broader green industries in the region (as defined by IMPLAN), while the survey questions for the public sector focused on capturing the involvement of local and municipal governments and other public agencies involved in U&CF related activities. Next, we developed a complete profile of employment statistics associated with U&CF businesses and activities for each group using the primary data obtained from the surveys.

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SURVEY RESULT HIGHLIGHTS

- Response rates ranged from 3% (private businesses) to 34.6% (non-profit organizations)
- Businesses in the nursery and tree production industry reported the highest number of employees, while businesses in nursery and florist supplies merchant wholesaler businesses reported the lowest employment numbers
- Private landscaping and tree care providers employ the largest percentage of workers in U&CF in the US South
- Farm and garden equipment wholesalers and supply stores reported the highest average annual sales in total (\$1-\$2.5 million)
- The top three challenges reported by private businesses were the lack of qualified personnel, consumer awareness of quality services, and personal turnover
- Public agencies' top three areas of concern were inadequate budget, lack of qualified personnel, and increasing extreme weather events and their associated costs
- Each group surveyed rated the impacts of the COVID-19 pandemic on their U&CF activities between 'somewhat negative' and 'neutral,' on average
- Among private businesses, respondents from nursery and garden supplies rated the average impact of the COVID-19 pandemic on the U&CF segment of their businesses between 'neutral' and 'somewhat positive'
- Survey respondents from each group rated the average future outlook of their U&CF activities given the COVID-19 pandemic between 'neutral' and 'somewhat optimistic'.

Out of the 225,119 direct jobs in U&CF in the 13-state southern region in 2019, 194,935 jobs were in the private sector. Businesses in private landscaping and tree care services reported the highest number of employees in U&CF (161,617 jobs), while businesses in landscape architectural services reported the lowest employment numbers (2,489 jobs). Furthermore, the 379 investor-owned and cooperative utility companies in the southern states support approximately 5,045 jobs and expend over \$403 million per year in total. Additionally, we found that county and city governments in the southern states employed 23,502 people directly working in U&CF activities in 2019. Moreover, according to the information collected from state representatives, state agencies employed 58 positions in the 13 southern states in 2019. Likewise, in 2019, findings from this analysis suggest that there were 910 direct jobs involved in U&CF activities on higher education campuses involved in U&CF activities in the southern states. Lastly, it is estimated that in 2019, non-profit organizations (NPOs) in the southern states supported 669 jobs directly working in U&CF activities.

Nursery, garden, and farm supplies stores and farm and garden machinery and equipment wholesaler businesses reported the highest average annual sales in total (\$1-\$2.5 million) and in U&CF-related sales (over 25%). Landscaping and tree care services indicated that over 51% of their average annual sales (\$500,000-\$1 million) in 2019 were related to U&CF activities. Surveyed nursery, greenhouse, and tree producers, nursery and florist supplies merchant wholesalers, and landscape architectural services each reported annual average total sales of \$250,000-\$500,000. Of these private industries, approximately 40% of annual sales of nursery, greenhouse, and tree producers,

over 36% of annual sales of landscape architectural service enterprises, and over 32% of annual sales of nursery and florists supplies wholesalers were in U&CF in 2019 in the southern region.

Overall, the groups surveyed outside the private sector stated that the COVID-19 pandemic had either a 'somewhat negative' and 'neutral' impact on their U&CF activities throughout the study region. Average ratings associated with respondents from the private sector specifically were just over 'neutral.' When decomposing the responses by business-type, only private businesses associated with farm and garden machinery rated COVID-19 related impacts on their U&CF activities between 'somewhat negative' and 'neutral,' on average. When asked how respondents would describe the future outlook of their public agency's U&CF activities given the COVID-19 pandemic, average ratings ranged between 'neutral' and 'somewhat optimistic.' Regarding other areas of concern, respondents from private businesses reported 'lack of qualified personnel' and rated 'consumer awareness of quality services' to be between 'moderately' and 'very' significant challenges affecting U&CF businesses in the study region. Survey respondents associated with county or parish governments rated the following concerns between 'slightly' and 'moderately' significant challenges impacting their U&CF activities: inadequate budget, lack of qualified personnel, increasing extreme weather events and associated costs, lack of public awareness or cooperation, lack of coordination between departments, personnel turnover, lack of urban and community forest inventories and data, inadequate credentialing of workforce, lack of political support, inadequate state or local regulations, and workforce diversity. Average ratings associated with respondents from community or municipal governments were 'moderately' significant of a challenge for the following areas of concern: inadequate budget and lack of

qualified personnel. Similar to the respondents from county/parish governments, respondents from community/municipal governments rated the following concerns between 'slightly' and 'moderately' significant challenges restricting U&CF activities: increasing extreme weather events and associated costs, lack of public awareness or cooperation, lack of coordination between departments, personnel turnover, lack of urban and community forest inventories and data, inadequate credentialing of workforce, lack of political support, inadequate state or local regulations, and lack of qualified private-sector contractors.

ECONOMIC CONTRIBUTION ANALYSES

Results from the input-output modeling suggest that in 2019, the U&CF in the 13 southern states directly contributed with \$21.1 billion to the region's industry output and \$11.6 billion in value-added (sum of labor income, other property income, and production and import taxes) by supporting 225,283 full- and part-time jobs. Including direct, indirect, and induced effects, the U&CF sector had a total contribution of \$43.3 billion in industry output to the 13-state regional economy, employing more than 349,453 people with a payroll of about \$15.4 billion. The private sector, predominantly landscaping services and tree care providers, represents over 85% of the direct jobs (194,935 jobs) and industry output (\$18.6 billion) in the study region. Public agencies (municipal, county, and state agencies) collectively contributed about \$3.3 billion in total industry output by supporting 30,559 jobs to the regional economy. Higher education institutions and non-profit organizations had total job contributions of 1,180 and 881, respectively. Meanwhile, investor-owned and cooperative utilities support 7,597 total jobs. We estimate that every \$1.00 of output generated in the U&CF sector by the private sector generated an additional \$1.09 to the 13-state regional economy.

II. GLOSSARY

Urban and Community Forestry (U&CF)

All activities (including producing, planting, maintaining, and removing trees) that support or care for the trees in cities, towns, suburbs, and other developed areas.

Direct Effects

The expenditures or initial production changes associated with an industry or sector in the study area which are entered into the Input-Output analysis. These changes can be positive or negative and display how the study area's economy will respond.

Employee Compensation

Total payroll cost of an employee, inclusive of wages, salaries, payroll taxes, and benefits such as health insurance and retirement.

Employment

The number of full-time, part-time, and seasonal jobs associated with a specific industry.

IMPLAN®

Modeling software that performs Input-Output analysis. The modeling framework enables users to create regional economic models and multipliers for one or more counties or states in the United States. Version 3 of the IMPLAN® software accounts for commodity production and consumption for 536 industry sectors, 10 household income levels, taxes to local/state and federal governments, capital investment, imports and exports, transfer payments, and business inventories.

Indirect Effects

The economic impact of local industries purchasing goods and services from other industries along supply chains.

Induced Effects

The economic impact of household spending of labor income following deductions from taxes, savings, and income for commuting.

Industry

A group of entities or businesses participating in similar types of economic activities.

Labor Income

The sum of employee compensation and proprietor income.

Multipliers

The measure of an industry's connection to the economy of the study area in terms of purchases, payments of wages and taxes, and other transactions.

North American Industry Classification System (NAICS)

An industrial classification scheme established and utilized by countries in North America for grouping entities by similar production processes.

Output

The value in dollars of production within a study area. It equates to the total of sales and net inventory change.

Proprietor Income

Production income of sole proprietorships, partnerships, and tax-exempt cooperatives.

Region or Regional Economy

The geographic area of interest (i.e., one or more county or state) and its economic activity.

Sector

The industries that make up the complete economy including businesses, households and institutions, and government. In the North American Industrial Classification System (NAICS), sectors are one of the major areas of economic activity and are classified at the 2-digit level.

Social Accounting Matrix (SAM)

SAMs capture all monetary market transaction, including what are called an economy's "ripple effects," during a study period by building upon Input-Out models to include transactions between industries and institutions, including those between institutions themselves.

Total Effects

The sum of direct, indirect, and induced effects.

Value-added (Gross Regional Product [GRP])

The total of labor income, other property income, and production and import taxes. It is also the difference between an industry's total output and the cost of its intermediate inputs. GRP equals the sum of value-added for all economic sectors within the study region.

III. INTRODUCTION

Urban and community forests are an integral component of cities and towns, as they not only provide critical ecosystem services to continuously increasing urban populations, but also make a substantial economic contribution to the regional economies in the United States. In addition to municipal and non-profit entities, the green and utility industries are key providers of urban forestry related services, contributing substantially to local and state economies. Urban and community forestry (U&CF) involves activities such as tree care and related landscaping services, nursery and tree production, arboricultural services, roadside and right-of-way vegetation management, and public sector involvement to improve over 140 million acres of urban landscape in the United States (U.S. Forest Service 2022). Nevertheless, the lack of a standardized definition and accounting framework for estimating the economic and social benefits of urban and community forestry (U&CF) related activities restrict the successful planning and further expansion of the Urban and Community Forestry Program (National Urban and Community Forestry Advisory Council, 2015). For the purposes of this report, we define U&CF as all activities that support or care for the trees in cities, towns, suburbs, and other developed areas (including producing, planting, maintaining, and removing trees).

Economic contribution analysis of the U&CF sector helps to communicate to policy makers the monetary benefits in terms of various business and economic metrics in the specified economy. The Economic Impact Analysis for Planning (IMPLAN) software and data are commonly used to quantify direct, indirect, and induced effects based on an input-output modeling framework. While state-level and regional economic contribution analyses of the forest sector covering forest product industries widely prevail (Henderson et al., 2017; Joshi et al., 2017; Parajuli et al., 2018; Pelkki and Sherman, 2020), only a few studies have

estimated the economic contribution of the U&CF sector in a couple of states (Templeton et al. 2011, Texas A&M Forest Service 2019, Hodges and Court 2019). In addition, the economic contributions analyses that have been completed have widely varied in terms of the scope of the urban forest industry, methods employed in input-output analysis, and reporting. The limited and inconsistent effort in economic contribution analysis of urban forestry is due primarily to two reasons: (a) there is currently no established IMPLAN sectors that correspond directly to urban forestry and (b) there is no standard framework for the urban forestry sector so that it can be segregated easily from broader green industries. Parajuli et al. (2022) recently adapted the methodologies featured in the literature to develop a comprehensive scope of urban forestry and transparent approach that captures activities conducted by private, public, and non-profit organizations in the Northeast-Midwest United States.



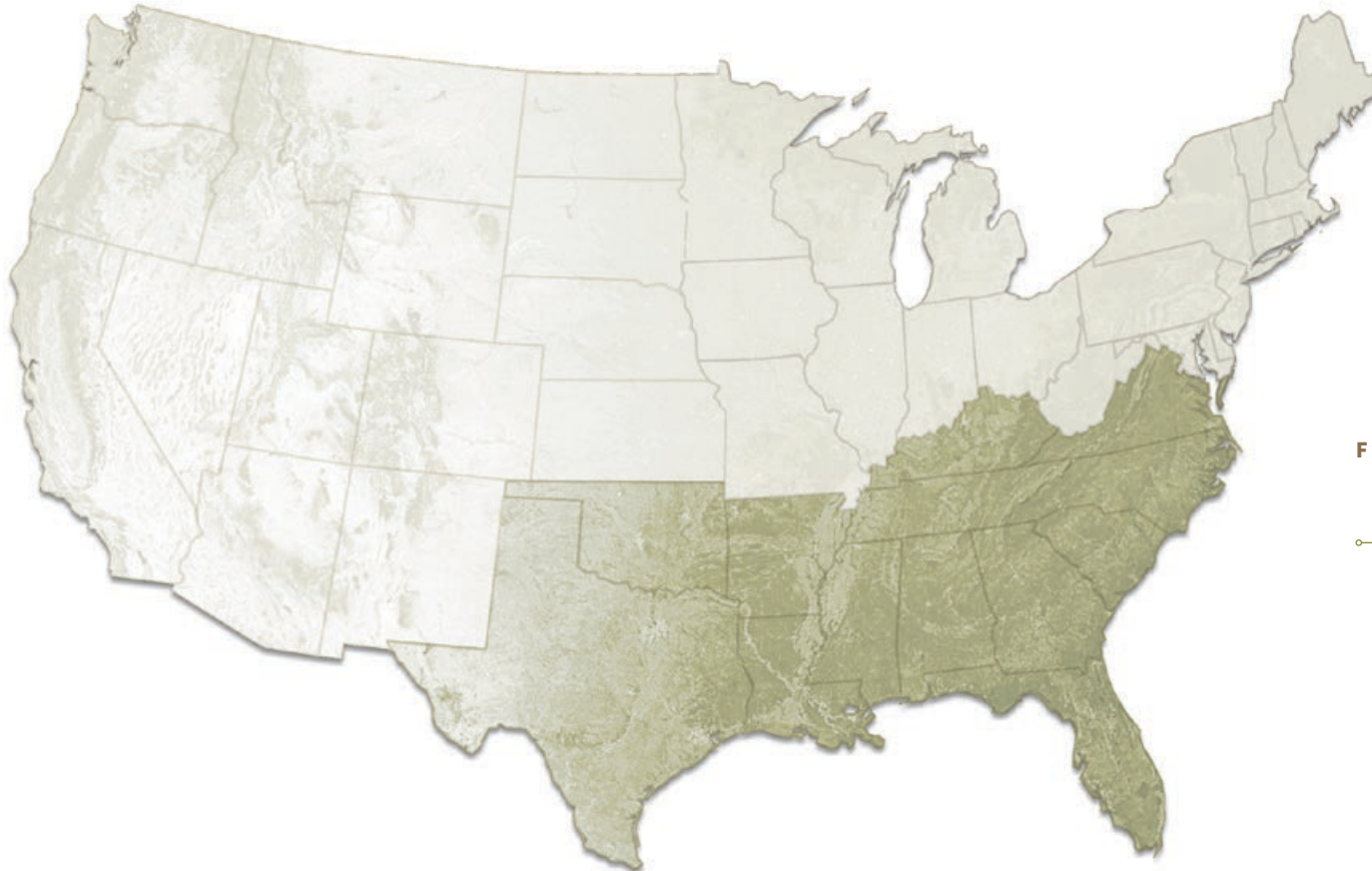
The main objective of this study is to estimate the economic contribution of the U&CF sector in the southern region of the United States, or region 8 as delineated by the US Forest Service. To accomplish this, we first developed a standardized definition of U&CF that characterized the scope of the sectors in the 13 southern states by following the similar study framework devised by Parajuli et al. (2022). We incorporated all private, public, and non-profit businesses and organizations associated with U&CF in the region. Next, we compiled the employment profile of all the related industries and agencies through online surveys and a number of other secondary sources. We used IMPLAN to estimate the economic contribution of U&CF to the regional economy in terms of several economic and business metrics including jobs, labor income, value-added, and tax collections (IMPLAN, 2021). We developed an extensive scope of U&CF building on the methodological approaches of Hodges and Court (2019) and Parajuli et al. (2022). These results underscoring the significant economic contributions of U&CF should be highly useful to the private sector in their marketing and communication efforts. Other sectors, such as the public agencies and NPOs, may also find these results valuable to advocate for support to sustain and expand U&CF programs in their jurisdictions.

IV. PROJECT GOALS AND OBJECTIVES

This project involved conducting an economic contribution analysis of the urban and community forest industries and organizations in the southern region (a 13-state region) (**F1**).

THE SIX SPECIFIC OBJECTIVES OF THIS PROJECT

- 1 Facilitate discussion and consensus on the scope of the U&CF sector in the southern states, methodology for analysis, and reporting.
- 2 Develop and distribute relevant survey questions in cooperation with the project team to separate contributions specific to the U&CF sector.
- 3 Document methodology and rationale for the selected approach in a written report.
- 4 Analyze regional and state-level contributions using the IMPLAN software.
- 5 Produce 13 reports and infographics documenting regional and state-level results.
- 6 Disseminate information developed for stakeholders and the public through a webinar and an in-person presentation.



**F1 THE 13 SOUTHERN REGION
STATES INCLUDED IN THE STUDY**

Alabama	North Carolina
Arkansas	Oklahoma
Florida	South Carolina
Georgia	Tennessee
Kentucky	Texas
Louisiana	Virginia
Mississippi	

V. SCOPE OF URBAN AND COMMUNITY FORESTRY (U&CF)

The definition of urban and community forestry (U&CF) is variable, but with input from stakeholders, we defined it as all activities that support or care for the trees in cities, towns, suburbs, and other developed areas (including producing, planting, maintaining, and removing trees). Since there are no well-defined industries specific to U&CF, and IMPLAN integrates U&CF-related industries into broader green industry sectors, the first crucial step of economic contribution analysis was to delineate the scope of U&CF activities in the study region. First, a list of private industries as well as public agencies and non-profit organizations involved in U&CF was developed based on an extensive review of available literature. The developed scope of U&CF industries and activities was rigorously discussed with the representatives from each participating state, and other project partners. Then, all the project team participants were surveyed to develop consensus on the following final list of U&CF related industries and activities in all sectors (**T1**).

T1 SCOPE OF URBAN FORESTRY IN SOUTHERN REGION

Shown in parentheses for private industries are North American Industry Classification System (NAICS) codes.

PRIVATE INDUSTRIES

- **Landscaping services** (NAICS 561730) Examples include arboriculture, tree pruning, removal, trimming, landscape care and maintenance, ornamental tree/shrub maintenance, plant appraisal.
- **Nursery and tree production** (NAICS 111421) Examples include nurseries with tree production for urban and community forestry.
- **Nursery, garden, and farm supply stores** (NAICS 444220) Examples include stores retailing nursery trees and garden products that are grown elsewhere.
- **Farm and garden machinery and equipment merchant wholesalers** (NAICS 423820) Examples include wholesale distribution of specialized machinery, equipment and parts used in farm, lawn and garden activities.
- **Nursery stock and florists' supplies merchant wholesalers** (NAICS 424930) Examples include wholesale distribution of nursery, flowers and tree stocks.
- **Landscape architectural services** (NAICS 541320) Examples include land use, city and urban planning services, parks and other recreational areas planning services.

PRIVATE INVESTOR-OWNED AND COOPERATIVE UTILITY COMPANIES

- (NAICS 561730) Examples include overhead utility line and rights-of-way maintenance

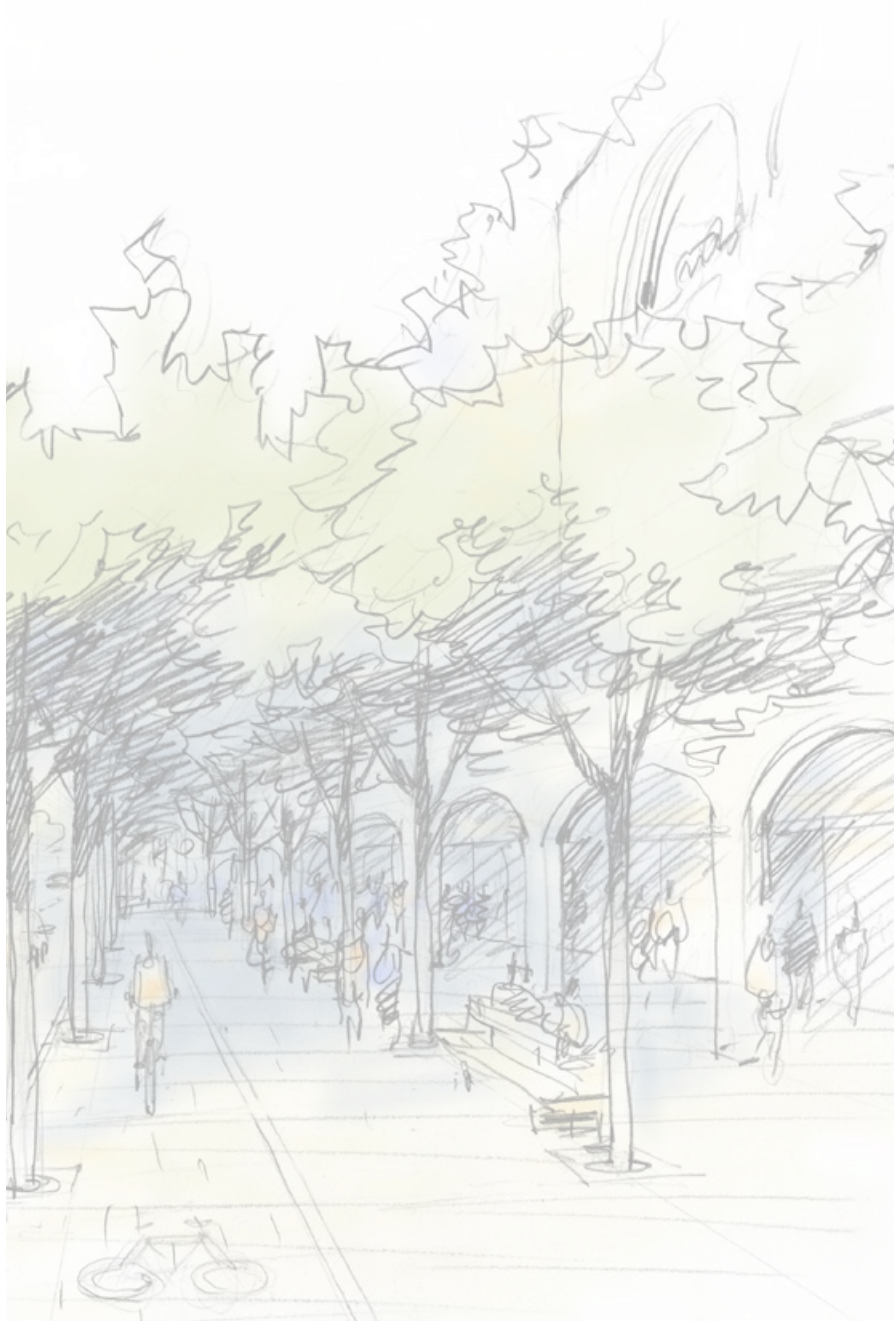
PUBLIC SECTORS

- **Cities**
- **Counties**
- **State agencies involved in urban and community forestry**

HIGHER EDUCATION INSTITUTIONS

- **Management of tree and urban forests on college and university campuses**

NON-PROFIT ORGANIZATIONS



Scope of Urban Forestry continued . . .

We organized a webinar for a detailed discussion regarding the scope of U&CF in the southern region. All team members and project partners who attended the webinar were given the opportunity to share their opinions and understandings of the U&CF-related sectors should be included in the study. Following the webinar, we used the information gleaned from the project partners from participating states, institutions, and organizations and prepared a final list of U&CF industries and organizations in private, public, and non-profit sectors.

The research 'Team' included principal and co-principal investigators from North Carolina State University, Ohio State University, Virginia Tech, University of Georgia, University of Kentucky, and Mississippi State University. The Team was responsible for data collection, analysis, and reporting. The Team was advised by the project 'Stakeholders' on the scope and approach of the project. The Stakeholders were representatives from each participating state, the Virginia Department of Forestry (VDOT), regional International Society of Arboriculture (ISA) chapters, and the United States Department of Agriculture (USDA) Forest Service. The VDOT and state U&CF coordinators were instrumental in compiling the contact lists of the public agencies, NPOs, utility companies, and higher education institutions.

VI. METHODS

Six different groups across the 13-state region were surveyed: private green industry businesses, public (county and municipal governments), public (state agencies), higher education institutions, investor-owned and cooperative utilities working in tree-line maintenance, and non-profit organizations. Contact lists of email addresses for U&CF businesses and organizations were compiled by the research team and project stakeholders. North Carolina State University (NCSU) distributed the electronic surveys to the contact lists on July 27, 2021, and stopped accepting survey responses on December 31, 2021, after three reminder emails. The survey instrument for the private sector was primarily designed to separate U&CF from broader green industries as well as to evaluate the current issues and opportunities related to U&CF businesses amidst the ongoing COVID-19 pandemic. Alternatively, the survey questions for the public sector focused on capturing the involvement of local and municipal governments and other public agencies in U&CF. Respondents were asked to answer survey questions based on their U&CF activities during the 2019 calendar year. The NCSU Institutional Review Board (IRB) (IRB-23973) approved and exempted all the survey instruments and the administration procedure.

We then compiled a complete profile of sales and expenditures of economic activities related to the establishment, care, and maintenance of urban and community forests utilizing publicly available sources. Based on both data from primary surveys and publicly available sources, we developed a complete profile of employment statistics including the number of jobs as well as percentage of jobs in U&CF for each group and sector, a key input for the IMPLAN modeling. We obtained the 2019 employment numbers in each North American Industry Classification System (NAICS) category from the US Bureau of Labor Statistics'

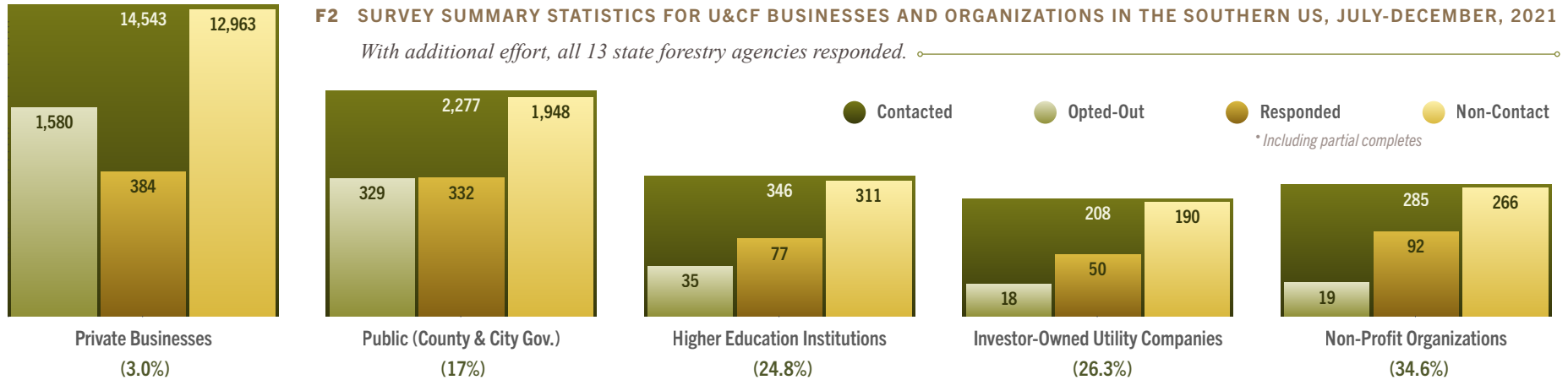
Census of Employment and Wages (CEW) for the private industries involved in U&CF activities (US BLS, 2021). Since the CEW does not incorporate self-employed jobs and businesses with their own social insurance programs (IMPLAN Data Team, 2021), the 2019 IMPLAN data was utilized to compute self-employed jobs in landscaping services (NAICS 561730) and nursery and tree production (NAICS 111421).

Next, we aggregated state-level IMPLAN data from 13 states to develop a regional input-output model with a trade flows specification and social accounts for households. In terms of an economic contribution method, we utilized Method 1 for multisector contribution analysis as outlined by Parajuli et al. (2018). Then, we employed the analysis-by-part (ABP) method for the labor income spending pattern to estimate indirect and induced effects of local and state governments, higher education institutions, and non-profit organizations in the study area.

We specify the steps in our approach to the surveys and subsequent economic contribution analysis in more detail in the [Parajuli et al. *Methodology report*].

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VII. SURVEY RESULTS



RESPONSE RATES

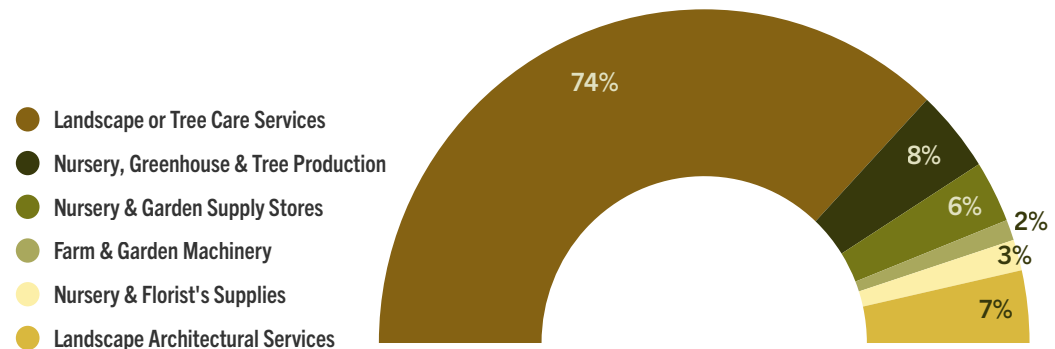
Response rates range from 3% (private businesses) to 34.6% (non-profit organizations), depending on the group surveyed (F2). The higher education institutions and non-public utility companies surveyed are both associated with

adjusted response rates of approximately 25%. Meanwhile, 17% of the county and municipal governments surveyed provided usable responses. All 13 state forestry agencies reported the required information for the state agencies group.

PRIVATE INDUSTRY

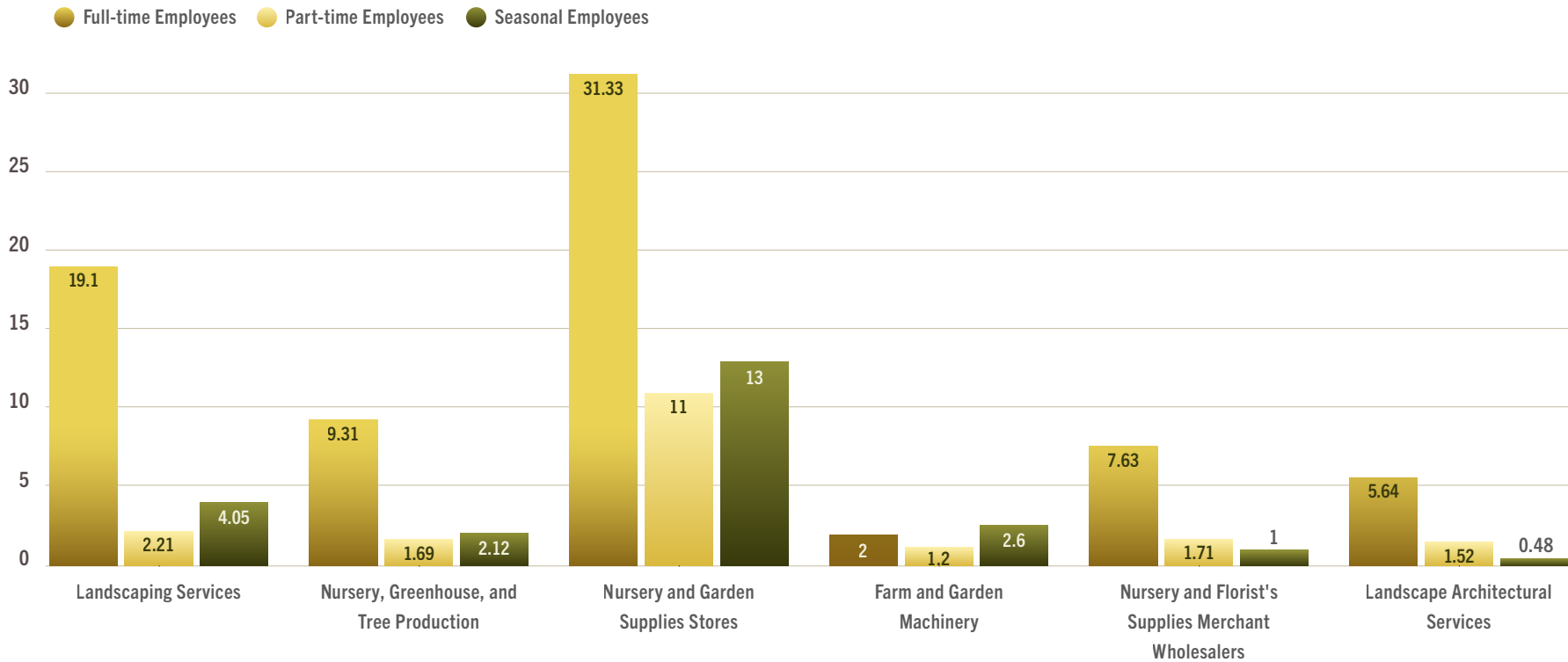
Responses varied by business type (F3). Companies in landscaping or tree care services (NAICS 561730) represented 74% of usable responses from private industry, whereas nursery, greenhouse, and tree production (NAICS 111421) constituted 8%. Landscape architectural services (NAICS 541320) followed with 7% of usable responses. Nursery and garden supplies stores (NAICS 444220) made up 6% of the usable responses. Finally, nursery and florists' supplies merchant wholesalers (NAICS 424930) and farm and garden machinery businesses (NAICS 423820) represented 3% and 2% of the responses from the private industry group, respectively.

F3 PERCENTAGE OF SURVEY RESPONSES BROKEN OUT BY BUSINESS TYPE



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F4 FULL-TIME, PART-TIME, AND SEASONAL EMPLOYMENT PER ORGANIZATION BY BUSINESS TYPE IN THE SOUTHERN STATES, 2019

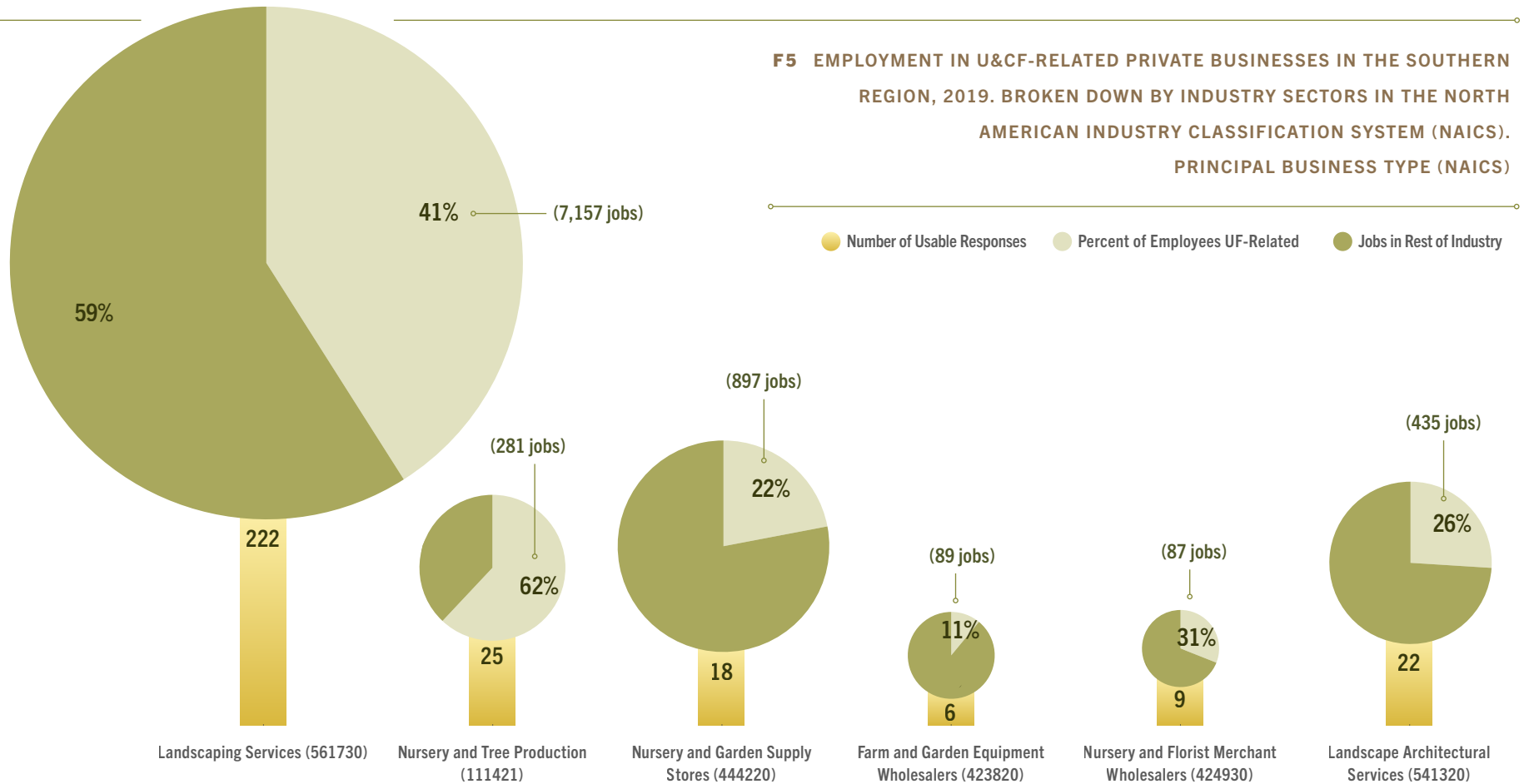


Businesses surveyed in the nursery and garden supply stores (50 total employees per business) reported the highest number of employees on average, including full-time, part-time, and seasonal employees (F4). Businesses surveyed in landscape and tree care services reported the second highest number of employees on average: 32 total employees, 24 of which are full-time, 3 part-time, and 5 seasonal employees. Meanwhile, landscape architectural

services averaged approximately 20 total employees per business, 13 of which are full-time, 5 being part-time, and 2 seasonal. Nursery and florist's supplies merchant wholesalers had the lowest employment numbers according to the regional survey with approximately 7 full-time employees, 2 part-time employees, and 1 seasonal employee.

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F5 EMPLOYMENT IN U&CF-RELATED PRIVATE BUSINESSES IN THE SOUTHERN REGION, 2019. BROKEN DOWN BY INDUSTRY SECTORS IN THE NORTH AMERICAN INDUSTRY CLASSIFICATION SYSTEM (NAICS). PRINCIPAL BUSINESS TYPE (NAICS)

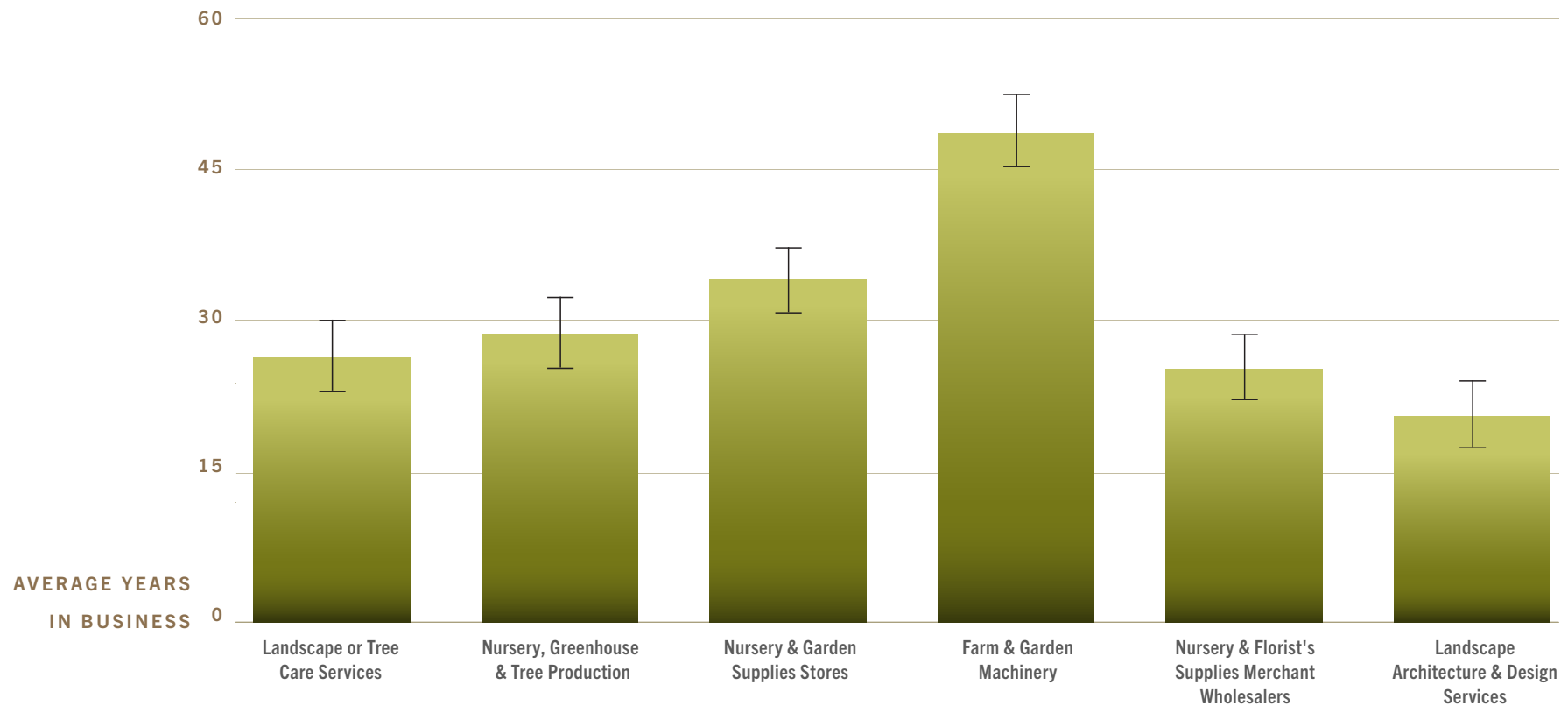


F5 presents the average number of employees per business and the average percentage of employees involved in U&CF-related activities per business. According to the results from the primary survey, private landscaping and tree care services employed the largest percentage of workers in U&CF on average in 2019 (40.5%). Approximately a third of nursery and tree production and nursery and florist’s merchant wholesalers’ employees performed work in U&CF

related activities. More than 20% of the employees in the following business types performed work in U&CF: nursery and garden supply stores and landscape architectural services. Finally, farm and garden machinery businesses that responded to the survey reported the lowest percentage of U&CF employees per business (10.5%).

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F6 AVERAGE YEARS IN OPERATION OF PRIVATE INDUSTRIES SURVEYED IN THE SOUTHERN STATES BY BUSINESS TYPE



The average number of years each business type has been in operation ranges from approximately 22 to 50 years (F6). On average, farm and garden machinery companies in the study region have been in business for almost 50 years. Meanwhile, nursery and garden supply stores have been in business for over 34 years on average. According to survey respondents in the study region, nursery, greenhouse, and tree production businesses averaged 28 years in

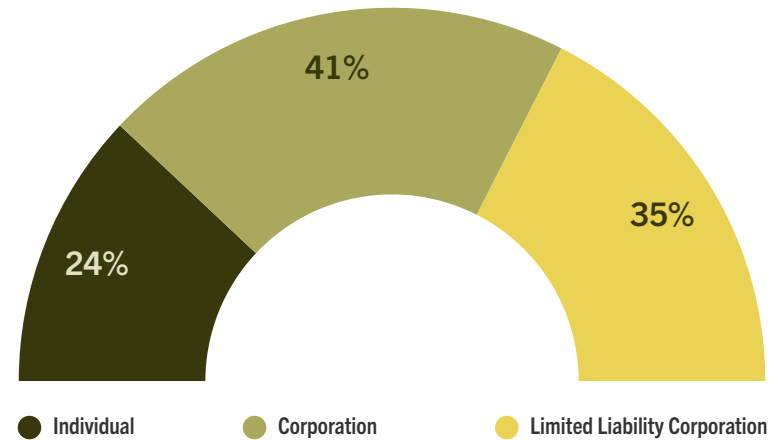
business. Further, landscape or tree care services and nursery and florist's supplies merchant wholesalers follow closely behind with 26 and 25 years on average of active business, respectively. Surveyed landscape architectural service businesses were found to be in business the least amount of time, averaging 22 years.

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VII. Survey Results continued . . .

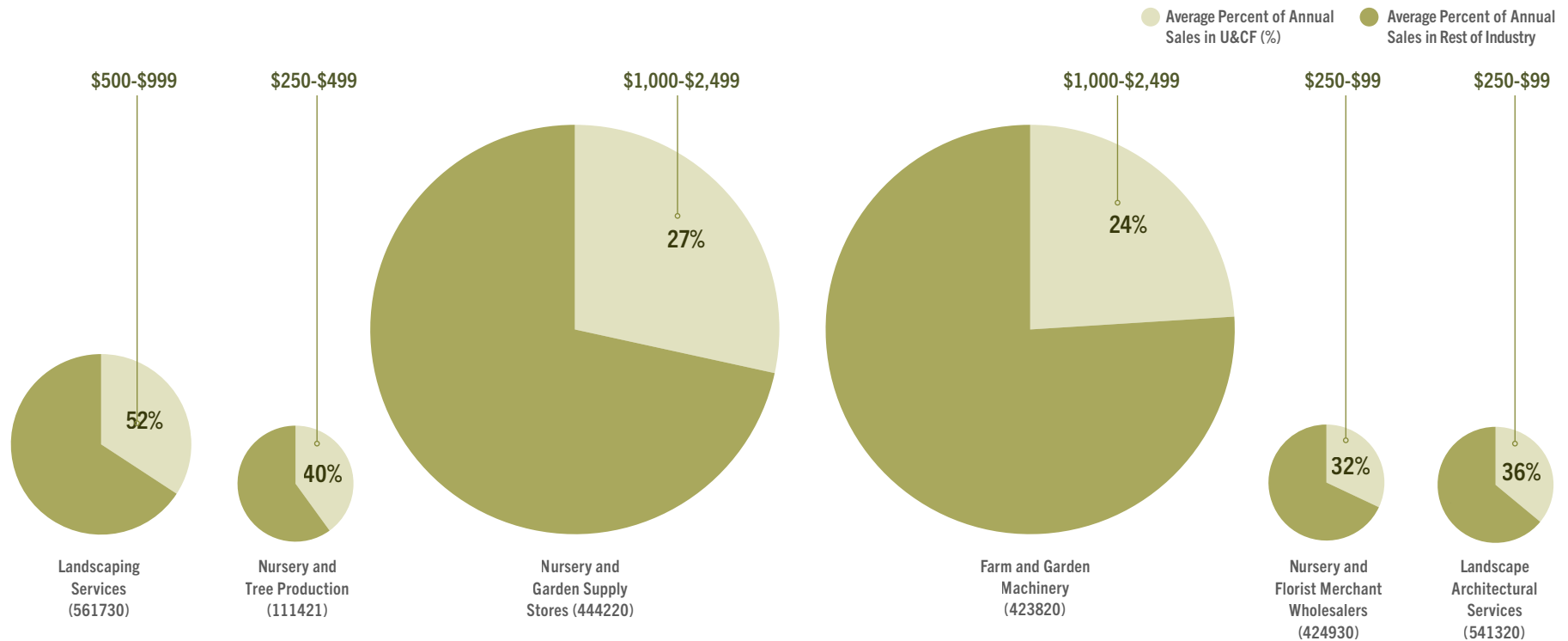
**F7 ORGANIZATIONAL STRUCTURE OF PRIVATE BUSINESSES
IN THE SOUTHERN STATES BY BUSINESS TYPE.**



F7 presents the organizational structure of the private businesses related to the green industry in the study states that responded to the survey. More than 40% of the surveyed businesses were corporations, while limited liability corporations (LLC) followed closely behind, constituting 35% of the surveyed private organizations. Additionally, sole proprietorships represented almost a quarter (24%) of the private businesses that responded to the survey.

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F8 AVERAGE ANNUAL SALES OF SURVEYED BUSINESSES BY BUSINESS TYPE

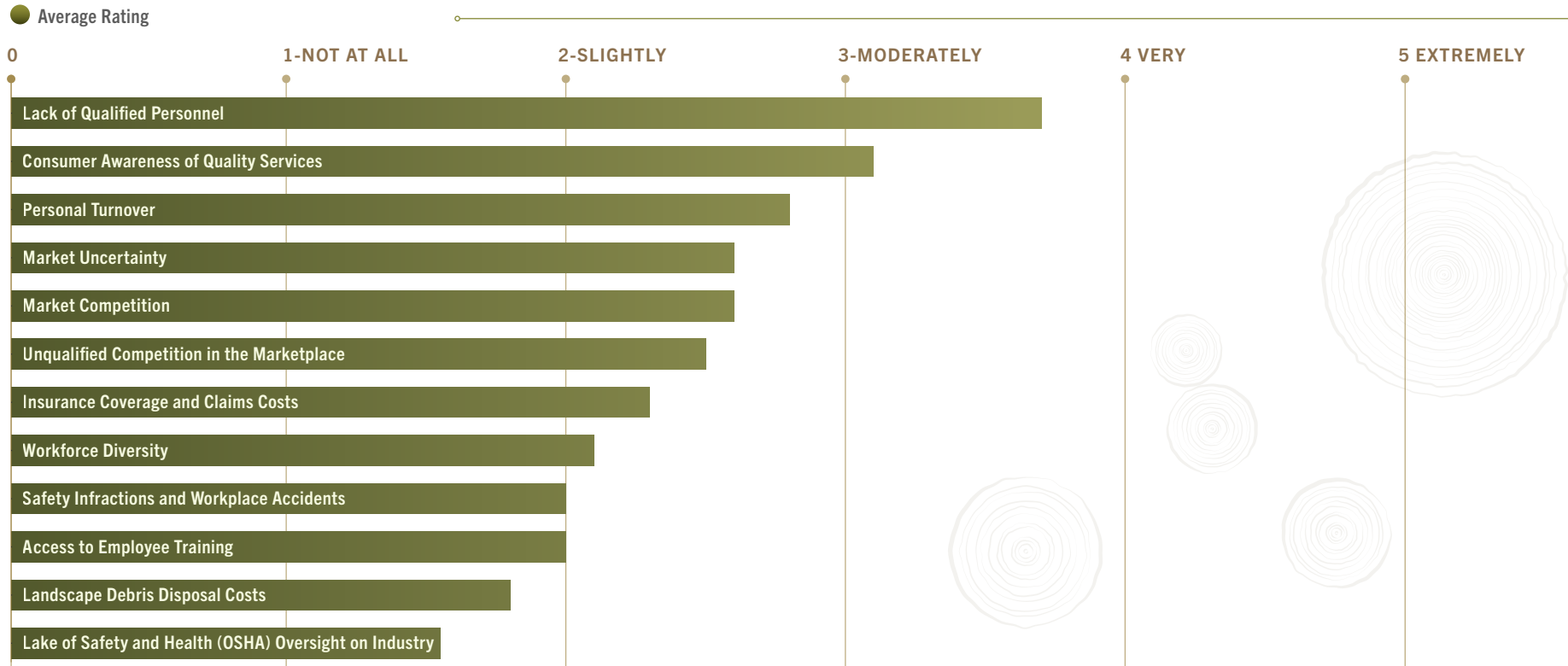


Utilizing the average annual sales and percentage of U&CF related activities reported in the survey, we estimated annual average U&CF-related sales, which varied by the business type (F8). For instance, farm and garden supply stores and garden equipment wholesalers reported the highest average annual sales in total (approximately \$1-\$2.5 million). Meanwhile, the surveyed businesses associated with the following business types were associated with average annual sales between \$250,000 and \$499,999: nursery, greenhouse, and tree production;

nursery and florist's supplies merchant wholesalers; and landscape architectural services. Finally, surveyed businesses that are classified as landscaping services were estimated to have annual total sales ranging from \$500,000 to \$1 million. The largest percentage sales and revenues in U&CF activities were reported by landscaping services (52%), followed by nursery and tree production business (40%), and landscape architectural services (36%). Farm and garden machinery wholesalers reported the lowest percentage sales in U&CF activities.

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F9 AVERAGE RATINGS OF CHALLENGES IMPACTING THE PROFITABILITY OF PRIVATE U&CF BUSINESSES

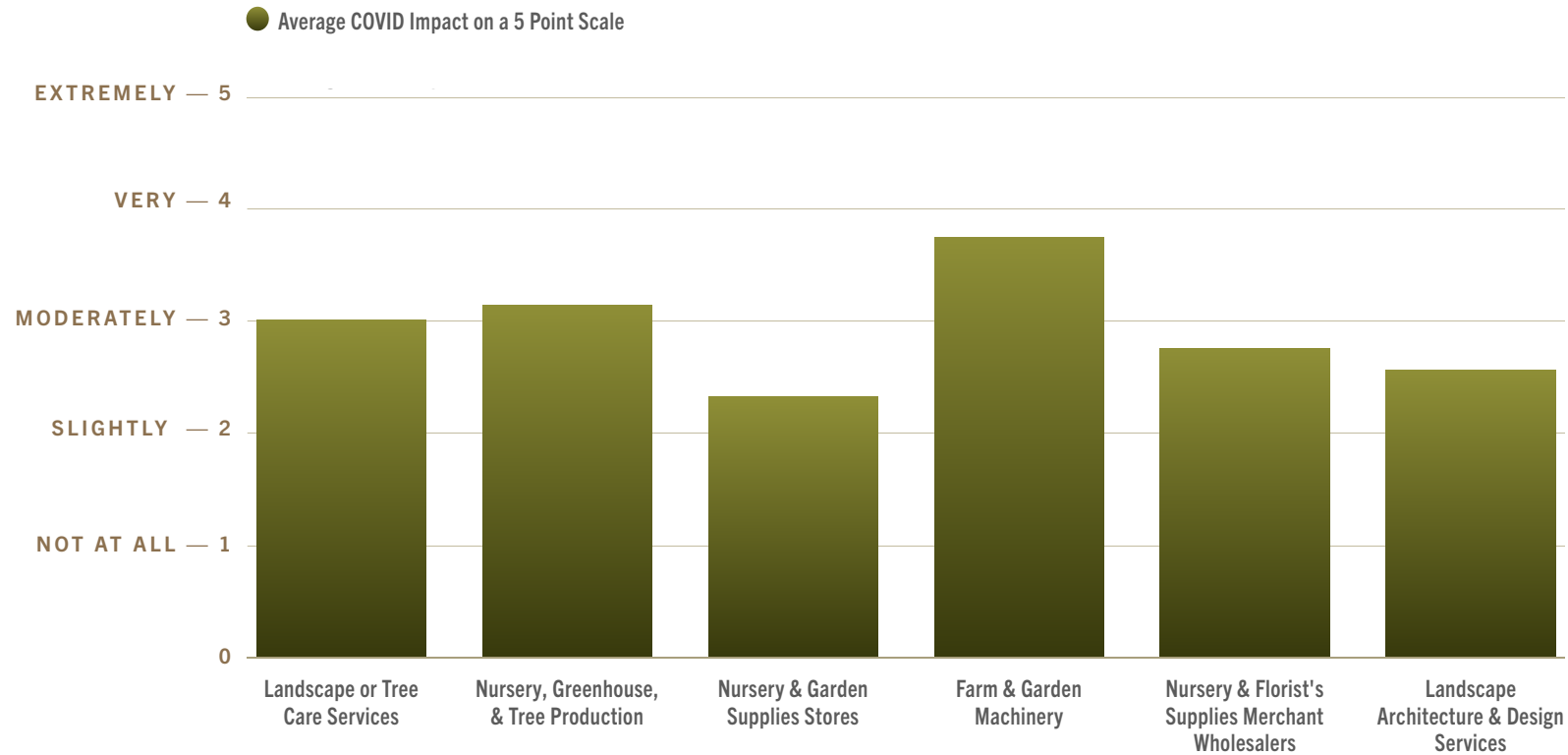


The survey also asked respondents about the perceived significance of various challenges impacting the profitability of U&CF businesses in the study region based on a 5-point ordinal scale: 1- 'not at all,' 2- 'slightly,' 3- 'moderately,' 4- 'very,' and 5- 'extremely' (F9). Survey respondents representing private businesses rated the lack of qualified personnel and consumer awareness of quality services as between 'moderately' and 'very' significant challenges impacting the profitability of U&CF activities. Respondents associated with the private industry sector rated the following challenges on average between

'slightly' and 'moderately' impacting the profitability of U&CF activities in the region: safety infractions and workplace accidents; access to employee training; workforce diversity; insurance coverage and claims costs; unqualified competition in the marketplace; market competition; market uncertainty; and personal turnover. Lastly, the private businesses surveyed rated lack of safety and health oversight on the industry and landscape debris disposal costs as between 'not at all' and 'slightly' significant challenges to profitability of U&CF businesses in the 13-state region.

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F10 AVERAGE IMPACT OF THE COVID-19 PANDEMIC ON THE U&CF RELATED ACTIVITIES PERFORMED BY SURVEYED BUSINESSES

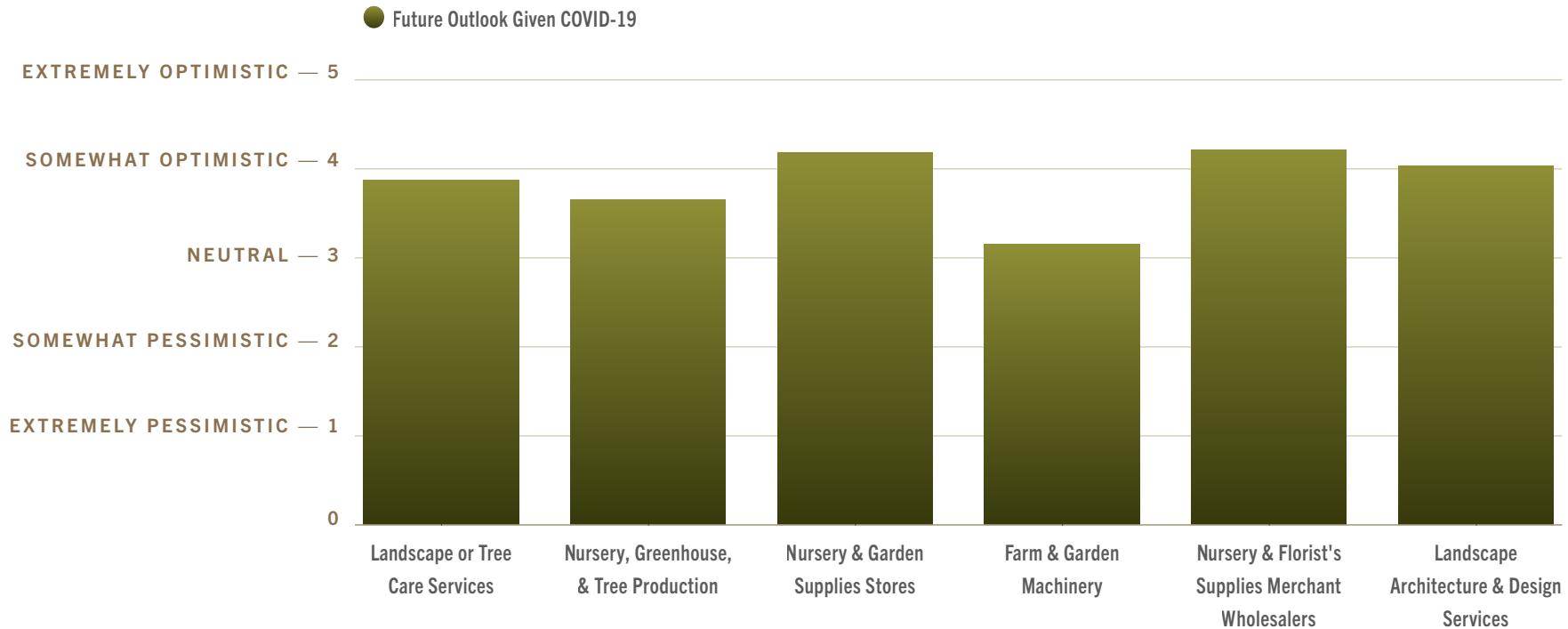


In addition to the questions that we asked related to their business and activities during 2019, we also inquired about the perceived impacts of the COVID-19 Pandemic on U&CF activities (F10). Impacts related to the COVID-19 pandemic were rated using a 5-point ordinal scale: 1- 'very negative,' 2- 'somewhat negative,' 3- 'neutral,' 4- 'somewhat positive,' 5- 'very positive.' Interestingly, COVID-19 had an overall 'neutral' impact on the U&CF activities performed

by the private industry sector in the study region according to the survey. For example, each business type surveyed indicated that, on average, COVID-19 had between a 'somewhat negative' (farm and garden machinery) and 'somewhat positive' (nursery and garden supplies stores) impact on their U&CF activities.

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F11 FUTURE OUTLOOK OF URBAN FORESTRY ACTIVITIES IN THE SOUTHERN STATES GIVEN THE COVID-19 PANDEMIC BY BUSINESS TYPE



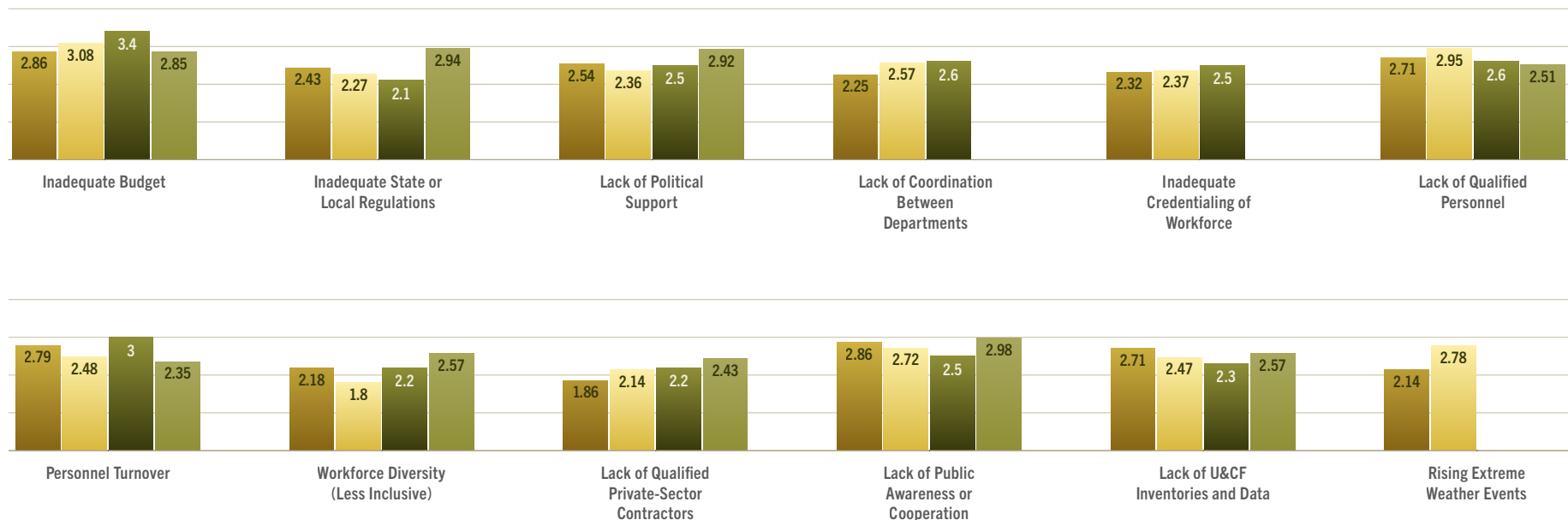
Survey respondents' outlook on the future of U&CF activities in their business varied by business type slightly more than the perceived impacts of COVID-19 (F11). Outlook was also based on a 5-point ordinal scale: 1- 'extremely pessimistic,' 2- 'somewhat pessimistic,' 3- 'neutral,' 4- 'somewhat optimistic,' 5- 'extremely optimistic.' Farm and garden machinery and equipment businesses appeared to have the most pessimistic outlook on average out of the private industry business types. Next, nursery and tree production, landscape and tree care, landscape architecture, and nursery and florist's supplies businesses'

average ratings on the future outlook of their work in U&CF ranged between 'neutral' and 'somewhat optimistic.' Respondents associated with nursery supply stores were the only business type surveyed in the region that rated their outlook on the future of U&CF activities in their business between 'somewhat optimistic' and 'extremely optimistic' on average (F11).

... continued

F12 AVERAGE RATINGS OF VARIOUS PUBLIC AGENCIES, HIGHER EDUCATION INSTITUTIONS AND NON-PROFIT ORGANIZATIONS ON CHALLENGES IMPACTING THE SUCCESS OF AGENCIES INVOLVED IN U&CF ACTIVITIES

● Counties ● Communities ● Higher Education Institutions ● Non-Profit Organizations

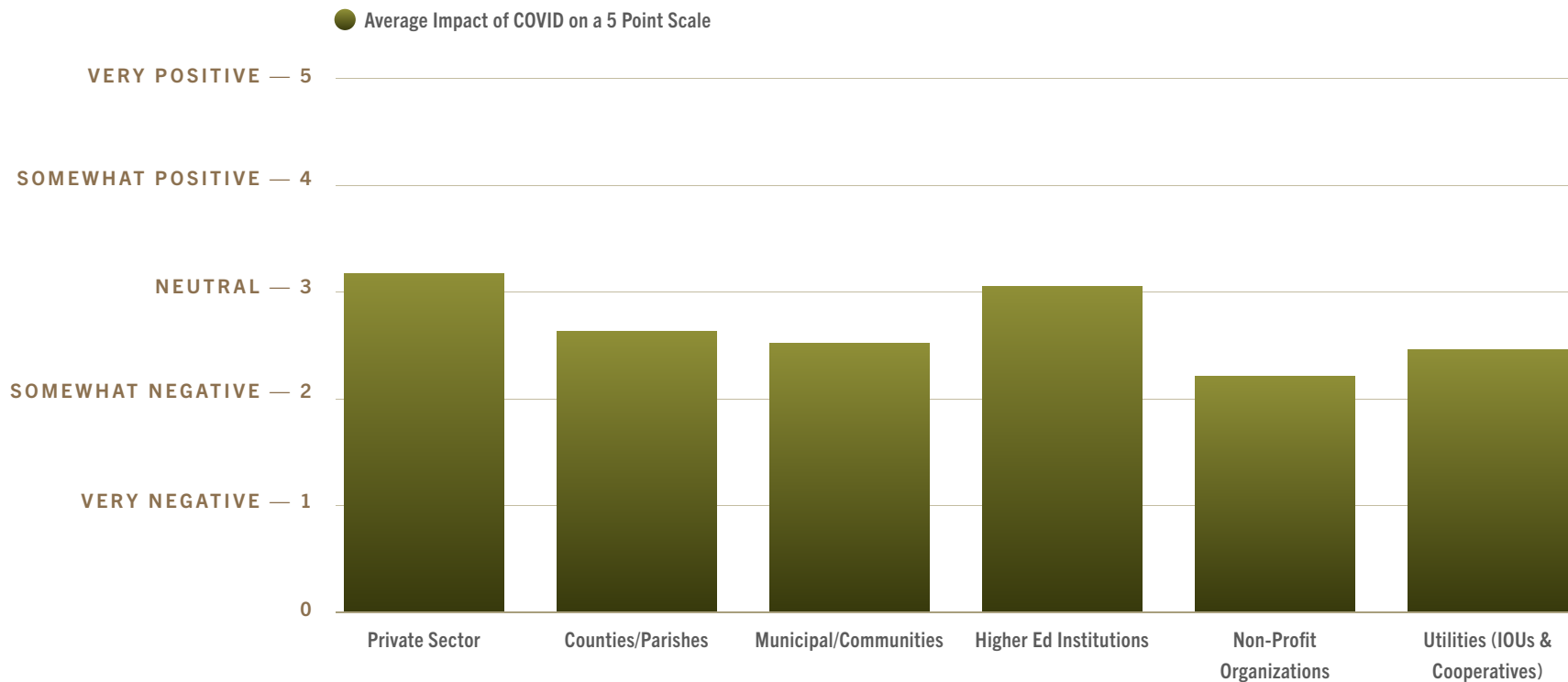


OTHER SECTORS

Survey respondents associated with the public agencies, higher education institutions, and NPOs were asked to rate the significance of challenges impacting the success of agencies involved in U&CF (F12). The issues related to inadequate budget, personnel turnover, lack of qualified personnel were rated consistently higher by all groups indicating that these are the major challenges impacting non-private portion of U&CF in the region. Respondents representing

NPOs rated inadequate state or local regulations, lack of public awareness or cooperation, and lack of political support as the top challenges for their U&CF activities in the southern region (F12).

F13 AVERAGE PERCEIVED IMPACT OF THE COVID-19 PANDEMIC ON THE ABILITY OF ORGANIZATION TO CARRY OUT ACTIVITIES RELATED TO U&CF IN THE STUDY REGION

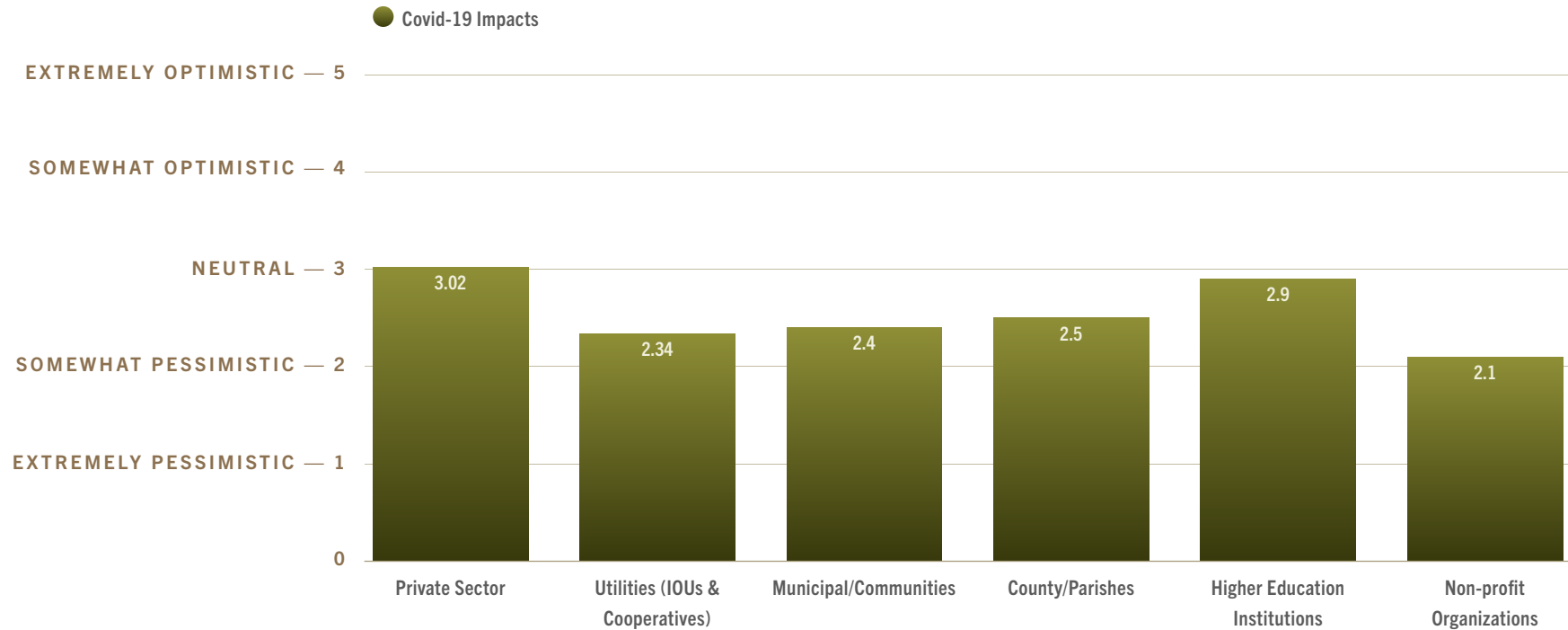


Using a 5-point ordinal scale from ‘very negative’ to ‘very positive,’ respondents were asked to rate the average impact of the COVID-19 pandemic on the ability of organizations associated with each of the groups surveyed to perform U&CF related activities (F13). On average, the private sector experienced between

‘neutral’ and ‘somewhat positive’ (3.0) impacts. The remaining groups, however, reported realizing impacts whose averages range from ‘somewhat negative’ to ‘neutral’ (2.1 - 2.6).

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F14 FUTURE OUTLOOK OF U&CF ACTIVITIES BY GROUP GIVEN THE COVID-19 PANDEMIC

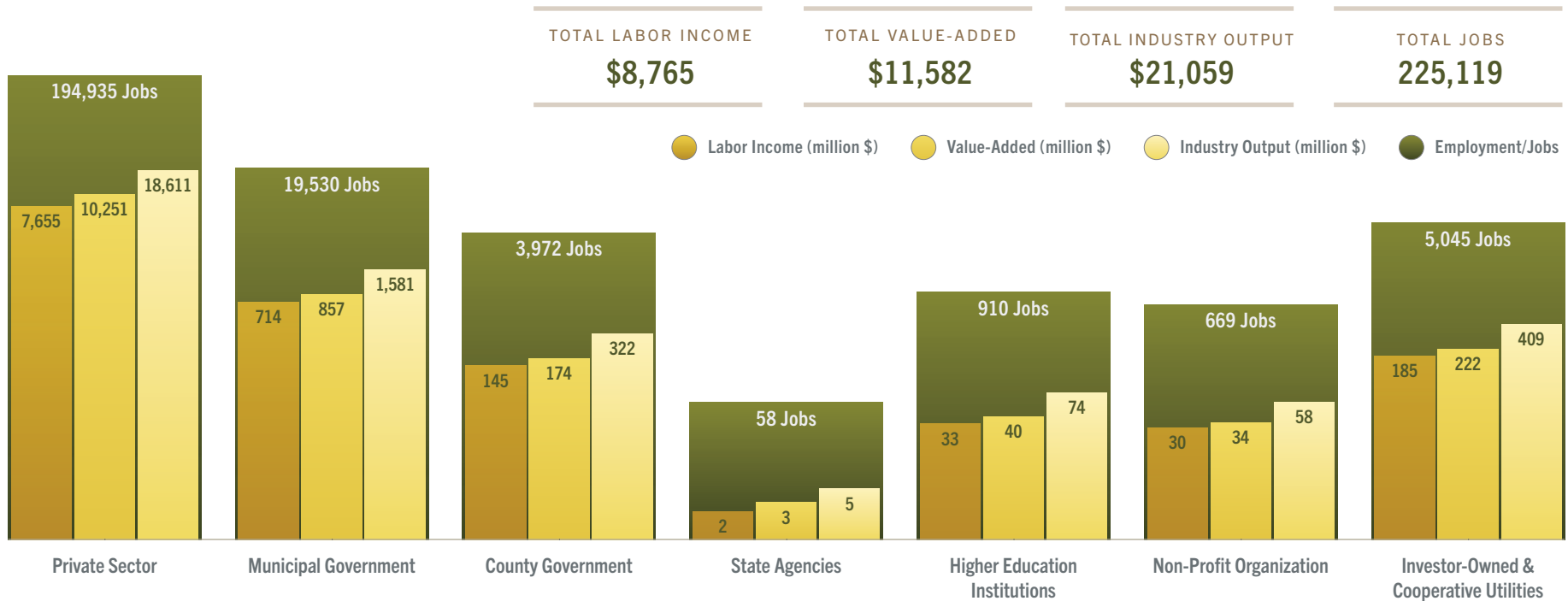


Survey respondents from each group were asked to rate their future outlook of U&CF activities given the COVID-19 Pandemic on a 5-point scale from ‘extremely pessimistic’ to ‘extremely optimistic (F14)’. Respondents associated with each sector reported having between a ‘neutral’ and ‘somewhat optimistic’ outlook related to their organizations’ work in U&CF on average (3.3 – 3.7). These observations correlate with the relatively neutral impact of the COVID-19 Pandemic documented by the survey respondents (F14).

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VIII. REGIONAL ECONOMIC CONTRIBUTION

F15A DIRECT EFFECT ECONOMIC CONTRIBUTION OF U&CF IN THE SOUTHERN UNITED STATES, 2019

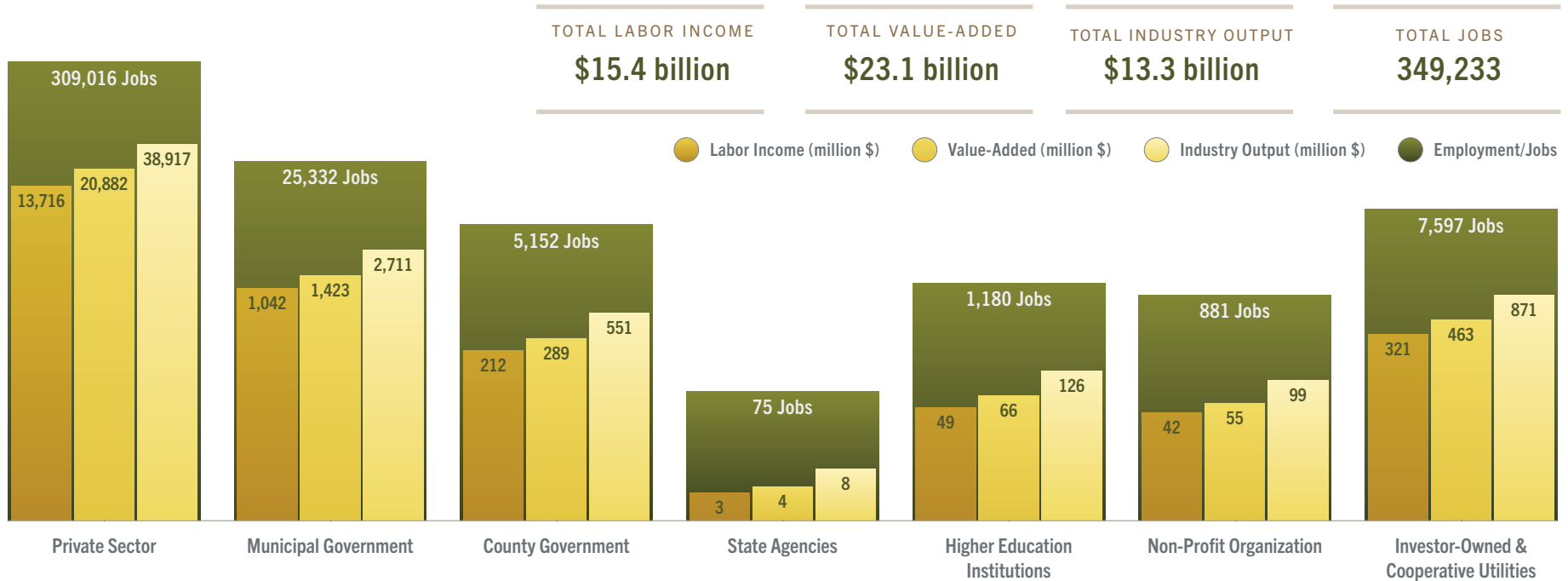


We estimated that in 2019, U&CF in the 13-state study region directly supported over 225,000 full- and part-time jobs in various businesses and activities in the regional economy (F15A). Further, the total job contribution of U&CF including direct, indirect, and induced employment surpassed 349,200. In terms of direct employment, the private sector accounted for the largest workforce in U&CF at nearly 195,000 jobs in the region. Local governments (municipal and county) comprised nearly 25,000 U&CF jobs, and utility companies exceeded 5,000 employees working in U&CF. Higher education institutions, non-profit

organizations, and state agencies were the smallest U&CF employers. In terms of labor income, U&CF in the southern states collectively contributed about \$8.8 billion directly, and over \$15.4 billion including the multiplier effects throughout the regional economy. Appendix A breaks down total economic contributions from U&CF activities in the study region by direct, indirect, and induced effects.

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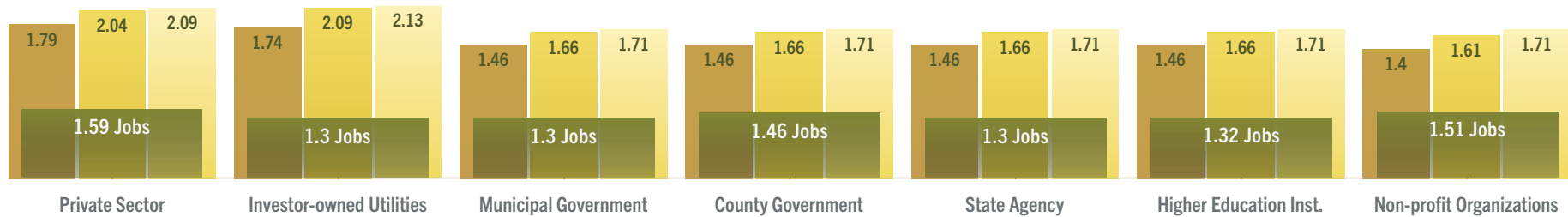
15B TOTAL EFFECT ECONOMIC CONTRIBUTION OF U&CF IN THE SOUTHERN UNITES STATES, 2019



Likewise, in terms of value-added, which is equivalent to gross domestic product, U&CF in the study region contributed approximately \$11.6 billion to the regional economy directly, and if we account for the indirect and induced effects, the total value-added contribution in 2019 was about \$23.2 billion (F15B). In terms of industry output representing all economic activities, the direct and total contributions of U&CF in the 13-state region were about \$21.1 billion and \$43.3 billion, respectively. The overall social accounting matrix (SAM) multiplier associated with employment was estimated to be 1.55, which

indicates that each job in U&CF in these states resulted in an additional 0.55 jobs in other sectors of the economy. Similarly, a multiplier equivalent to 2.06 suggests that every \$1.00 generated in U&CF contributed another \$1.06 in industry output to the rest of the regional economy (F15B).

F15C SAM MULTIPLIER ECONOMIC CONTRIBUTION OF U&CF IN THE SOUTHERN UNITED STATES, 2019

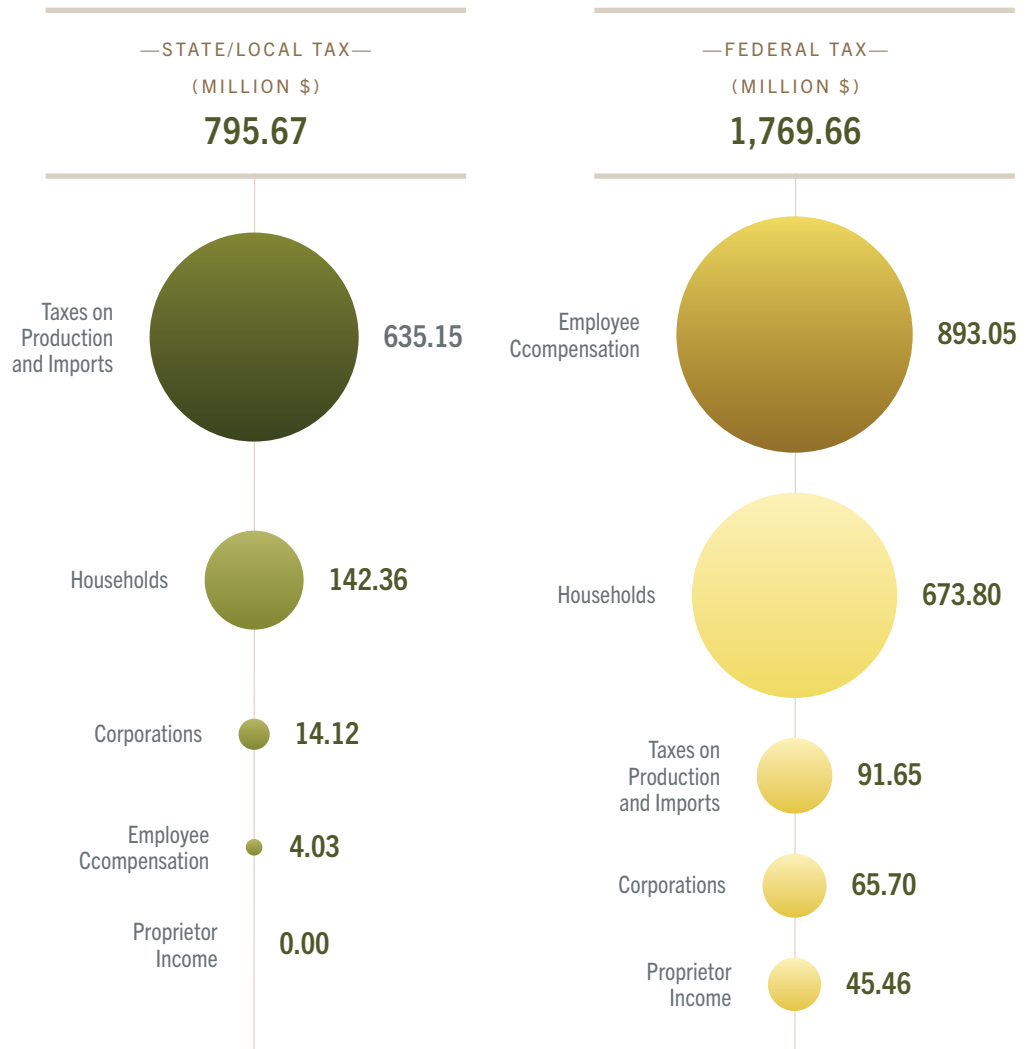


However, the economic contribution of U&CF varies widely among the sectors and groups surveyed. For example, the private sector represents over 88% of the direct jobs and industry output in the 13-state region in the US South. The public agencies (municipal, county, and state agencies) collectively contributed about \$3.3 billion in total industry output by supporting over 30,500 jobs in the regional economy (F15C). Further, higher education institutions and non-profit organizations had total job contributions of 1,180 and 881, respectively.

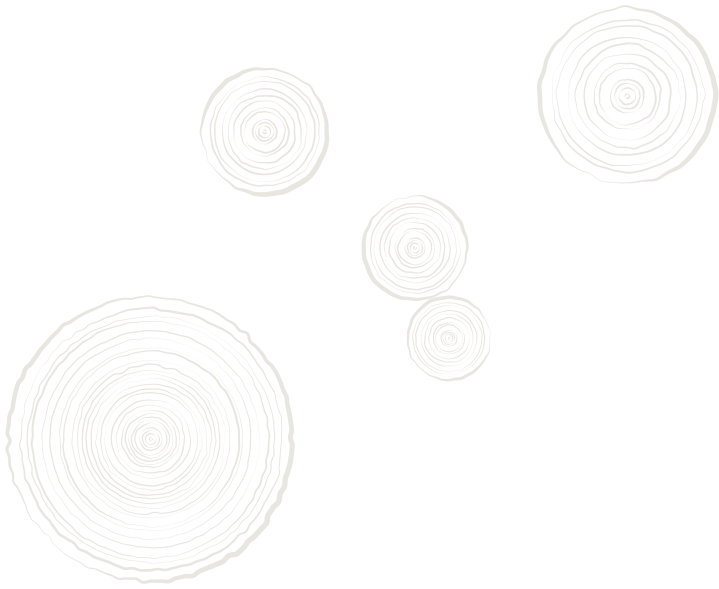
Additionally, we estimated that the private sector had the largest SAM multiplier values in employment and labor income and the investor-owned and cooperative utilities had the largest values in value-added and industry output (F15C). The SAM value of 2.13 associated with the industry output of the utility sector surveyed indicates that every \$1.00 generated in U&CF by the sector contributed an additional \$1.13 to the other sectors in the 13-state regional economy.

There were substantial contributions by U&CF activities in the southern states to local or state and federal taxes (**F16**). In 2019, U&CF businesses and employees in the 13-state region led to approximately \$796 million in state and local taxes collection and about \$1.8 billion in federal taxes. Most of the state and local taxes were collected on production and imports of goods, followed by household taxes. Meanwhile, employee compensation and households were the major categories contributing to about 89% of federal taxes collected directly from U&CF businesses and employees in the study region.

F16 DIRECT TAX CONTRIBUTION OF URBAN FORESTRY IN SOUTHERN STATES, 2019



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F17 THE TOP 10 INDUSTRIES AFFECTED BY JOBS IN U&CF IN SOUTHERN STATES, 2019

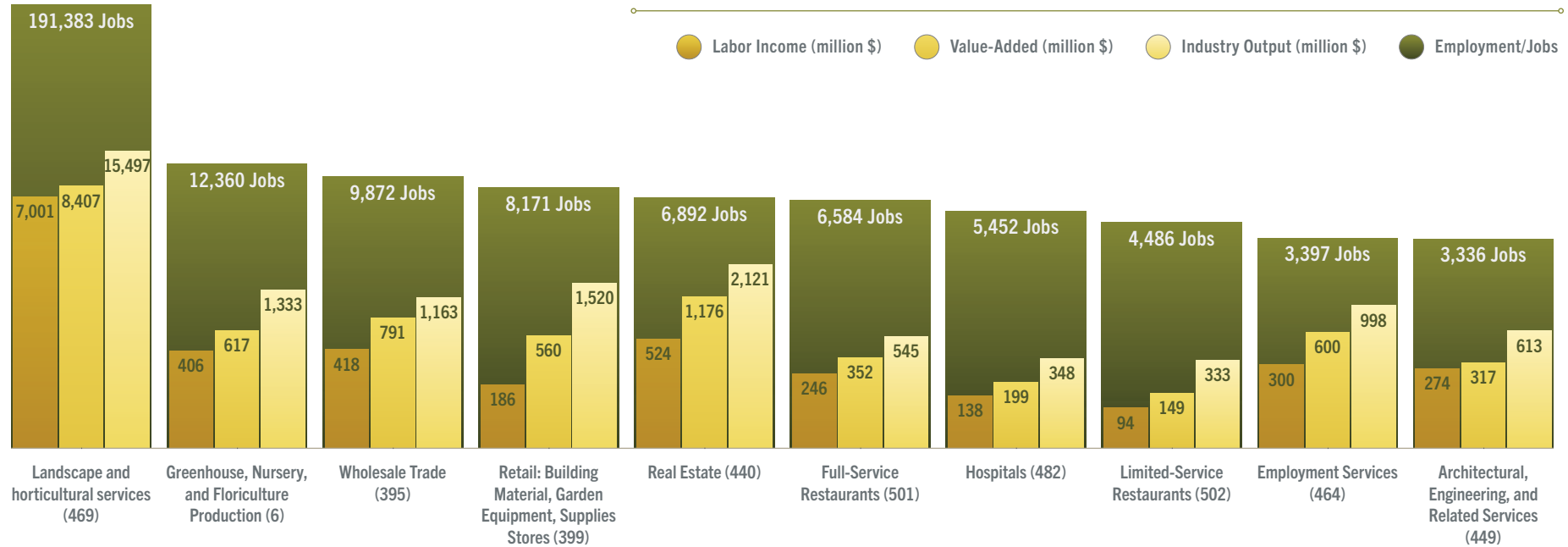
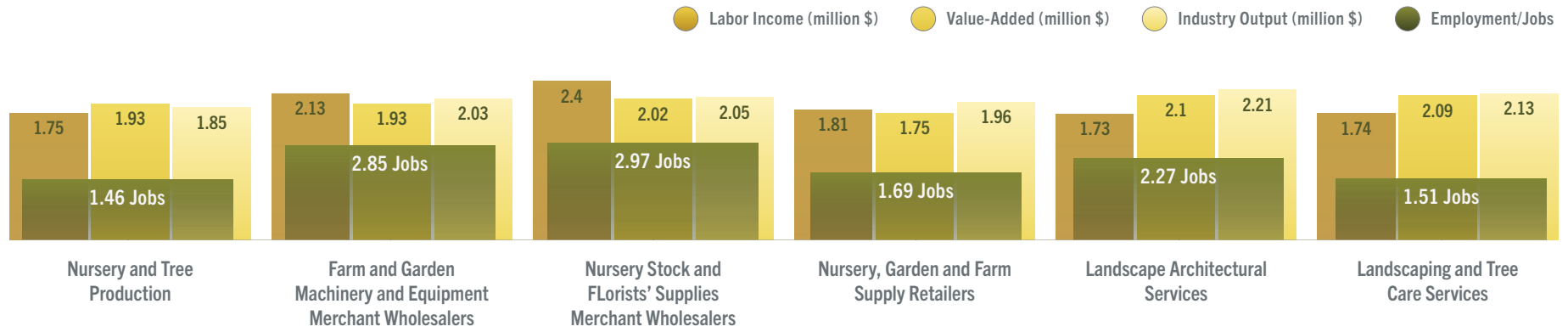


Figure 17 presents the top 10 industries in the 13-state region that have the highest employment contributions from U&CF. U&CF employment contributed 191,383 jobs with an industrial output of about \$15.5 billion in landscape and horticultural services in the study region. Further, U&CF supported 12,360 jobs in greenhouse, nursery, and floriculture production, 9,872 jobs in the wholesale trade industry, and 8,171 jobs in the retail sector in the study region (F17). Through the induced effects, employees in U&CF in the 13-state region supported a number of jobs in real estate, full-service and limited-service restaurants, and hospitals through the multiplier effects.

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F18A DIRECT EFFECT ECONOMIC CONTRIBUTIONS OF PRIVATE URBAN FORESTRY INDUSTRIES IN THE SOUTHERN STATES, 2019

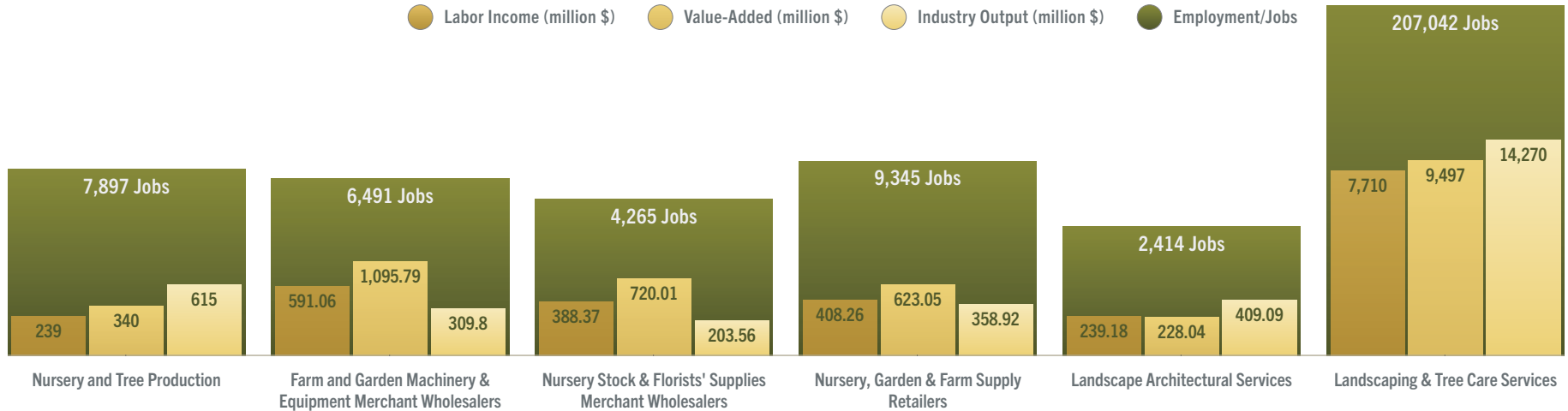
TOTAL LABOR INCOME	TOTAL VALUE-ADDED	TOTAL INDUSTRY OUTPUT	TOTAL JOBS
\$7.7 billion	\$10.3 billion	\$18.6 billion	194,935



We also explored the economic contribution of each industry within the private sector since it represents a significant portion of the U&CF activities in the US South (F18A-C). Among the six major business types explored in this study, landscaping and tree care services (NAICS 561730) represent over 70% of the total contribution from the private sector in terms of all business metrics.

F18B TOTAL EFFECT ECONOMIC CONTRIBUTIONS OF PRIVATE URBAN FORESTRY INDUSTRIES IN THE SOUTHERN STATES, 2019

TOTAL LABOR INCOME	TOTAL VALUE-ADDED	TOTAL INDUSTRY OUTPUT	TOTAL JOBS
\$13.7 billion	\$20.9 billion	\$38.9 billion	309,016

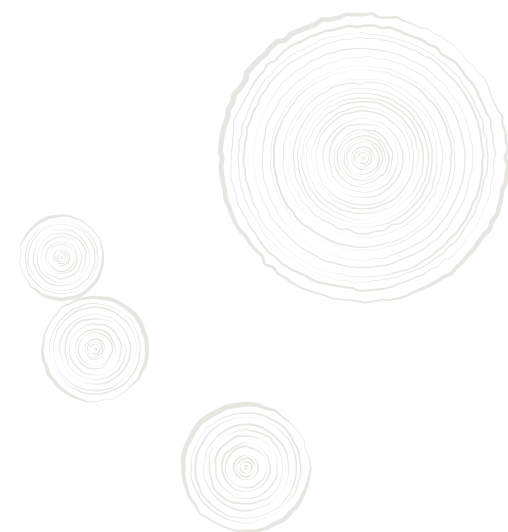
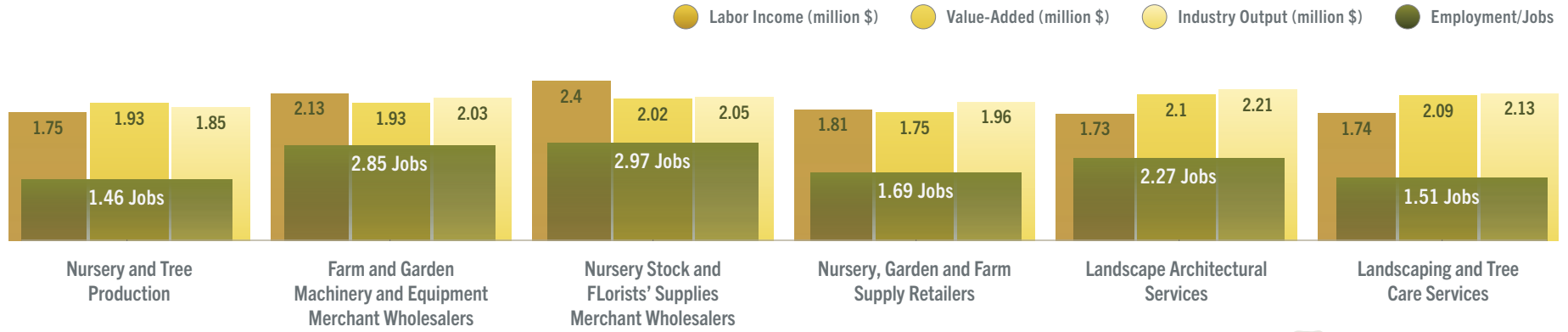


In fact, 161,617 direct full- and part-time jobs were supported by private landscaping and tree care services in various aspects of urban trees management, plantation, and arboriculture services. Furthermore, businesses involved in nursery and tree production for U&CF contributed over \$1.3 billion in industry output directly, supporting over 12,000 direct jobs in the southern states. In total (direct, indirect, and induced effects), the private industries involved in urban forestry contributed approximately \$39 billion in industry output and about \$20.9 billion in value-added by employing over 309,000 people in 2019.

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F18C SAM MULTIPLIER ECONOMIC CONTRIBUTIONS OF PRIVATE URBAN FORESTRY INDUSTRIES IN THE SOUTHERN US, 2019

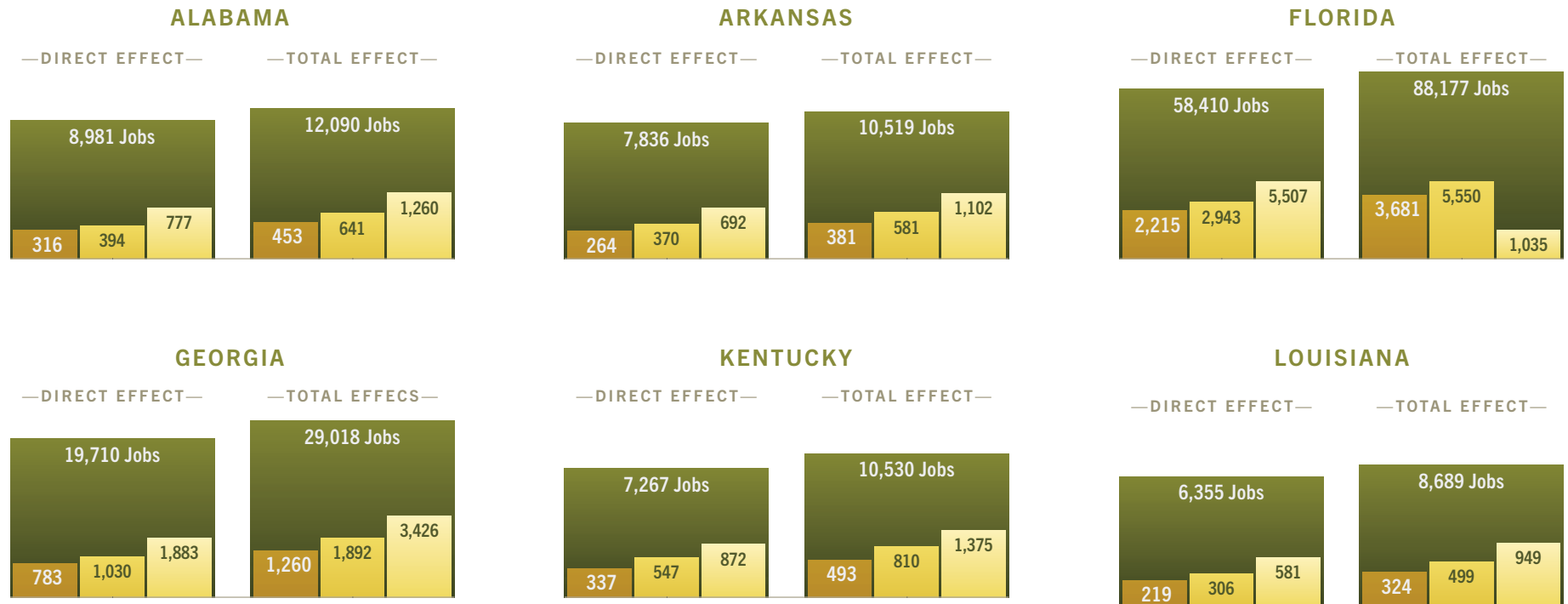
TOTAL LABOR INCOME	TOTAL VALUE-ADDED	TOTAL INDUSTRY OUTPUT	TOTAL JOBS
\$1.79 billion	\$2.0 billion	\$2.1 billion	1.59



To assess the economic contribution of U&CF to each of the state economies in the study region, we estimated the state-level IMPLAN models for all 13 states separately. Table 15 summarizes the direct and total economic impacts by state. Among the 13 states included in the regional analysis, the top five states in terms of the total jobs are Florida, Texas, North Carolina, Georgia, and Virginia, each of which had over 22,000 jobs supported by U&CF in their respective state

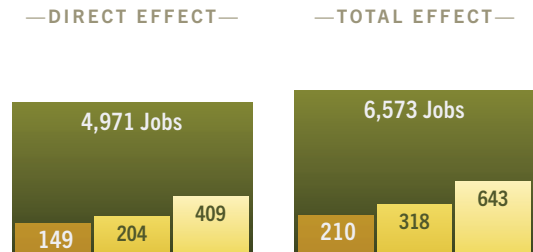
economies. Other notable states with employment contributions surpassing 12,000 jobs included Tennessee, South Carolina, and Alabama. States with over 10,000 total jobs supported by U&CF in 2019 were Kentucky and Arkansas. Other state-specific business metrics such as labor income and value-added in both direct and total contributions are presented in **(F19)**.

- Labor Income (million \$)
 - Value-Added (million \$)
 - Industry Output (million \$)
 - Employment/Jobs
- *Total effects from the individual state-level numbers do not sum to the total regional results because of the leakage effects.

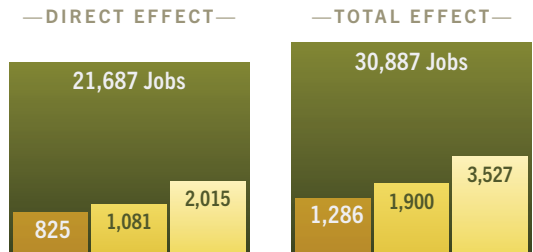


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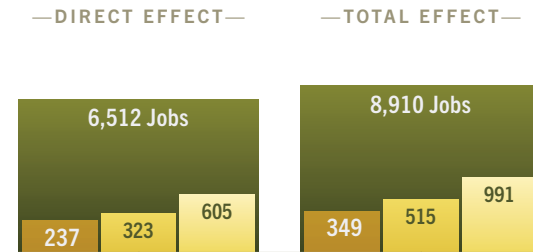
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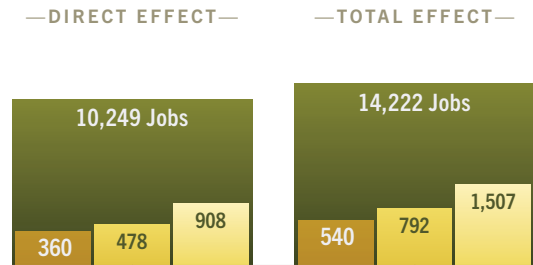
NORTH CAROLINA



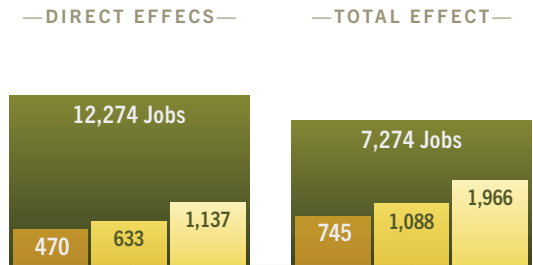
OKLAHOMA



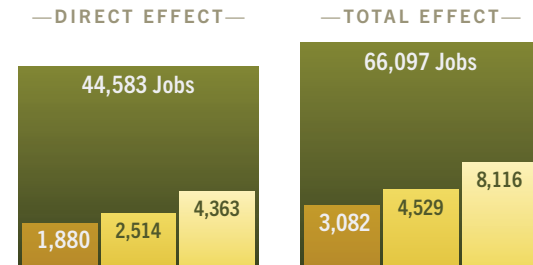
SOUTH CAROLINA



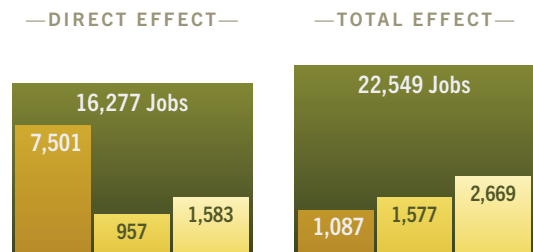
TENNESSEE



TEXAS



VIRGINIA



X. CONCLUSIONS

In recent years, U&CF has received considerable attention for two primary reasons: (1) urban forests' intrinsic values in urban and suburban landscapes, and (2) the economic significance of various businesses and industries relying on U&CF. However, estimating the economic contribution of U&CF is somewhat challenging as it is quite difficult to separate the sector from broader green industries. As a result, estimation of the sector's economic contributions through input-output modeling requires additional effort to characterize industry portions specific to U&CF. In this report, we outlined our approach, which is modeled after Parajuli et al. 2022, to employ a standard methodology and model set-ups to capture U&CF related businesses and activities exclusively. We then applied our approach to estimate the economic contributions of U&CF in the 13-state study region in the US South. To this end, our study makes an important methodological contribution and sets a milestone in U&CF economic contribution analysis. Results from our IMPLAN model indicate that most U&CF-related employment opportunities in the southern states are in the private sector, which collectively represents industries related to urban tree care services, nursery and tree production, machinery supplies, and landscape architecture, among others. The results also indicate that landscaping and tree care services were the most dominant private sectors, contributing to nearly 162,000 direct jobs in the study region. The magnitude of the SAM multipliers associated with the private sector were higher than those associated with the public sectors. This difference reflects the diversified market channels of private industries and the subsequent magnified ripple effects throughout the rest of the economy (Henderson et al., 2017). While employment from U&CF in the public sector in the study region is minimal, the findings from this study suggest a meaningful contribution of the public sector in large metropolitan areas. Rather, public

sector investments in U&CF have paid off through employment opportunities, ripple effects in other sectors of the economy, and ecosystem service-related benefits such as shade and health (Hardy et al., 2000; Donovan, 2017).

The framework and findings documented in this report also have important management and policy implications:

- Using stakeholder input and rigorous discussion as a foundation, we established an exhaustive scope of U&CF activities, incorporating the involvements of private, public, non-profit, and higher education institutions.
- Our approach adapted an input-output analysis framework for U&CF outlined by Parajuli et al. (2022), which applies the analysis-by-parts method and margins analysis for wholesalers and retailers. This approach is generalizable and can be used to estimate analogous results regardless of the study region.
- Our findings could provide justification for enhancement of current programs or creation of new measures to support U&CF activities.
- The comprehensive nature of this study leads to a robust picture of U&CF contributions, including areas that require attention.
- Results from this study could be utilized to inform targeted technical and financial assistance to jurisdictions that require capacity building.
- Private sector U&CF industries could use the findings of this study to highlight their economic contribution to the states and region at large while communicating with the public and policymakers on issues pertinent to their industries.

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Despite this being a ground-breaking study, there are some caveats that are worth noting. Response rates that varied widely among the target groups could have some potential bias. Response rates from the public sector, higher education institutions, and non-profit organizations were relatively high compared to other studies based on web-based surveys, for example, Sinclair et al. (2012) that found internet surveys were associated with adjusted response rates of 2.2% to 4.7%. Meanwhile, the response rate from private businesses (about 3%) was comparatively less than the other groups surveys but still within the range reported by Sinclair et al. (2012). The ongoing COVID-19 Pandemic is one possible reason explaining lower survey responses from the private businesses. Nevertheless, the lower response rates are consistent with the finding that web-based surveys may be more effective for the groups with smaller population sizes (Sinclair et al., 2012). To this end, we suggest that future studies adopt the mixed-mode approach utilizing both paper-based and web-based platforms.



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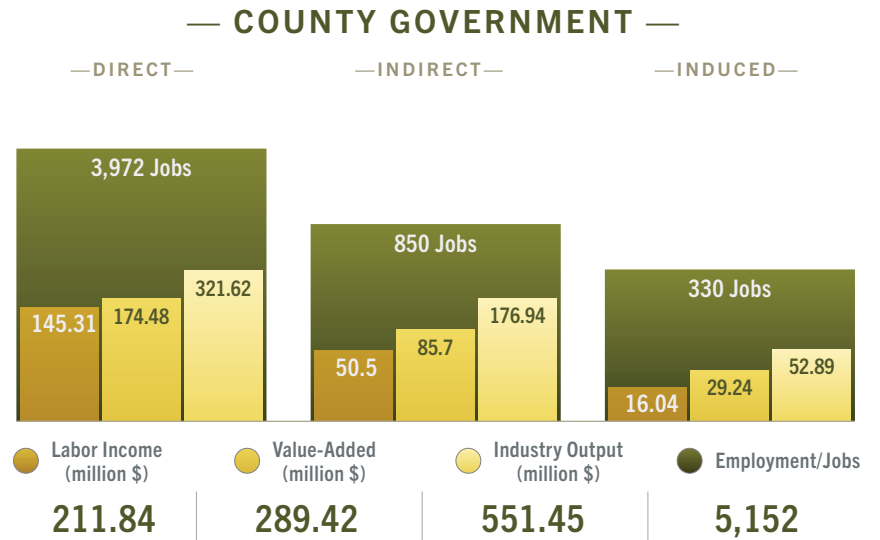
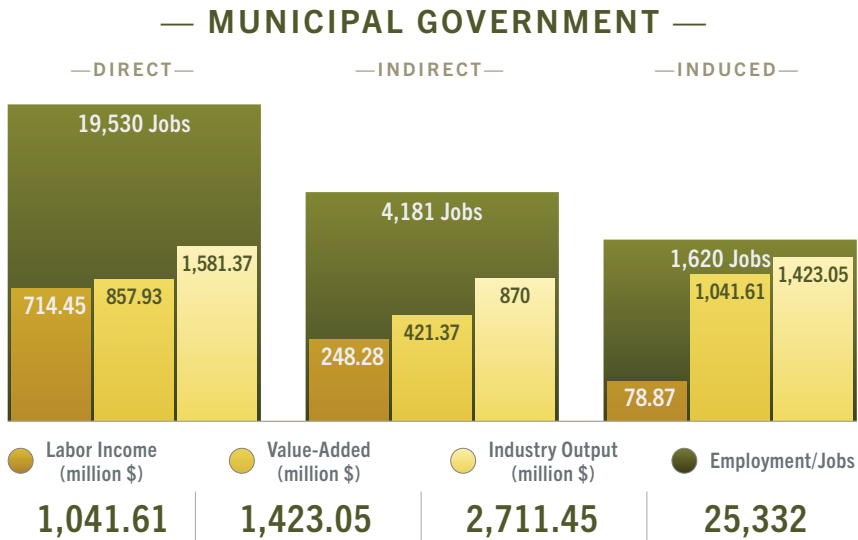
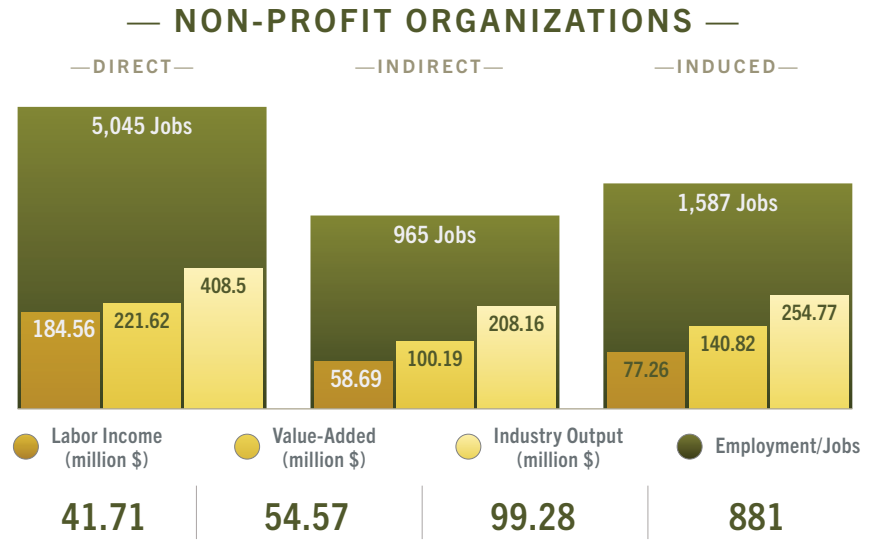
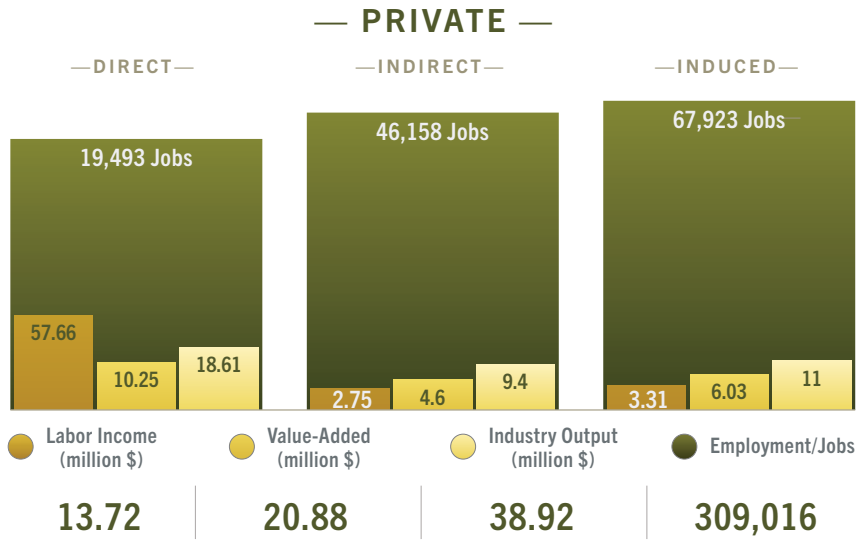
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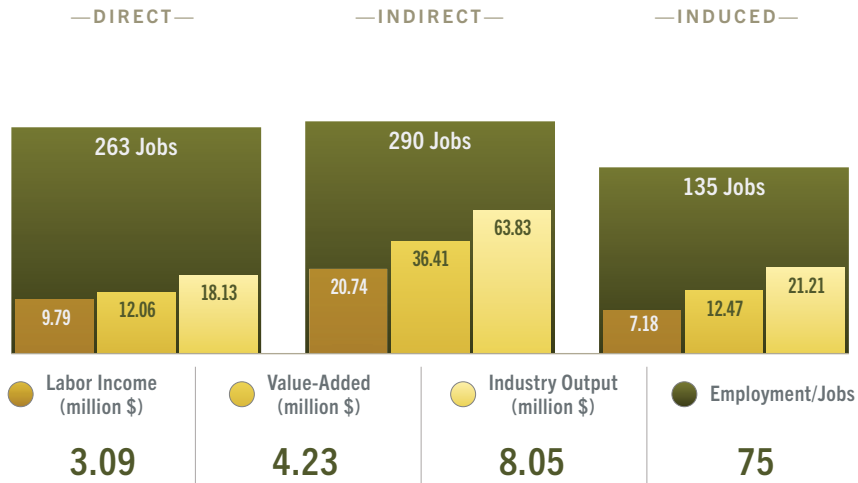
APPENDIX A

ECONOMIC CONTRIBUTIONS (DIRECT, INDIRECT, INDUCED, AND TOTAL) OF ALL SECTORS FEATURED IN THIS STUDY

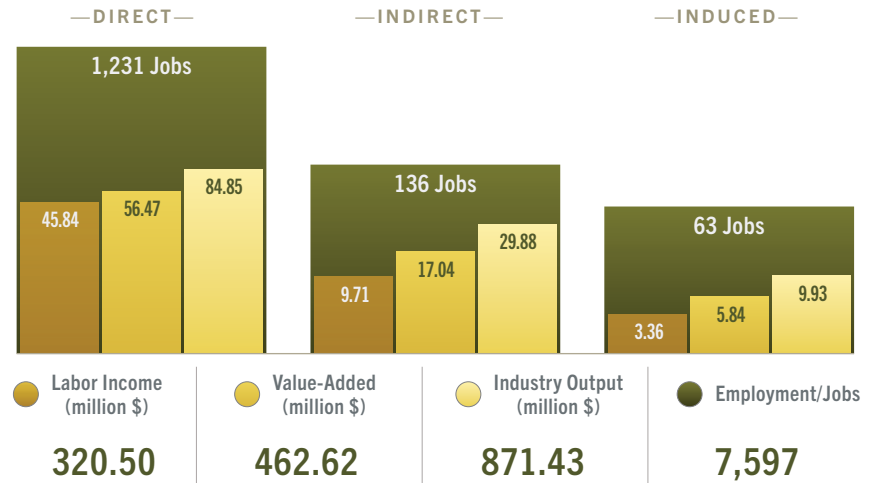


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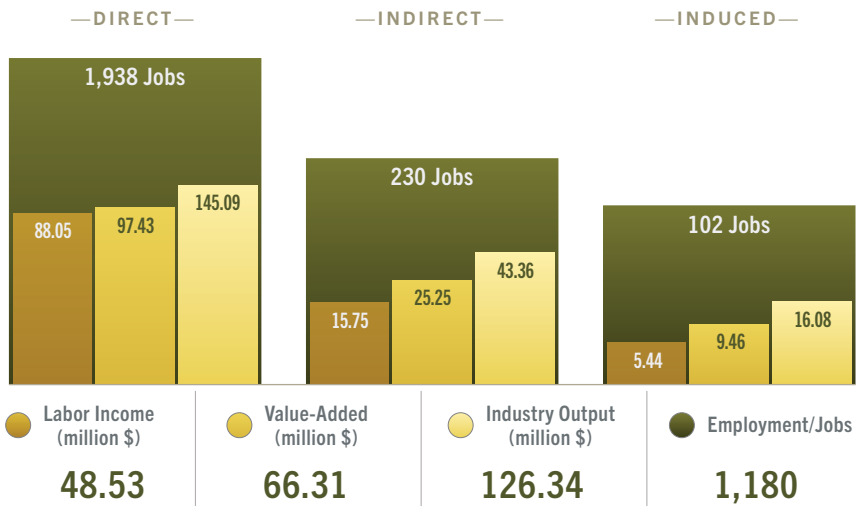
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