



URBAN FORE\$TRY

ECONOMIC ANALYSIS • 2019

ARKANSAS



PREPARED FOR

Virginia Department of Forestry

PREPARED BY

**Rajan Parajuli, Stephanie Chizmar
and Austin Lamica**

North Carolina State University

Eric Wiseman, Stella Schons

Virginia Polytechnic Institute
and State University

Jason Gordon

University of Georgia

Thomas Ochuodho

University of Kentucky

Sayed Mehmood

Ohio State University

James Henderson

Mississippi State University

Date of Publication

January, 2023

TABLE OF CONTENTS

Acknowledgements	ii
I. Executive Summary	1
II. Glossary.....	3
III. Introduction	4
IV. Objectives.....	6
V. Scope of U&CF	7
VI. Methods	8
VII. Employment Profile.....	9
VIII. State Economic Contribution Analysis	12
IX. Conclusions	16
REFERENCES	18
APPENDIX A.....	20
U.S. Forest Service Nondiscrimination Statement.....	39

TABLE

T1 Scope of U&CF in Arkansas	7
---	---

LIST OF FIGURES

F1 Map Depicting the 13 States Involved in U&CF Economic Analysis	6
F2 U&FC Jobs in Private Businesses in Arkansas	9
F3 U&FCJobs in City and County Governments in Arkansas.....	10
F4 U&FC Jobs in Higher Education Institutions in Arkansas	11
F5 U&FC Jobs in Non-profit Organizations (NPO's) in Arkansas	11
F6 Economic Contribution of U&FC in Arkansas, 2019.....	12
F7 Direct Tax Contribution of U&FC in Arkansas, 2019.....	14
F8 Top 10 Industries Affected by Jobs in U&FC in Arkansas	15



ACKNOWLEDGEMENTS

This report is funded by a U.S. Forest Service Landscape Restoration Competitive Grant (Agency reference number: RFP 411.A2000-05) and coordinated by the Virginia Department of Forestry (VDOF) in partnership with the 12 other southern states. The 13-state region includes Alabama, Arkansas, Florida, Georgia, Kentucky, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, and Virginia. The project collaborators are listed below.

This work was made possible by the support and encouragement of the state foresters in the participating states. There were also many other individuals from various states who provided additional review and assistance. We thank them for their contributions.

Dale Dickens and Katie Wiswall

Alabama Forestry Commission

Kristine Kimbro and Harold Fisher

Arkansas Department of Agriculture,
Forestry Division

Will Liner and Stephen Lloyd

Florida Forest Service

Joan Scales, Seth Hawkins,

Susan Granbery

Georgia Forestry Commission

Mark Bays and Riley Coy

Oklahoma Forestry Services

Andrew G. Pleninger and Jennifer Rall

North Carolina Forest Service

Lara Johnson and Molly O'Liddy

Virginia Department of Forestry

Bridget Abernathy

Kentucky Division of Forestry

Diane Warwick and Ashley Kite-Rowland

Tennessee Dept. of Agriculture/Forestry

Robert Seemann and Christopher Cooper

Baton Rouge Green

**Paul Johnson, Gretchen Riley, Linda Moon
and Mac Martin**

Texas A&M Forest Service

Misty Booth and Meacham Harlow

Mississippi Forestry Commission

Frances Waite and Lowe Sharpe

South Carolina Forest Commission

Chelsea Ealum

Southern Group of State Foresters

For more information and resources, visit SouthernForests.org



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 130 million acres of urban landscape in the United States (U.S. Forest Service 2019). 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 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 sector for 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 applied with 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.

... continued

Out of the 7,836 direct jobs in U&CF in Arkansas in 2019, 6,501 jobs were in the private sector. Businesses in private landscaping and tree care services reported the highest number of employees in U&CF (5,621 jobs), while businesses in landscape architectural services reported the lowest employment numbers (28 jobs). Furthermore, the 20 investor-owned and cooperative utility companies in Arkansas support approximately 277 jobs and expend over \$21.3 million per year in total. Additionally, we found that county and city governments in Arkansas employed 1,009 people directly working in U&CF activities in 2019. Moreover, according to the information collected from state representatives, state agencies employed 1 positions in Arkansas in 2019. Likewise, in 2019, findings from this analysis suggest there were 33 direct jobs involved in U&CF activities on higher education campuses involved in U&CF activities in Arkansas. Lastly, it is estimated that in 2019, non-profit organizations (NPOs) in Arkansas supported 15 jobs directly working in U&CF activities.

Results from the input-output modeling suggest that in 2019, U&CF in Arkansas directly contributed \$692 million in industry output and \$370 million in value-added by supporting about 7,836 full- and part-time jobs in various businesses and activities. Including direct, indirect, and induced effects, U&CF in the state had a total contribution of \$1.10 billion in industry output to the state economy, employing more than 10,519 people with a payroll of about \$381 million. The private sector, predominantly landscaping services, represents about 83% of the direct jobs and industry output in the study region. The public agencies (city, county, and state agencies) collectively contributed about \$107.8 million

in total industry output by supporting approximately 1,193 jobs to the state economy. Similarly, higher education institutions and non-profit organizations had total job contributions of 39 and 18, respectively. We estimated that every \$1.00 generated in U&CF by the private sector contributed an additional \$0.62 to the state economy.



II. GLOSSARY

Urban and Community Forestry (U&CF)

In this study, all activities of 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. Its framework enables users to create regional economic models and multipliers for one or more counties or states in the USA. Version 3 of IMPLAN®

accounts for commodity production and consumption for 536 industry sectors, 10 household income levels, taxes to local/state and federal governments, capital investment, imports/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 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 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-Output 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 (or 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 130 million acres of urban landscape in the United States (U.S. Forest Service 2019). 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, 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) developed a standard framework for evaluating the economic contribution of the U&CF sector by incorporating various private, public, and non-profit groups' involvement in U&CF development, management and maintenance in Northeastern-Midwest states in the United States.



Introduction continued . . .



The main objective of this report is to estimate the economic contribution of the U&CF sector in Arkansas. To accomplish this, we first developed a standardized definition of U&CF that characterized the scope of the sectors in the 13 Southern states, or region 8 as delineated by the US Forest Service, 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 state 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).

IV. OBJECTIVES

THE SIX SPECIFIC OBJECTIVES OF THIS PROJECT

- 1

Facilitate discussion and consensus on the scope of U&CF economic activities, methodology for analysis, and report template
- 2

Develop and distribute relevant survey questions in cooperation with the project team to separate contributions specific to U&CF businesses and organizations
- 3

Document methodology and rationale for the selected approach in a written report
- 4

Analyze data collected
- 5

Produce reports documenting regional and state-level results and analysis and summary spreadsheets
- 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

Since there are no well-defined industries specific to U&CF and IMPLAN integrates U&CF into broader green sectors, the first crucial step of economic contribution analysis was to delineate the scope of urban forest industries 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 urban forestry was rigorously discussed with the representatives from each participating state, and other project partners from universities and agencies. Then, all the project team participants were surveyed to develop consensus on the following final list of U&CF related industries and activities in both private and public sectors (T1).

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 that 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 (VDOF), regional International Society of Arboriculture (ISA) chapters, and the United States Department of Agriculture (USDA) Forest Service.

T1 SCOPE OF U&CF IN THE SOUTHERN STATES

PRIVATE INDUSTRIES
<ul style="list-style-type: none">Landscaping services (NAICS 561730)Nursery and tree production (NAICS 111421)Nursery, garden, and farm supply stores (NAICS 444220)Farm and garden machinery and equipment merchant wholesalers (NAICS 423820)Nursery stock and florists’ supplies merchant wholesalers (NAICS 424930)Landscape architectural services (NAICS 541320)
PRIVATE (INVESTOR-OWNED & COOP)) UTILITY COMPANIES
PUBLIC SECTORS
<ul style="list-style-type: none">CitiesCountiesState agencies involved in U&CF
HIGHER EDUCATION INSTITUTIONS
NON-PROFIT ORGANIZATIONS

VI. METHODS

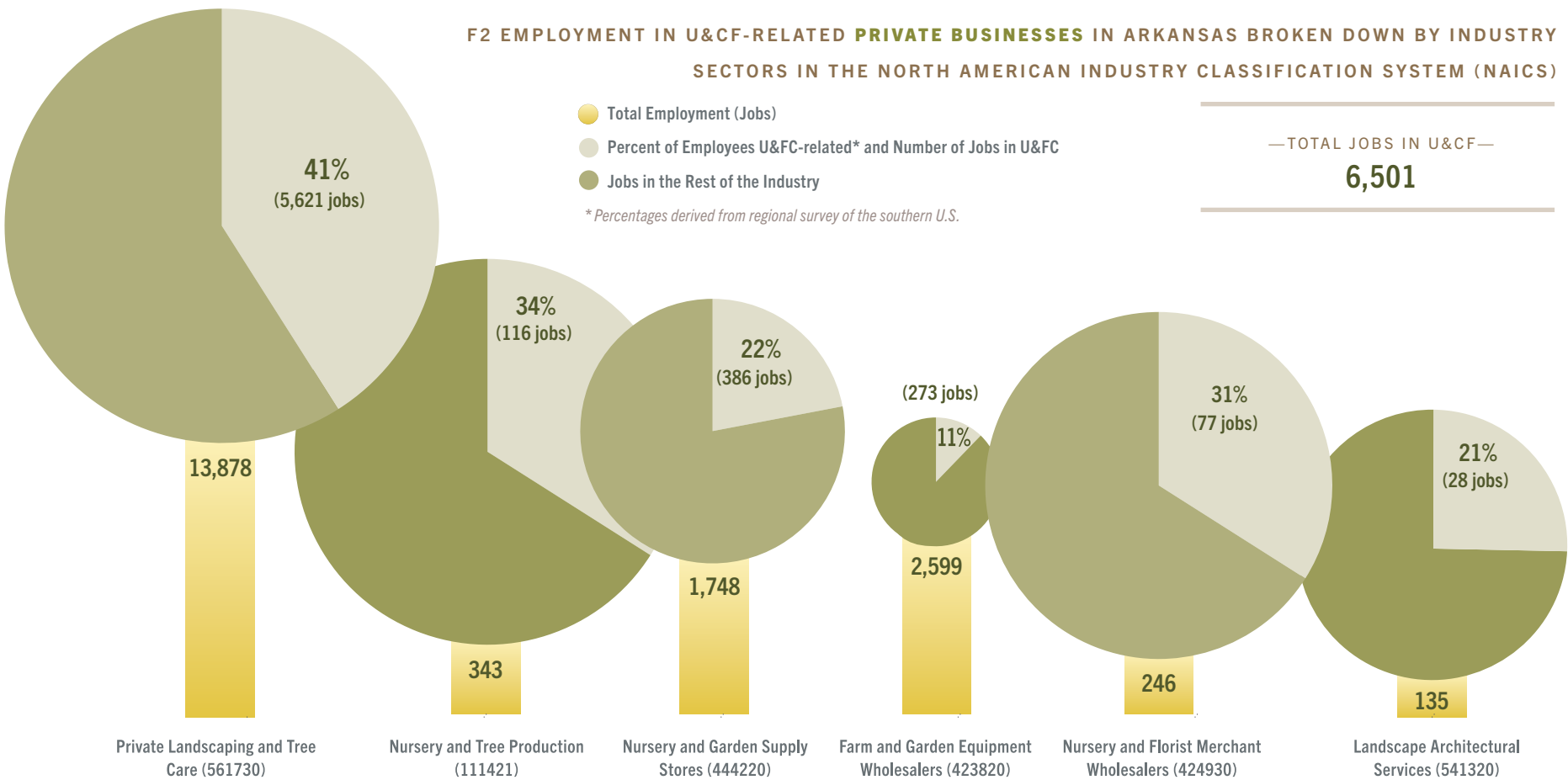
Six different groups across the 13-state region were surveyed: private green industry businesses, public (county and municipal governments), public (state agencies), higher education institutions, investor-owned and cooperative utilities working in tree-line maintenance, and non-profit organizations. 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 in 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 establishment, care, and maintenance of urban forests utilizing publicly available sources in addition to the primary surveys to separate urban forestry activities from broader green industries. Also utilizing data from the primary surveys and publicly available sources, we developed a complete profile of employment statistics including job number and percentage of jobs in U&CF associated with each group and sector, a key input in the IMPLAN

modeling. For the private industries, the 2019 employment numbers in each North American Industry Classification System (NAICS) category were obtained from the Census of Employment and Wages (CEW) from the US Bureau of Labor Statistics (US BLS, 2021). Since CEW does not incorporate self-employed jobs and businesses with their own social insurance programs (IMPLAN Data Team, 2021), the 2017 IMPLAN data was utilized to compute proprietary jobs specifically in landscaping services (NAICS 561730) and Nursery and tree production businesses (NAICS 111421). We specify the steps in our approach to the surveys and subsequent economic contribution analysis in more detail in the Methodology Report.



VII. EMPLOYMENT PROFILE

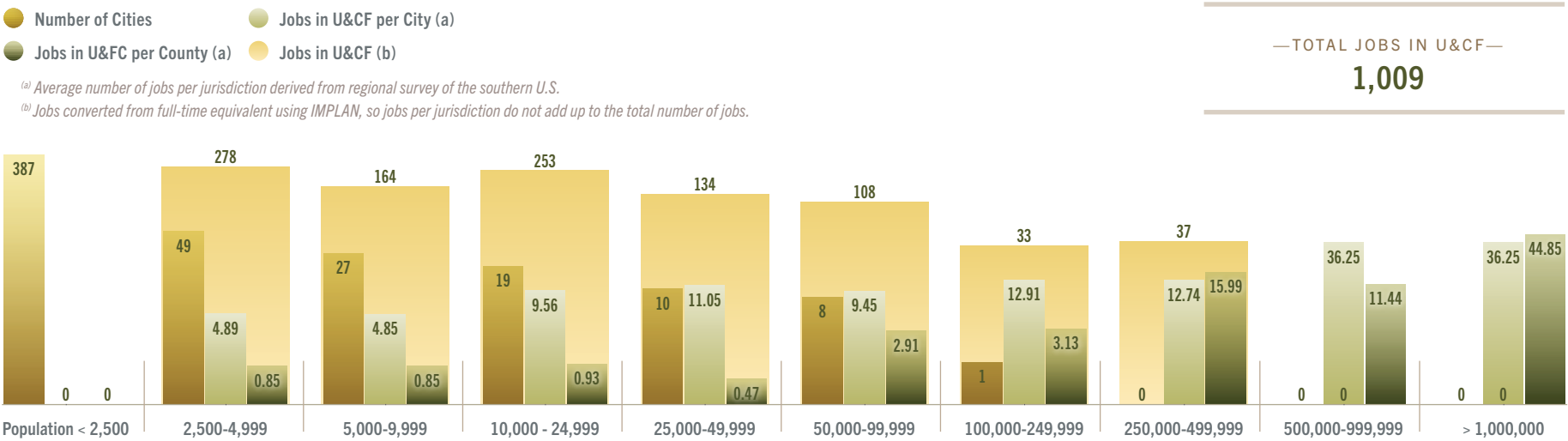


Out of the businesses surveyed in Arkansas, private landscaping and tree care services followed by nursery and tree production establishments reported the highest number of employees on average, including full-time, part-time, and seasonal employee (**F2**). Private landscaping and tree care providers also employ the highest number of workers in U&CF (5,621 direct jobs). Nursery and garden supply enterprises employ the second highest number of workers in

U&CF (386 direct jobs). Meanwhile, nursery and tree production stores support 116 jobs, nursery and florist merchant wholesalers support 77 jobs, and farm and garden equipment wholesalers support 273 jobs in U&CF in Arkansas in 2019 (Table 2). Landscape architectural services employed the fewest number of workers in U&CF in Arkansas in 2019 (28 direct jobs).

... continued

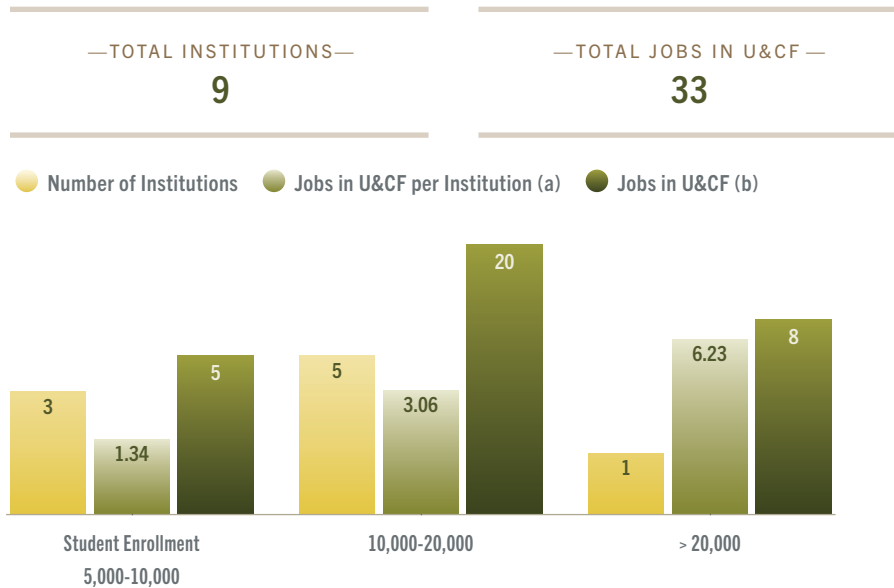
F3 EMPLOYMENT IN U&CF-RELATED JOBS IN CITY AND COUNTY GOVERNMENTS AGENCIES IN ARKANSAS, 2019



Since investor-owned and cooperative utility companies are also significant contributors of tree line clearing and vegetation management in urban and suburban regions, we include their involvement in U&CF in the study. According to the survey, the average per company in-house expenses of investor-owned and cooperative utility companies in vegetation management in our study region was over \$1 million per year. The total expenditures of investor-owned and cooperative utility companies in vegetation management are calculated by multiplying the number of investor-owned and cooperative utility companies in the study state by the average expenditures per company. Thus, the 20 investor-owned and cooperative utility companies in Arkansas support approximately 277 jobs and expend over \$21.3 million per year in total.

Similarly, total public employees involved in U&CF are estimated based on the population size of the jurisdiction that these agencies serve in the study region. We obtained the number of cities by population size and the number of counties by population size in all 13 states from the Population Division of the U.S. Census Bureau (US Census Bureau, 2020). Then, we estimated the average numbers of employees in a city and county using our regional survey as well as the total number of jobs in U&CF employed by city and county governments (F3). As a result, we found that county and city governments in Arkansas employed 1,009 people directly working in U&CF activities in 2021. Moreover, we also include the number of employees in state forestry or natural resources agencies directly involved in U&CF in the economic contribution analysis. According to the information collected from state representatives, in 2019, state agencies employed 1 position in the study region.

F4 U&CF EMPLOYMENT IN HIGHER ED INSTITUTIONS IN ARKANSAS, 2019

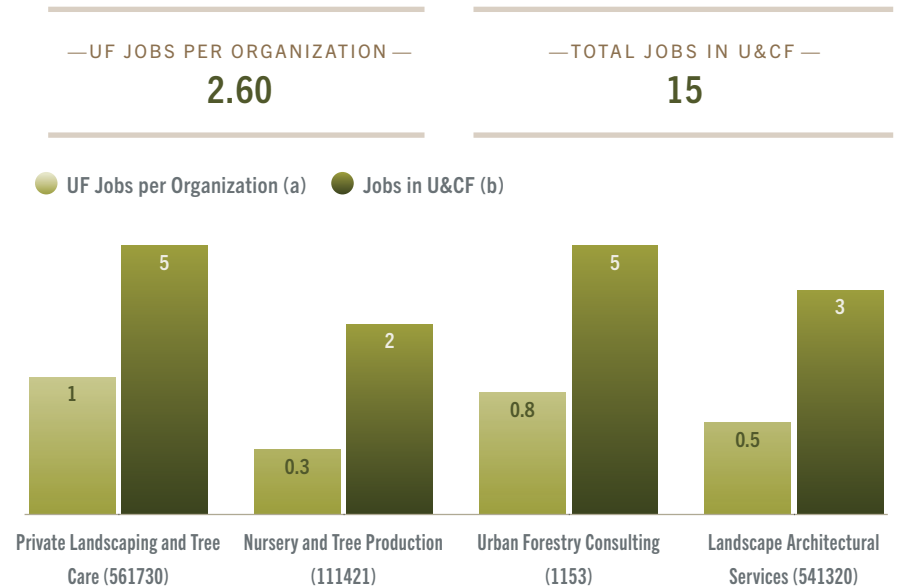


^(a) Average number of jobs per jurisdiction derived from regional survey of the southern U.S.

^(b) Jobs converted from full-time equivalent using IMPLAN, so jobs per institution do not add up to the total number of jobs.

Likewise, we estimated the total jobs related to U&CF supported by higher education institutions based on their student enrollment size. First, we collected the total number of higher education institutions and student enrollments from various publicly available sources in each state. We then estimated the total U&CF jobs in colleges and universities by multiplying the number of institutions by the average number of jobs per institution, which we calculated using the regional survey of higher education institutions (**F4**). In 2019, there were 33 direct jobs from the 9 qualifying higher education institutions involved in U&CF activities in Arkansas.

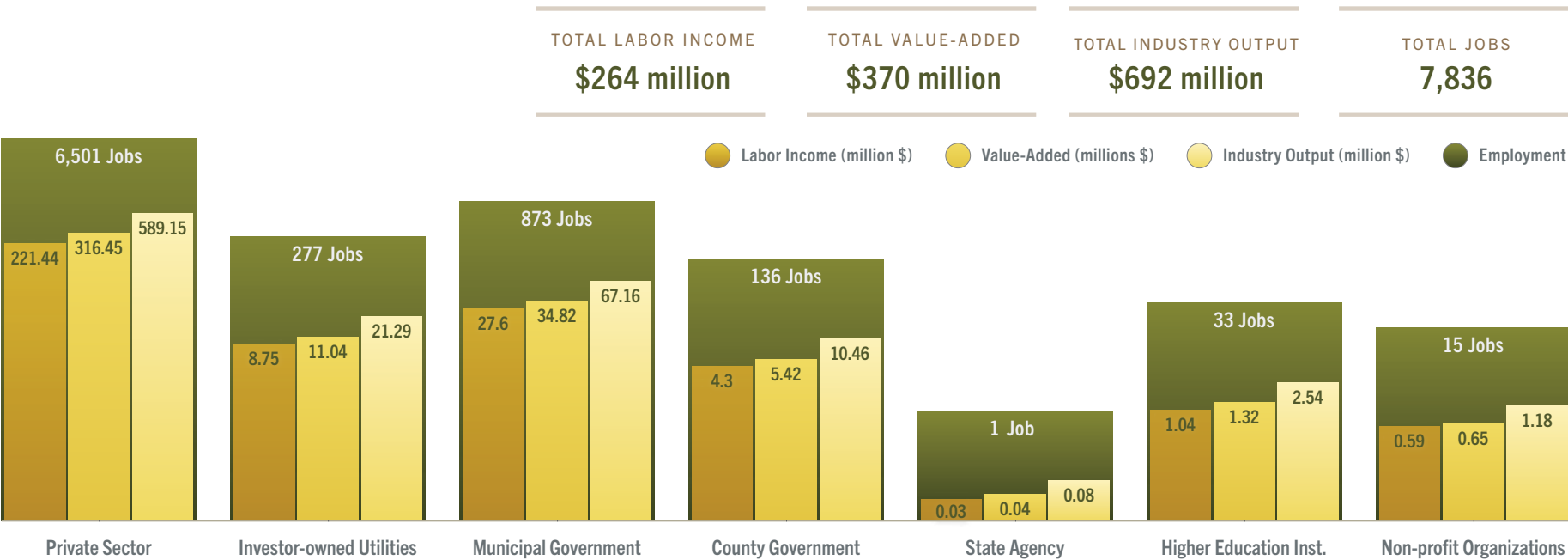
F5 U&CF EMPLOYMENT IN NON-PROFIT ORGANIZATIONS IN ARKANSAS, 2019



Further, this analysis includes the total jobs related to U&CF supported by non-profit organizations (NPOs) in the Southern region. The regional survey of NPOs revealed that on average, a NPO supports 2.6 jobs in U&CF activities: 1 job in landscaping and tree care services, 0.3 jobs in nursery and tree production, 0.8 jobs in forestry consulting services (**F5**), and 0.5 jobs in landscape architectural services.

VIII. STATE ECONOMIC CONTRIBUTION ANALYSIS

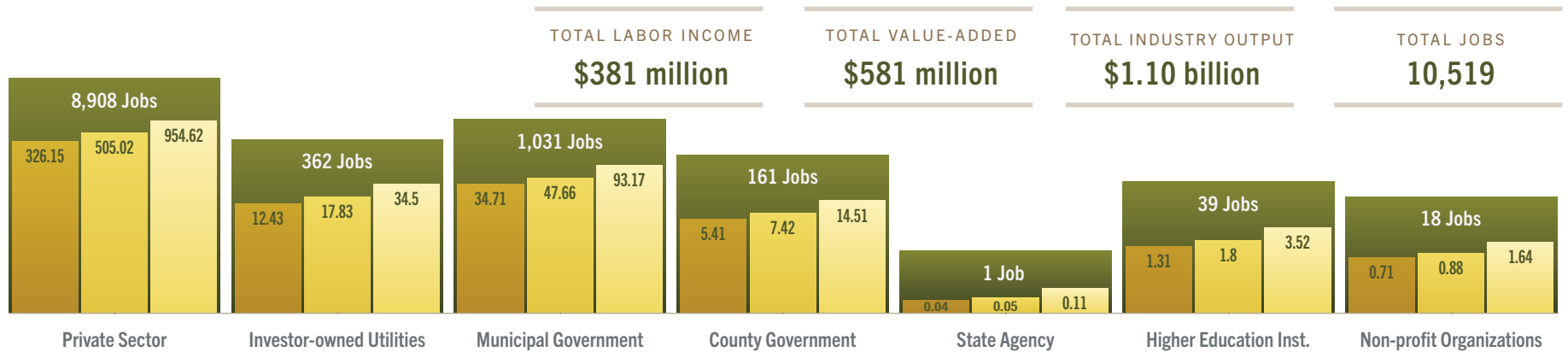
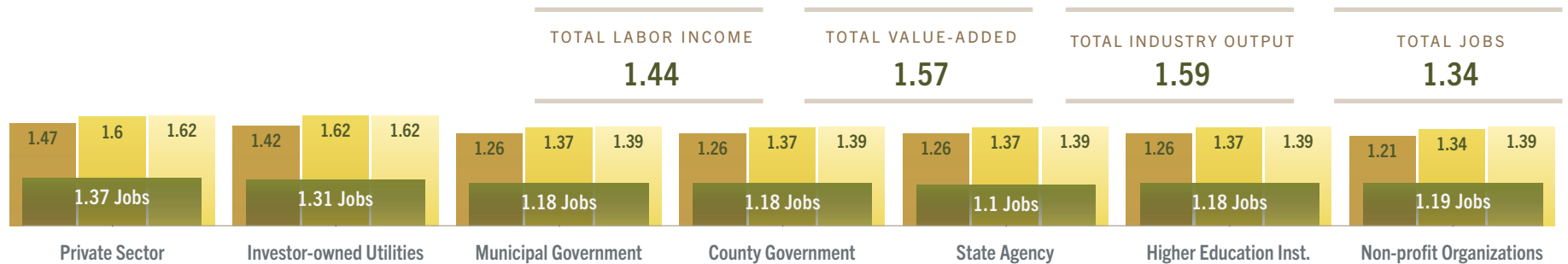
F6A DIRECT EFFECT ECONOMIC CONTRIBUTION OF U&CF IN ARKANSAS, 2019



Figures 6A, 6B and 6C present the summary economic contribution results obtained from individual IMPLAN scenarios representing each sector of U&CF in Arkansas. Based on the input-output modeling, we estimated that in 2019, U&CF in Arkansas directly supported 7,836 full- and part-time jobs in various businesses and activities. The total job contribution of U&CF including the direct, indirect, and induced employment was 10,519. In terms of labor income, U&CF in this region collectively contributed about \$264 million directly, and over \$381 million including the multiplier effects throughout the state economy. Appendix A breaks down total economic contributions from U&CF activities in the study by direct, indirect, and induced effects.

Similarly, in terms of value-added, which is equivalent to gross domestic product, U&CF in Arkansas contributed approximately \$370 million to the state economy directly, and if we account for the indirect and induced effects, the total value-added contribution in 2019 was about \$581 million (F6A). In terms of industry output representing all economic activities, the direct and total contributions of U&CF were approximately \$692 million and \$1.10 billion, respectively. The overall SAM multiplier associated with employment was estimated to be 1.34, indicating that every job in U&CF in these states resulted in another .34 jobs in other sectors of the economy. Similarly, every \$1.00 generated in U&CF contributed an additional \$0.59 in industry output to the rest of the regional economy.

... continued

F6B TOTAL EFFECT ECONOMIC CONTRIBUTION OF U&CF IN ARKANSAS, 2019**F6C SAM MULTIPLIER ECONOMIC CONTRIBUTION OF U&CF IN ARKANSAS, 2019**

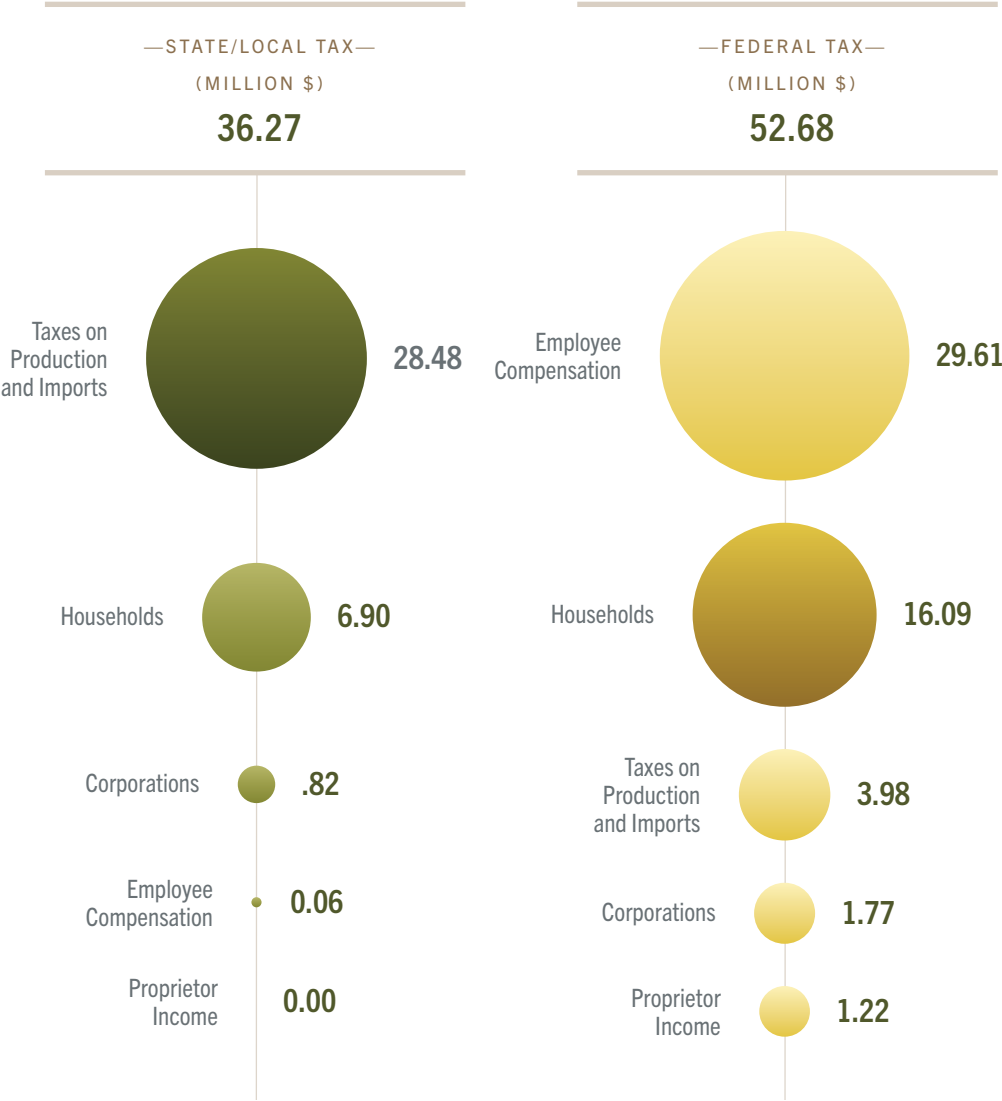
However, the economic contribution of U&CF varies widely among the sectors. The private sector, predominantly landscaping services, represents about 83% of the direct jobs and industry output in the study region. The public agencies (city, county, and state agencies) collectively contributed about \$107.8 million in total industry output by supporting approximately 1,193 jobs to the state economy (**F6B**). Similarly, higher education institutions and non-profit organizations had total job contributions of 39 and 18, respectively. Investor-owned and cooperative

utilities contributed 362 total jobs in U&CF and over \$34.5 million in total industry output. We also estimated that the private sector had the highest SAM multiplier values in employment and labor income. Meanwhile, the investor-owned and cooperative utilities sector had the highest SAM multiplier values in value-added and industry output. The SAM value of 1.62 associated with the industry output of the private sector indicates that every \$1.00 generated in U&CF by the private sector contributed an additional \$0.62 to the state economy.

... continued

There were substantial contributions by U&CF activities in Arkansas to local, state, and federal taxes (**F7**). In 2019, U&CF businesses and employees in the study region paid over \$36.3 million in state and local taxes and about \$52.7 million in federal taxes. Most of the state and local taxes were collected on production and imports of goods, followed by household taxes. Employee compensation and households were the major categories contributing to about 87% of federal taxes collected directly from U&CF businesses and employees in the region.

F7 DIRECT TAX CONTRIBUTION OF U&CF IN ARKANSAS, 2019



F8 TOP 10 INDUSTRIES AFFECTED BY JOBS IN URBAN AND COMMUNITY FORESTRY IN ARKANSAS IN 2019

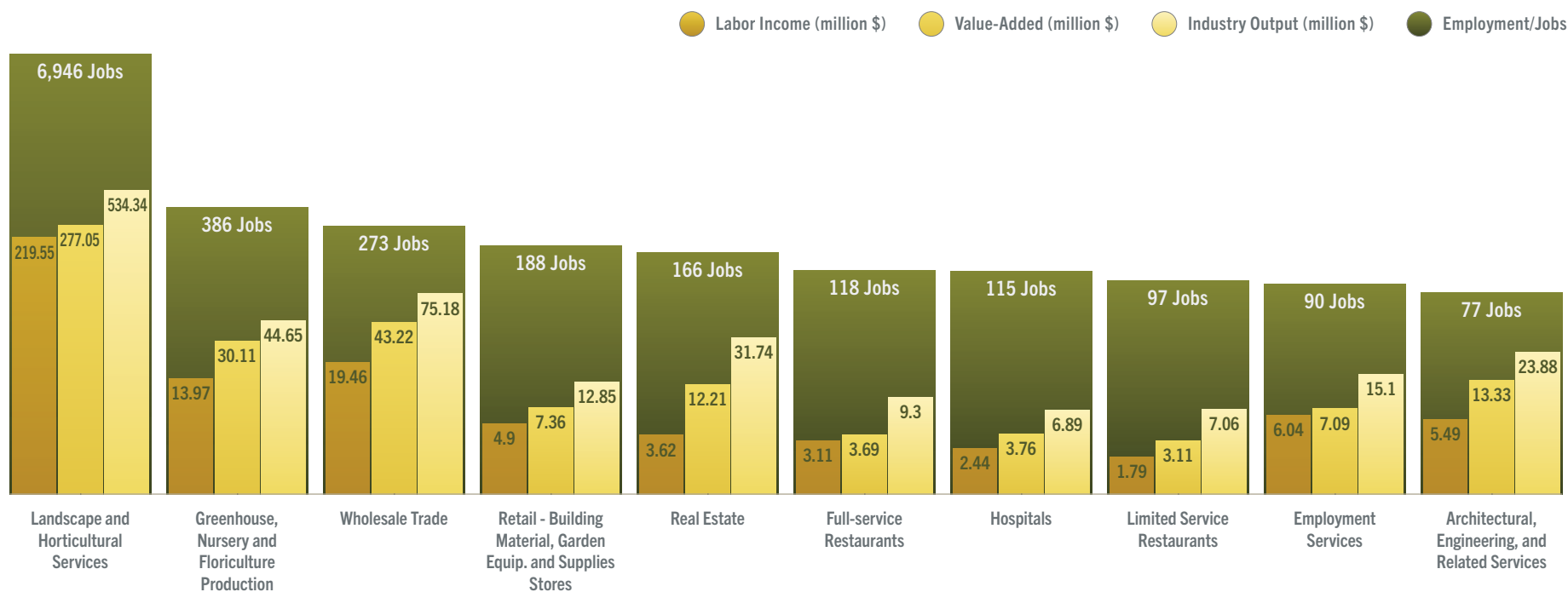


Figure 8 presents the top 10 industries in the state that have the highest employment contributions from U&CF. A total of 6,946 jobs with an industrial output of about \$534 million in landscape and horticultural services were contributed by the U&CF in the study region. Urban forestry supported over 386 jobs in greenhouse, nursery, and floriculture production, about 273 jobs in the wholesale trade industry, and about 188 jobs in the retail sector in the study

region (**F6B**). Through the induced effects, employees in urban forestry in the study region supported a number of jobs in real estate, full-service and limited-service restaurants, and hospitals, playing a vital role in the overall state economy.

IX. 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 the approach to estimate the economic contributions of U&CF in Arkansas. 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 suggest that the majority of the U&CF-related employment opportunities in Arkansas are in the private sector, which collectively represents industries related to urban tree cares and 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 during 2019, contributing to more than 5,621 direct jobs in the state. Interestingly, the magnitude of SAM multipliers in the private sector industries were higher than those associated with the public sectors, which reflects the diversified market channels of private industries and the subsequent magnified ripple effects in the rest of the economy (Henderson et al., 2017). While employment from U&CF in the state's public sectors is minimal, our results suggest a meaningful contribution of this 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.

... continued

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.



REFERENCES

Donovan, G.H. 2017. Including public-health benefits of trees in urban-forestry decision making. *Urban Forestry and Urban Greening* 22, pp. 120–123. <https://doi.org/10.1016/j.ufug.2017.02.010>

Hardy, J., Behe, B.K., Barton, S.S., Page, T.J., Schutzki, R.E., Muzii, K., ... Safley, C. 2000. Consumers Preferences for Plant Size, Type of Plant Material and Design Sophistication in Residential Landscaping. *Journal of Environmental Horticulture* 18(4), pp. 224–230. <https://doi.org/10.24266/0738-2898-18.4.224>.

Henderson, J.E., Joshi, O., Tanger, S., Bobby, L., Hubbard, W., Pelkki, M., ... Tappe, P. 2017. Standard procedures and methods for economic impact and contribution analysis in the forest products sector. *Journal of Forestry* 115(2), pp. 112-116. <https://doi.org/10.5849/jof.16-041>.

Hodges, A.W., Court, C.D. 2019. Economic Contributions of Urban Forestry in Florida in 2017. *Florida Department of Agriculture and Consumer Services-Florida Forest Service*. Retrieved August 18, 2021 from <https://fred.ifas.ufl.edu/DEStudio/html/EconomicImpactAnalysis/EconomicContributionsFloridaUrbanForestry.pdf>.

IMPLAN. 2021. IMPLAN. Retrieved August 18, 2021 from <https://www.implan.com/>.

IMPLAN Data Team, 2021. CEW data details. Retrieved August 18, 2021 from <https://support.implan.com/hc/en-us/articles/115009679608-CEW-FAQ>.

Joshi, O., Henderson, J.E., Tanger, S.M., Bobby, L.A., Pelkki, M.H., Taylor, E.L. 2017. A synopsis of methodological variations in economic contribution analyses for forestry and forest-related industries in the US South. *Journal of Forestry* 115(2), pp. 80-85. <https://doi.org/10.5849/jof.16-044>.

National Urban and Community Forestry Advisory Council. 2015. *Ten-Year Urban Forestry Action Plan: 2016-2026*. University of Virginia Institute for Environmental Negotiation. Retrieved August 18, 2021 from https://urbanforestplan.org/wp-content/uploads/2015/11/FinalActionPlan_Complete_11_17_15.pdf.



... continued

Parajuli, R., Chizmar, S., Hoy, M., Joshi, O., Gordon, J., Mehmood, S.,... and Buntrock, L. 2022. *Economic Contribution Analysis of Urban Forestry in the Northeastern and Midwestern States of the United States in 2018*. *Urban Forestry & Urban Greening* 69(127490), pp. 1-9. <https://doi-org.prox.lib.ncsu.edu/10.1016/j.ufug.2022.127490>.

Parajuli, R., Henderson, J.E., Tanger, S., Joshi, O., Dahal, R. 2018. Economic Contribution Analysis of the Forest-Product Industry: A Comparison of the Two Methods for Multisector Contribution Analysis Using IMPLAN. *Journal of Forestry* 116(6), pp. 513-519. <https://doi.org/10.1093/jofore/fvy047>.

Pelkki, M., Sherman, G. 2020. Forestry's economic contribution in the United States, 2016. *Forest Products Journal* 70(1), pp. 28-38. <https://doi.org/10.13073/FPJ-D-19-00037>.

Sinclair, M., O'Toole, J., Malawaraarachchi, M., Leder, K. 2012. Comparison of response rates and cost-effectiveness for a community-based survey: postal, internet and telephone modes with generic or personalised recruitment approaches. *BMC Medical Research Methodology* 12(1), pp. 1-8. <https://doi.org/10.1186/1471-2288-12-132>.

Templeton, S.R., Goldman, G. 1996. Estimating Economic Activity and impacts of urban forestry in California with multiple data sources from early 1990s. *Journal of Arboriculture* 22(3), pp. 131–143. Retrieved August 18, 2021 from http://www.actrees.org/files/Research/templeton_economics.pdf.

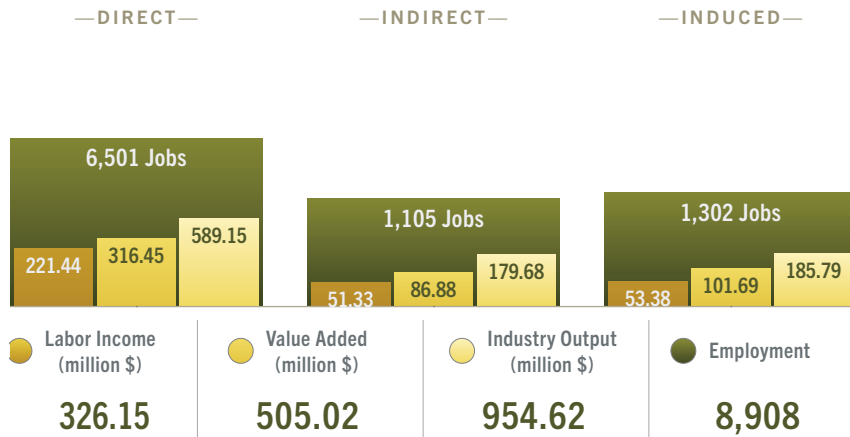
United States Bureau of Labor Statistics [US BLS]. 2021. *Quarterly Census of Employment and Wages: Various years*. U.S. Bureau of Labor Statistics. Retrieved August 18, 2021 from <https://www.bls.gov/cew/>.

United States Census Bureau. 2021. *Annual estimates of the resident populations*. Population Division, U.S. Census Bureau. Retrieved August 18, 2021 from <https://www.census.gov/topics/population.html>.

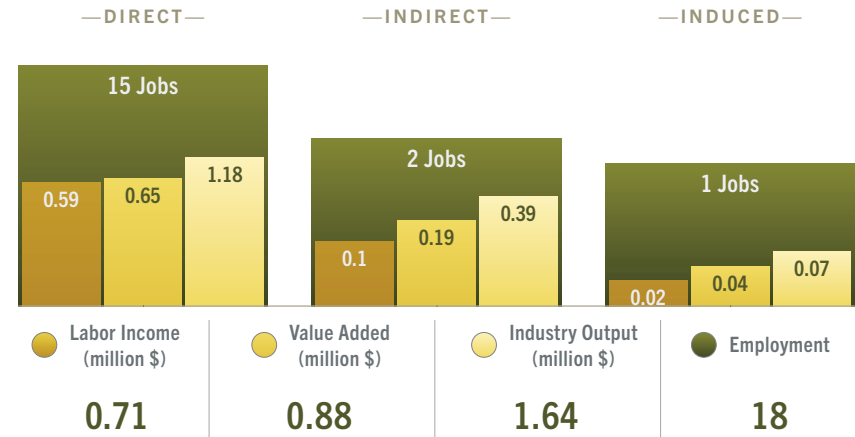
APPENDIX A

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

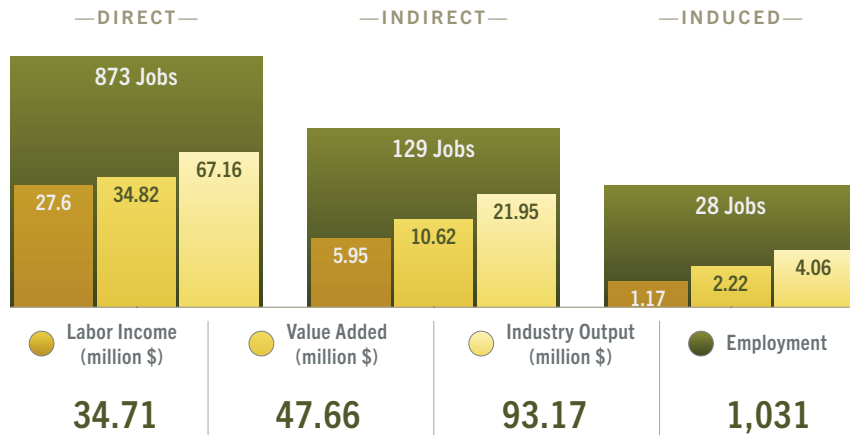
— PRIVATE —



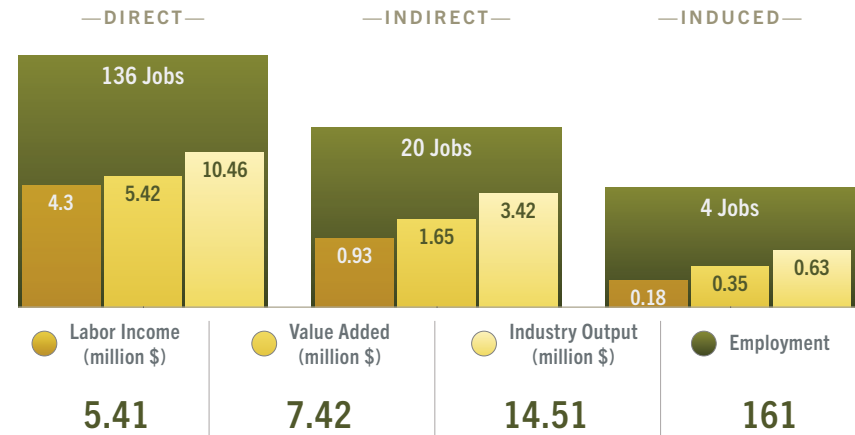
— NON-PROFIT —



— MUNICIPAL GOVERNMENT —



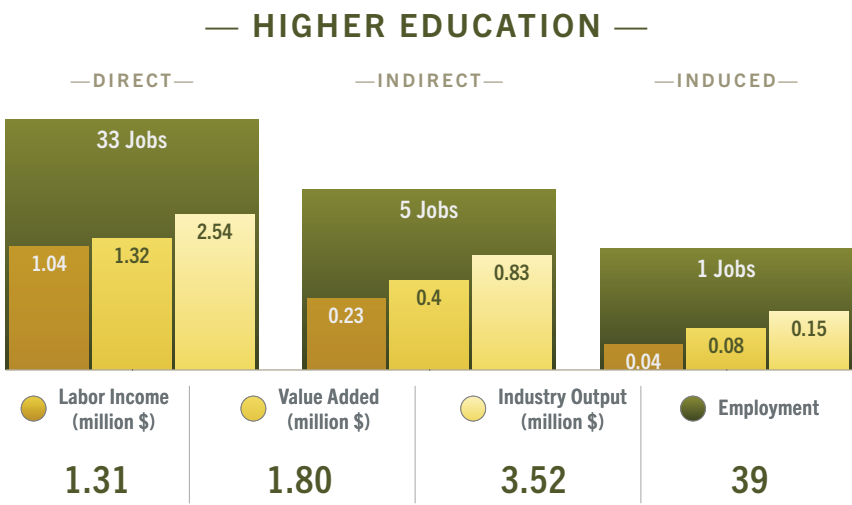
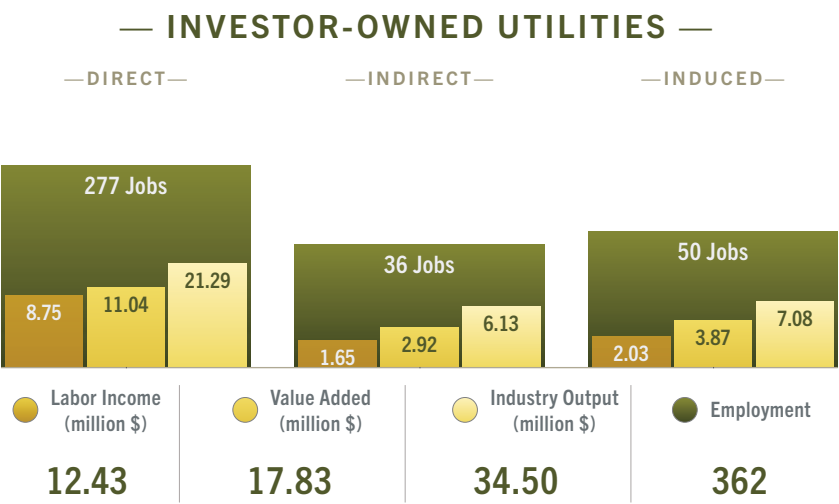
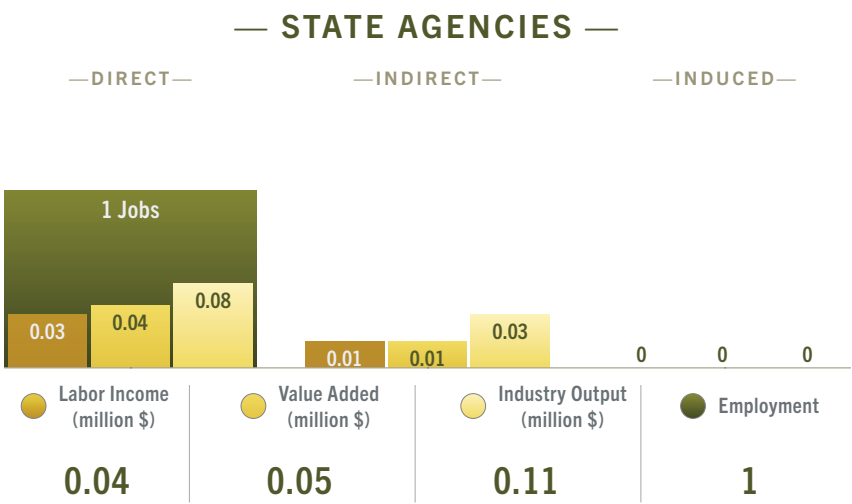
— COUNTY GOVERNMENT —



... continued

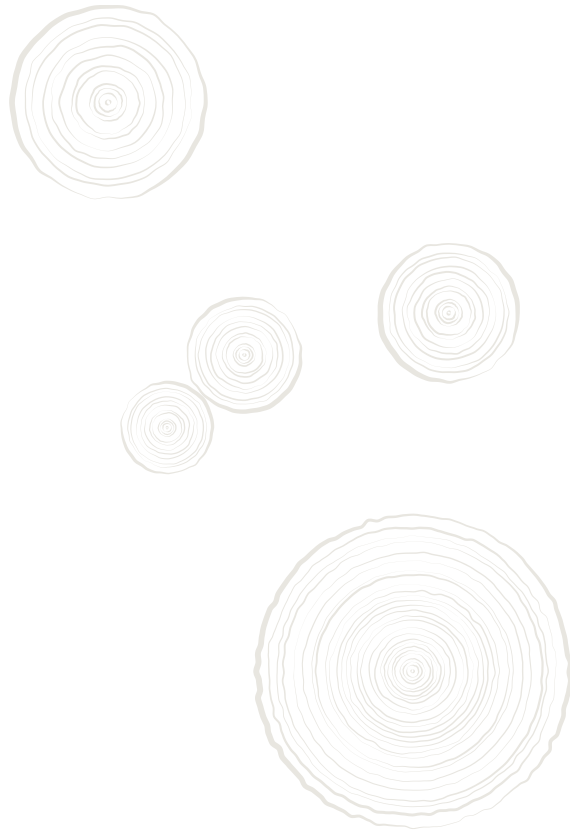
APPENDIX A

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





"This institution is an equal opportunity provider."



U.S. FOREST SERVICE NONDISCRIMINATION STATEMENT

In accordance with Federal law and U.S. Department of Agriculture (USDA) civil rights regulations and policies, this institution is prohibited from discriminating on the basis of race, color, national origin, sex, age, disability, and reprisal or retaliation for prior civil rights activity (Not all prohibited bases apply to all programs).

Persons with disabilities who require alternative means of communication for program information (e.g., Braille, large print, audiotape, American Sign Language, etc.) should contact the responsible State or local Agency that administers the program or USDA's TARGET Center at (202) 720-2600 (voice and TTY) or contact USDA through the Federal Relay Service at (800) 877-8339. Additionally, program information is also available in languages other than English.

To file a complaint alleging discrimination, complete the USDA Program Discrimination Complaint Form, AD-3027, found online at http://www.ascr.usda.gov/complaint_filing_cust.html, or at any USDA office or write a letter addressed to USDA and provided in the letter all of the information requested in the form.

To request a copy of the complaint form, call (866) 632-9992 or submit the completed form/letter to USDA:

MAIL

U.S. Department of Agriculture
Office of the Assistant Secretary for Civil Rights
1400 Independence Avenue, SW
Washington, D.C. 20250- 9410

FAX

(202) 690-7442

EMAIL

program.intake@usda.gov.