

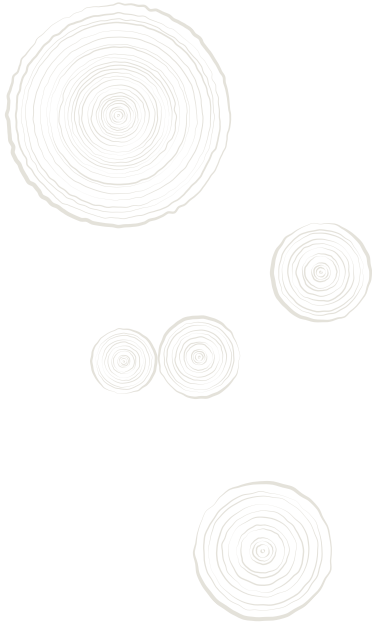


# URBAN & COMMUNITY FORESTRY

ECONOMIC CONTRIBUTION TO CALIFORNIA, 2021

BAY AREA REGION





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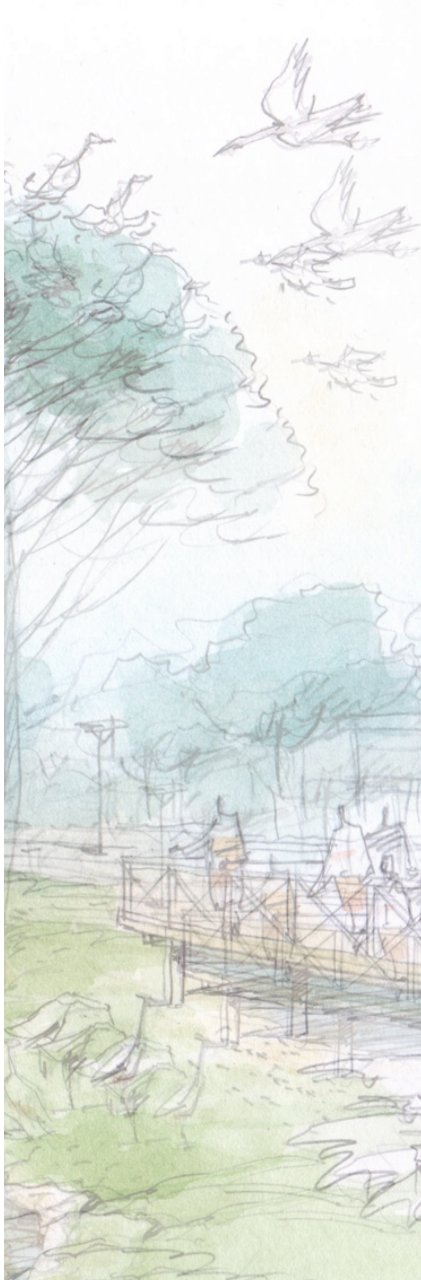
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## I EXECUTIVE SUMMARY

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Urban and community forests not only provide valuable ecosystem services to rapidly growing urban and suburban areas—there is also a large and diverse contingent of businesses and organizations involved in urban and community forestry (U&CF) that makes substantial contributions to the regional economy. In addition to municipal and non-profit entities, the green and utility industries are key providers of U&CF related services, contributing substantially to local and state economies. This report presents the economic contributions of U&CF activities in Bay Area, California in 2021. In this study, 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). We employed the Economic Impact Analysis for Planning (IMPLAN) software and 2021 data for Bay Area counties to estimate direct, indirect, and induced effects based on an input-output modeling framework. We used data collected through a state-wide survey of U&CF business and organizations to develop the U&CF employment profile in Bay Area counties. For the detailed methodology of economic contribution analysis, please refer to the state-wide report.

<http://californiareleaf.org/2021-UCF-Economic-Study>

Results from the input-output modeling estimate that in 2021, U&CF activities in Bay Area, California **directly** contributed about \$1.4 billion to the regional industry output and \$836.80 million in value-added contributions (*sum of labor income, other property income, and production and import taxes*) by supporting 10,034 full- and part-time jobs. Including **direct, indirect, and induced effects**, the U&CF sector made a **total contribution** of \$2.2 billion in industry output to the regional economy of the Bay Area, employing more than 13,063 people with a payroll of about \$977.60 million. The private sector, predominantly landscaping services,

and tree care providers, represents over 94% of the direct jobs (9,387 jobs) and industry output (\$1.3 billion) in the region. Public agencies (*municipalities, counties, and state agencies*) collectively contributed about \$83.2 million in total industry output by supporting 528 jobs to the region's economy. Higher education institutions and non-profit organizations had total job contributions of 110 and 140 jobs, respectively. Meanwhile, investor-owned, and cooperative utilities were found to support 55 total jobs. We estimate that every \$1.00 spent in U&CF by these various sectors generated an additional \$0.61 in the regional economy of the Bay Area. Similarly, every job in U&CF activities and businesses supported an additional 0.30 jobs in the Bay Area in 2021.



## II. GLOSSARY

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### **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** 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.

**Municipality** The Census definition of an incorporated place, which is a type of governmental unit, incorporated under state law as a city, town (*except in New England, New York, and Wisconsin*), borough (*except in Alaska and New York*), or village, generally to provide governmental services for a concentration of people within legally prescribed boundaries (*U.S. Census Bureau, 2018*).

**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 transactions, 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

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Urban and community forests not only provide numerous ecosystem services to rapidly growing urban and suburban areas, but also are a critical component of a regional economy with a substantial economic contribution. While the private green and utility industries offer the bulk of goods and services to establish and maintain urban forests, non-profits and public agencies including higher education institutions also represent an important share of urban and community forestry (U&CF) activities (Parajuli et al. 2022, Parajuli et al. 2023). 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).

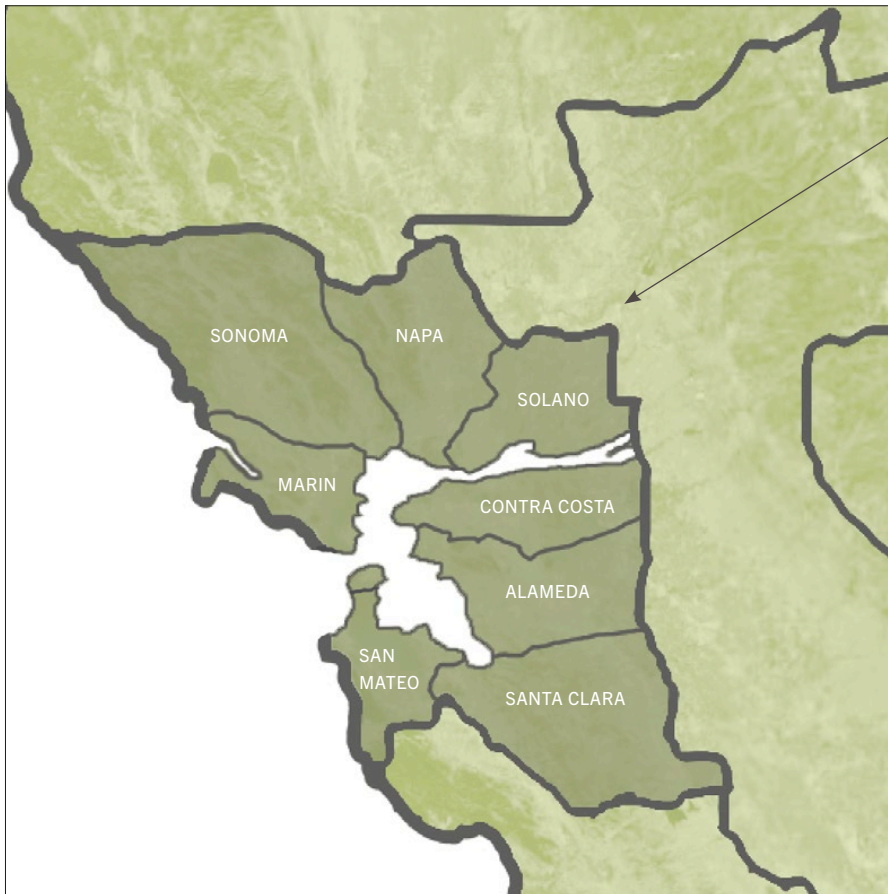
Economic contribution analysis of U&CF informs citizens, legislators, and decision makers about the impacts of the industry on gross domestic product and workforce development. With periodic support from CALFIRE, a couple of studies in the 1990s and 2000s produced a detailed economic impact of U&CF in California (Templeton and Goldman 1996, Templeton et al. 2011). The most recent of these reports was based on 2009 data; recent development of more sophisticated tools and economic contribution analyses (Parajuli et al. 2022, Parajuli et al. 2023) provides an opportunity to perform an updated and in-depth economic impact study of U&CF in California.



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**F1 MAP DEPICTING THE BAY AREA OF CALIFORNIA INCLUDED IN THE U&CF ECONOMIC ANALYSIS**

**BAY AREA**



This study aims to estimate the economic contribution of the U&CF sector in Bay Area, California using the 2021 economy-wide data and a peer-reviewed economic contribution analysis methodology. By closely following Parajuli et al. (2022) and Parajuli et al. (2023), we incorporated private green industry businesses, public agencies (*including county and municipal governments*), non-profits, and higher education institutions that are directly involved in U&CF in this region. **FIGURE 1** shows the counties included in this select region: Bay Area, California. Next, we compiled the employment profile of all the related industries and agencies using responses to an online survey of each U&CF group along with several 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*). These results highlight the significant economic contributions of U&CF and should be very useful to the private sector for 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. SCOPE OF URBAN AND COMMUNITY FORESTRY INDUSTRIES AND ACTIVITIES

**T1 URBAN AND COMMUNITY FORESTRY (U&CF) RELATED INDUSTRIES AND ACTIVITIES IN CALIFORNIA. NUMBERS IN PARENTHESES FOR PRIVATE INDUSTRIES ARE NORTH AMERICAN INDUSTRY CLASSIFICATION SYSTEM (NAICS) CODES**

To be consistent with other U&CF economic contribution reports, we adapted the definition of urban and community forestry 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*) in this select region: Bay Area, California. 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. In our project stakeholder meeting with various members from California Urban Forestry Council held online on Feb 1, 2022, we discussed the detailed scope of U&CF groups including private industries, public agencies, non-profit organizations (NPOs), investor-owned utility companies, and higher education institutions (T1). Participants approved our proposed scope of U&CF industries and activities, which were in line with our previous similar studies in northeastern states (*Parajuli et al. 2022*) and southern states (*Parajuli et al. 2023*).

### PRIVATE INDUSTRIES

- Landscaping services (NAICS 561730)
- Nursery and tree production (NAICS 111421)
- Nursery, garden, and farm supply stores (NAICS 444220)
- Nursery stock and florists' supplies merchant wholesalers (NAICS 424930)
- Farm and garden machinery and equipment merchant wholesalers (NAICS 423820)
- Landscape architectural services (NAICS 541320)

### PRIVATE (INVESTOR-OWNED & COOP) UTILITY COMPANIES

### PUBLIC SECTORS

- Cities
- Counties
- State agencies involved in U&CF

### HIGHER EDUCATION INSTITUTIONS

### NON-PROFIT ORGANIZATIONS (NPOs)



## V. METHODS

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Since IMPLAN does not specify industries and data associated solely with U&CF, we employed the approach devised by Parajuli et al. (2022) to compile a complete profile of employment related to establishment, care, and maintenance of urban and community forests in California. While most of the data related to the private sector can be retrieved from publicly available sources such as the US Census Bureau, primary surveys of U&CF related businesses and organizations are required to fully quantify and segregate the U&CF portion of the businesses and activities from the overall green industry. Through several rounds of web-based surveys of private businesses, the U&CF industries were separated from the broader green industries throughout the state. Similarly, several group-specific surveys were conducted to fully quantify the public and nonprofit sector involvement in U&CF. Respondents were asked to answer survey questions about their U&CF activities in California that occurred during the 2021 calendar year. For more details about the survey of six different U&CF groups along with the economic contribution analysis approach, please refer to the state-wide report. <http://californiareleaf.org/2021-UCF-Economic-Study>



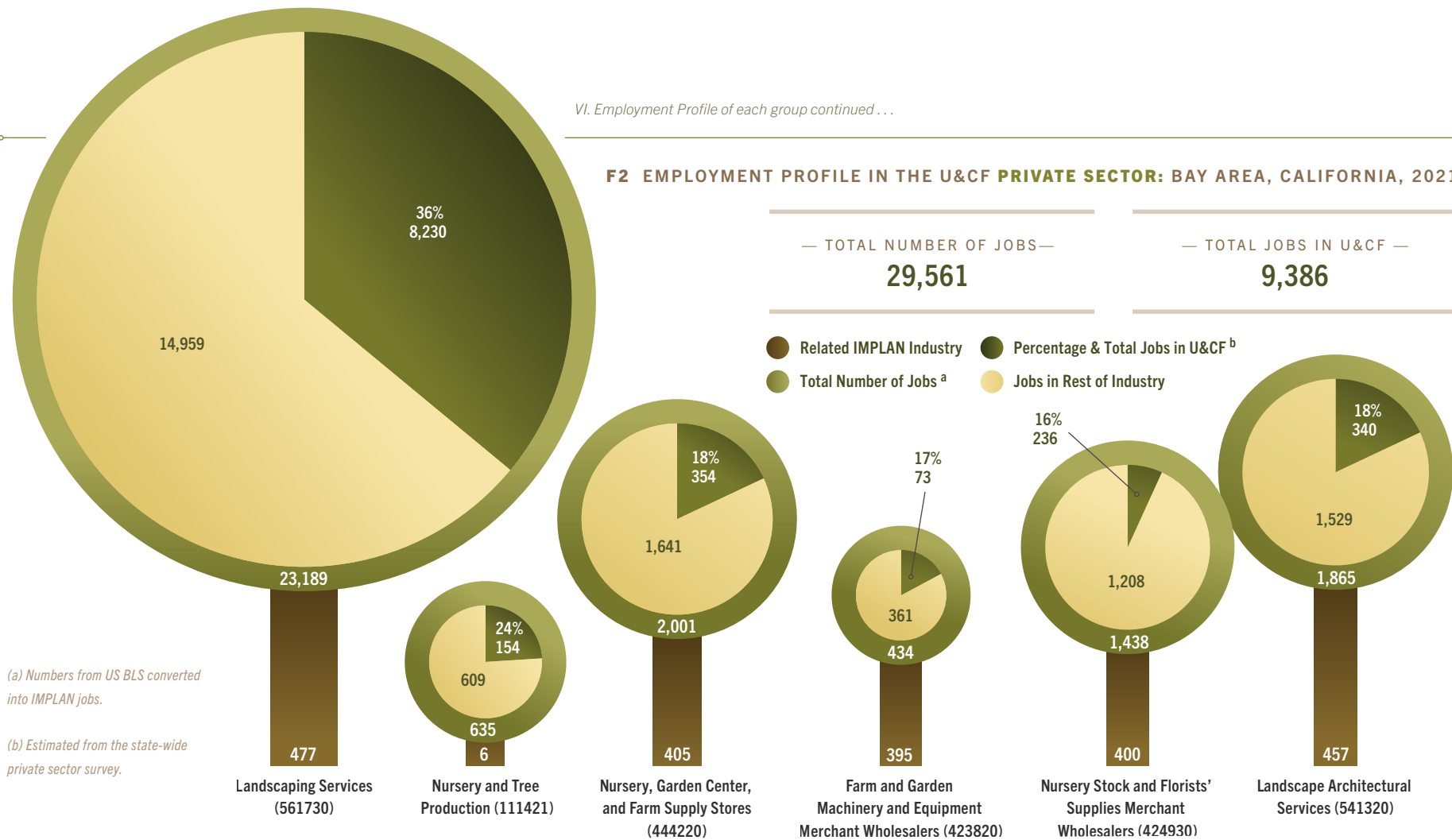
## VI. EMPLOYMENT PROFILE OF EACH GROUP

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The primary source of the industry-level employment data is the Quarterly Census of Employment and Wages of the US Census Bureau, which reports the periodic employment profile of private businesses broken down by the North American Industry Classification System (NAICS) category. We utilized our state-wide surveys of private green industry businesses to parse out the portion of U&CF jobs from the broader private green industry sector in this select region: Bay Area, California. Since the Quarterly Census of Employment and Wages (CEW) does not incorporate self-employed jobs and businesses with their own social insurance programs (IMPLAN Data Team, 2021), the 2021 IMPLAN data is utilized to compute proprietary jobs specifically in landscaping services (NAICS 561730) and nursery and tree production businesses (NAICS 111421). **FIGURE 2** presents the annual employment profile of private businesses involved in U&CF activities in the Bay Area in 2021. In 2021, the private sector contributed over 9,386 direct U&CF related jobs in the Bay Area. Private landscaping and tree care services was the top employer among private green industry businesses, which supported 8,230 full-time, part-time, and seasonal employees in 2021. Nursery, garden center, and farm supply stores were the second largest industry, which employed 354 jobs in U&CF annually, followed by landscape architectural services at 340 jobs.

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**F2 EMPLOYMENT PROFILE IN THE U&CF PRIVATE SECTOR: BAY AREA, CALIFORNIA, 2021**



(a) Numbers from US BLS converted into IMPLAN jobs.

(b) Estimated from the state-wide private sector survey.

Besides private green industry businesses, several investor-owned and cooperative utility companies are also greatly involved in tree line clearing and vegetation management in urban and suburban regions. According to the primary survey of utility companies, we estimated that in 2021, the average per company in-house expenses of investor-owned and cooperative utility companies in vegetation management in California was about \$1.31 million per

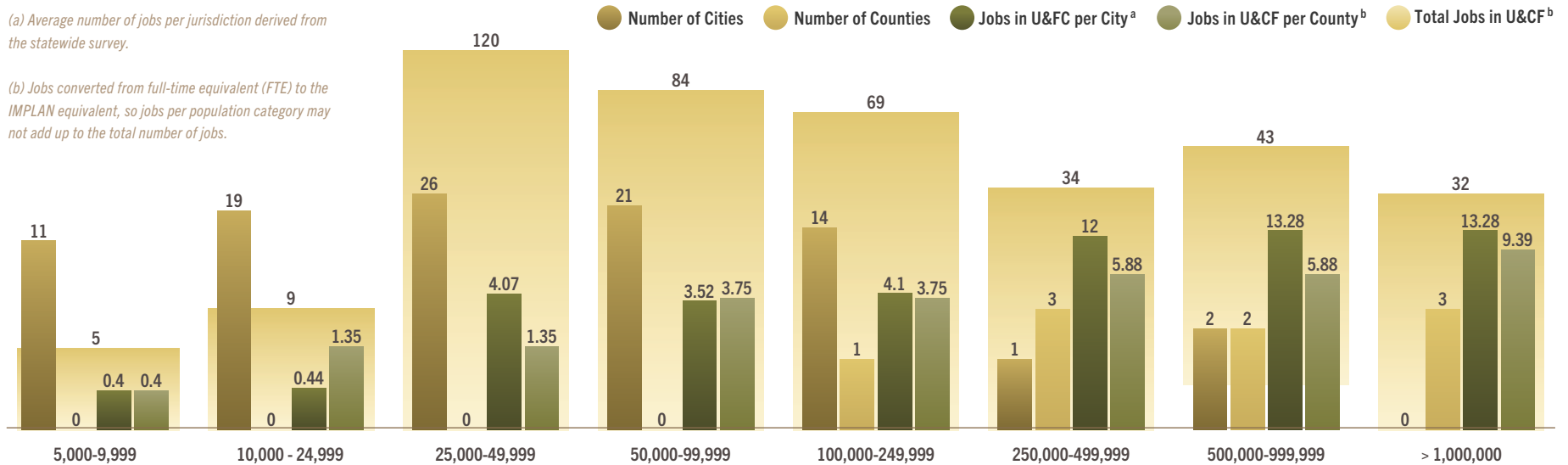
year. To estimate the total expenditure of investor-owned and cooperative utility companies in vegetation management, we multiplied the number of companies by the average expenditures per company. We estimated that 4 investor-owned and cooperative utility companies in the Bay Area, California supported 42 U&CF jobs in 2021, which was the input value for the economic contribution analysis.

**F3 URBAN AND COMMUNITY FORESTRY JOBS IN LOCAL GOVERNMENT PUBLIC AGENCIES: BAY AREA, CALIFORNIA, 2021**



(a) Average number of jobs per jurisdiction derived from the statewide survey.

(b) Jobs converted from full-time equivalent (FTE) to the IMPLAN equivalent, so jobs per population category may not add up to the total number of jobs.



Public agencies such as municipal and county governments have a vital role in managing U&CF in most of the populated towns and cities. We estimated the total public employees involved in U&CF based on the population size of the jurisdiction that these agencies serve in the Bay Area, California. We obtained the number of cities and counties by population size in all counties and cities in this select region from the Population Division of the U.S. Census Bureau (*US Census Bureau, 2023*). Then, using the average number of employees in a city and county from our state-wide survey of municipalities and counties in California, we estimated the total number of jobs in U&CF employed by city and county

governments (**F3**). Our results suggest that county and municipal governments in the Bay Area employed about 396 people directly working in U&CF activities in 2021. Similarly, our economic contribution analysis included the number of employees in CALFIRE, CALTRANS, state hospitals, and the department of general services who were directly involved in U&CF in this select region. According to the information collected from our state-wide survey coupled with public record requests, state agencies employed 12 U&CF positions in the Bay Area in 2021.

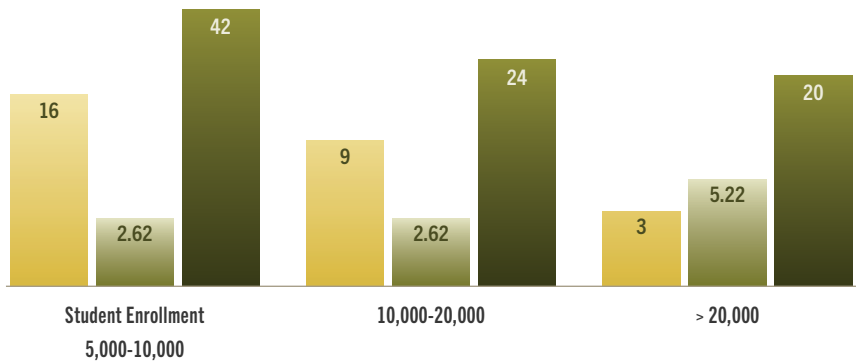
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**F4 U&CF JOBS IN HIGHER EDUCATION INSTITUTIONS: BAY AREA, CA, 2021**



● Number of Institutions ● Jobs in U&CF per Institution<sup>a</sup> ● Total Jobs in U&CF

(a) Average number of jobs per institution derived from the statewide survey of higher education institutions.



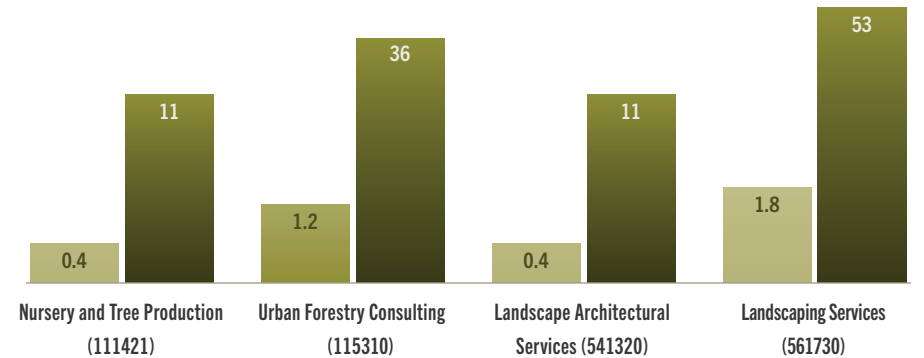
Furthermore, based on the student enrollment size, we estimated the total annual U&CF jobs supported by higher education institutions in the Bay Area, California. First, we collected the total number of higher education institutions and student enrollments in this region from CollegeSimply (*CollegeSimply, 2023*). We then estimated the total number of 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 our state-wide survey of higher education institutions (**F4**). In 2021, 28 higher education institutions with at least 5,000 student enrollments supported 85 full- and part-time jobs involved in U&CF activities in the Bay Area.

**F5 U&CF JOBS IN NON-PROFIT ORGANIZATIONS: BAY AREA, CA, 2021. THERE WERE AN ESTIMATED 29 U&CF NPOS IN BAY AREA, CA, 2021**



● U&CF Jobs per Organization<sup>a</sup> ● Jobs in U&CF

(a) Average number of jobs per organization derived from the statewide survey of NPOs in California.

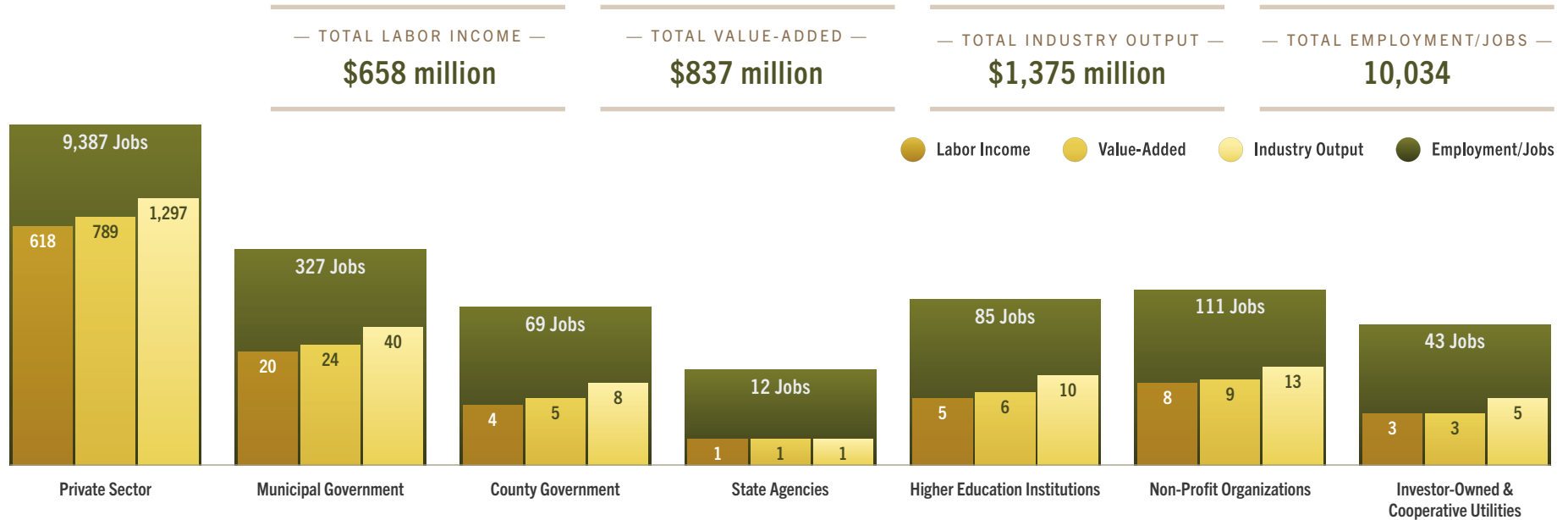


We also included the involvement of non-profit organizations (*NPOs*) in U&CF activities while estimating the economic contribution of U&CF in this select region. Our statewide survey of NPOs revealed that on average, an NPO supports 3.8 jobs in U&CF activities: about 1.8 jobs in landscaping and tree care services, 0.4 jobs in nursery and tree production, 1.2 jobs in forestry consulting services, and 0.4 jobs in landscape architectural services (**F5**). Collectively, NPOs in Bay Area, California supported 110 jobs directly working in U&CF activities in 2021.



## VII. ECONOMIC CONTRIBUTION RESULTS

**F6A DIRECT EFFECT ECONOMIC CONTRIBUTION OF U&CF: BAY AREA, CALIFORNIA, 2021; REPORTED IN 2021 DOLLARS**



By incorporating seven different private, non-profit, higher education and public organizations involved in U&CF, we conducted a multi-industry economic contribution analysis using IMPLAN online to evaluate the overall state-wide economic contribution of U&CF in this select region. In 2021, U&CF in the Bay Area, California directly supported about 10,034 full- and part-time jobs in various businesses and activities (F6A). Further, the total job contribution of U&CF including direct, indirect, and induced employment was estimated to be over 13,060 jobs. In terms of direct employment, the private sector accounted for the largest workforce in U&CF at nearly 9,387 jobs throughout the Bay Area.

Local governments (*municipal and county*) supported approximately 396 U&CF jobs. Higher education institutions and non-profit organizations supported 196 U&CF jobs. In terms of labor income, U&CF in the Bay Area collectively contributed about \$658 million directly, and approximately \$977.6 million including the multiplier effects throughout the state economy. **APPENDIX A** breaks down the total economic contributions from U&CF activities in California by direct, indirect, and induced effects stemming from seven various industry groups and organizations.

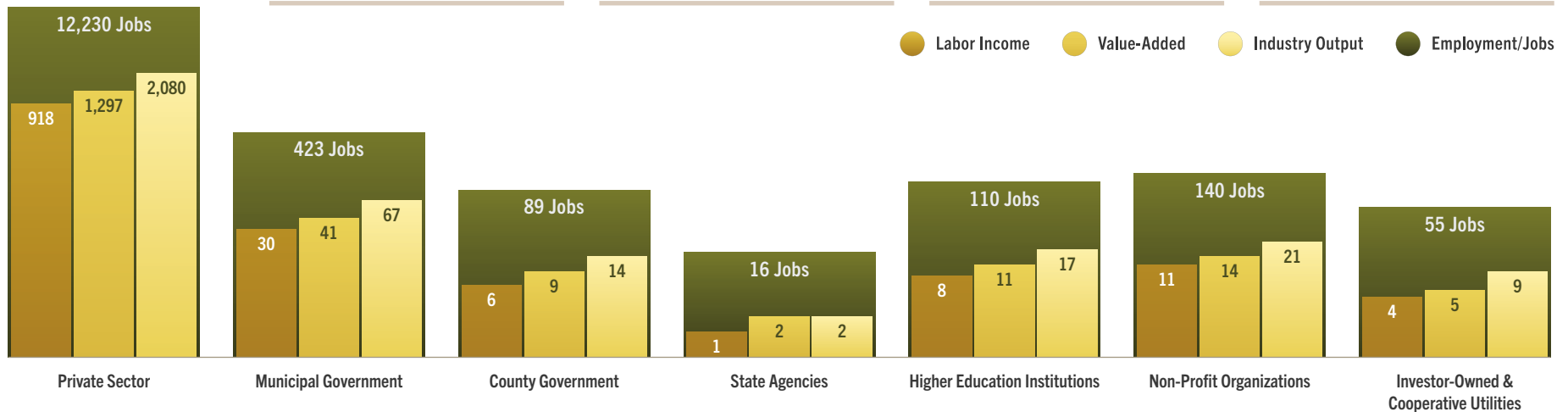
**F6B TOTAL EFFECT ECONOMIC CONTRIBUTION OF U&CF: BAY AREA, CALIFORNIA, 2021; REPORTED IN 2021 DOLLARS**

— TOTAL LABOR INCOME —  
**\$978 million**

— TOTAL VALUE-ADDED —  
**\$1,378 million**

— TOTAL INDUSTRY OUTPUT —  
**\$2,210 million**

— TOTAL EMPLOYMENT/JOBS —  
**13,063**



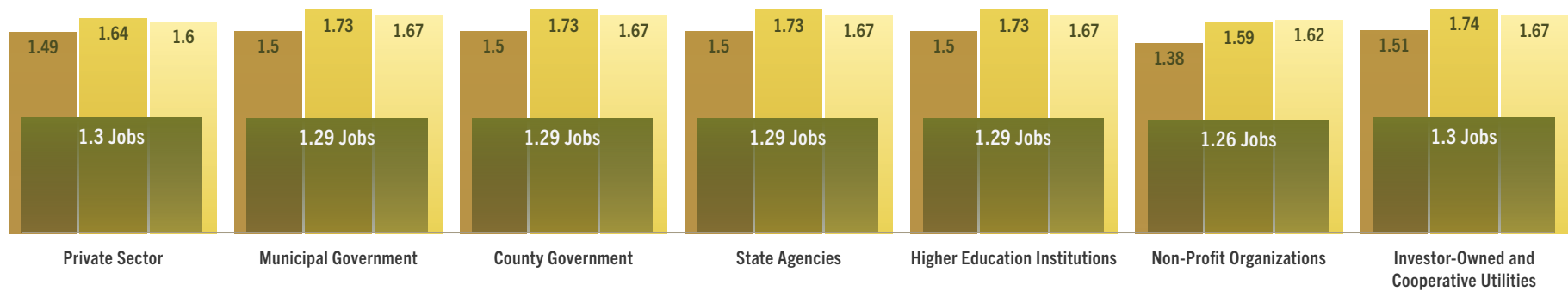
In terms of value-added, which is equivalent to gross domestic product, U&CF in this select region contributed approximately \$836.8 million to the regional economy directly, and with the indirect and induced effects, the total value-added contribution in 2021 was about \$1.38 billion (F6B). Similarly, in terms of industry output representing all economic activities, the direct and total contributions of U&CF in the Bay Area, California in 2021 were about \$1.4 billion and \$2.2 billion, respectively. In terms of the interlinkages among the industry sectors, the overall social accounting matrix (SAM) multiplier associated with employment was estimated to be 1.30, which indicates that each job in U&CF in

the Bay Area resulted in an additional 0.30 jobs in other sectors of the economy. Similarly, a multiplier associated with industry output of 1.61 suggests that every \$1.00 spent in U&CF generated another \$0.61 in industry output in the rest of the economy of the Bay Area (F6C).

**F6C SAM MULTIPLIER ECONOMIC CONTRIBUTION OF U&CF: BAY AREA, CALIFORNIA, 2021; REPORTED IN 2021 DOLLARS**



● Labor Income ● Value-Added ● Industry Output ● Employment/Jobs

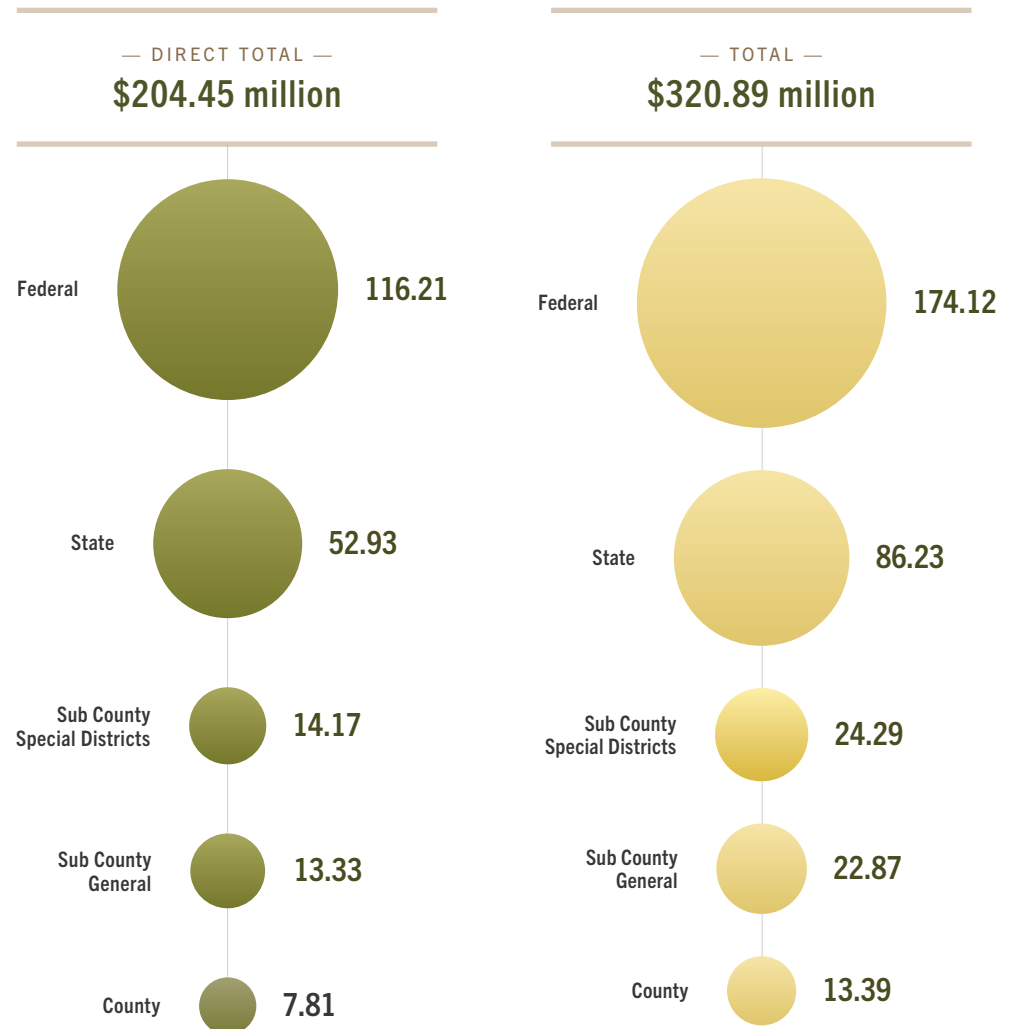


The economic contribution of U&CF varies widely among the seven sectors and groups incorporated into this analysis. For example, the private sector constitutes about 94% of the economic contribution of U&CF in the Bay Area, California. The public agencies (*municipal, county, and state agencies*) collectively contributed about \$83.2 million in total industry output by supporting over 528 jobs in the select region economy (**F6C**). Higher education institutions and non-profit organizations had total job contributions of 110 and 140 jobs, respectively.

Moreover, we found that investor-owned utility companies had the largest SAM multiplier value of 1.74 in value-added (**F6C**). The SAM value of 1.74 associated with the industry output of the utility sector indicates that every \$1.00 generated in U&CF by these sectors contributed an additional \$0.74 to the other sectors in the Bay Area, California economy.

**F7 DIRECT TAX CONTRIBUTION OF U&CF: BAY AREA, CALIFORNIA, 2021; REPORTED IN 2021 DOLLARS**

Besides jobs, labor income and value added, U&CF in the Bay Area of California also contributes to local, state, and federal taxes significantly (F7). In 2021, U&CF businesses and employees in this region paid approximately \$204 million directly to local, state, and federal taxes. With indirect and induced effects included, the total tax contribution of the aggregated U&CF sector in this region was about \$321 million in various taxes.

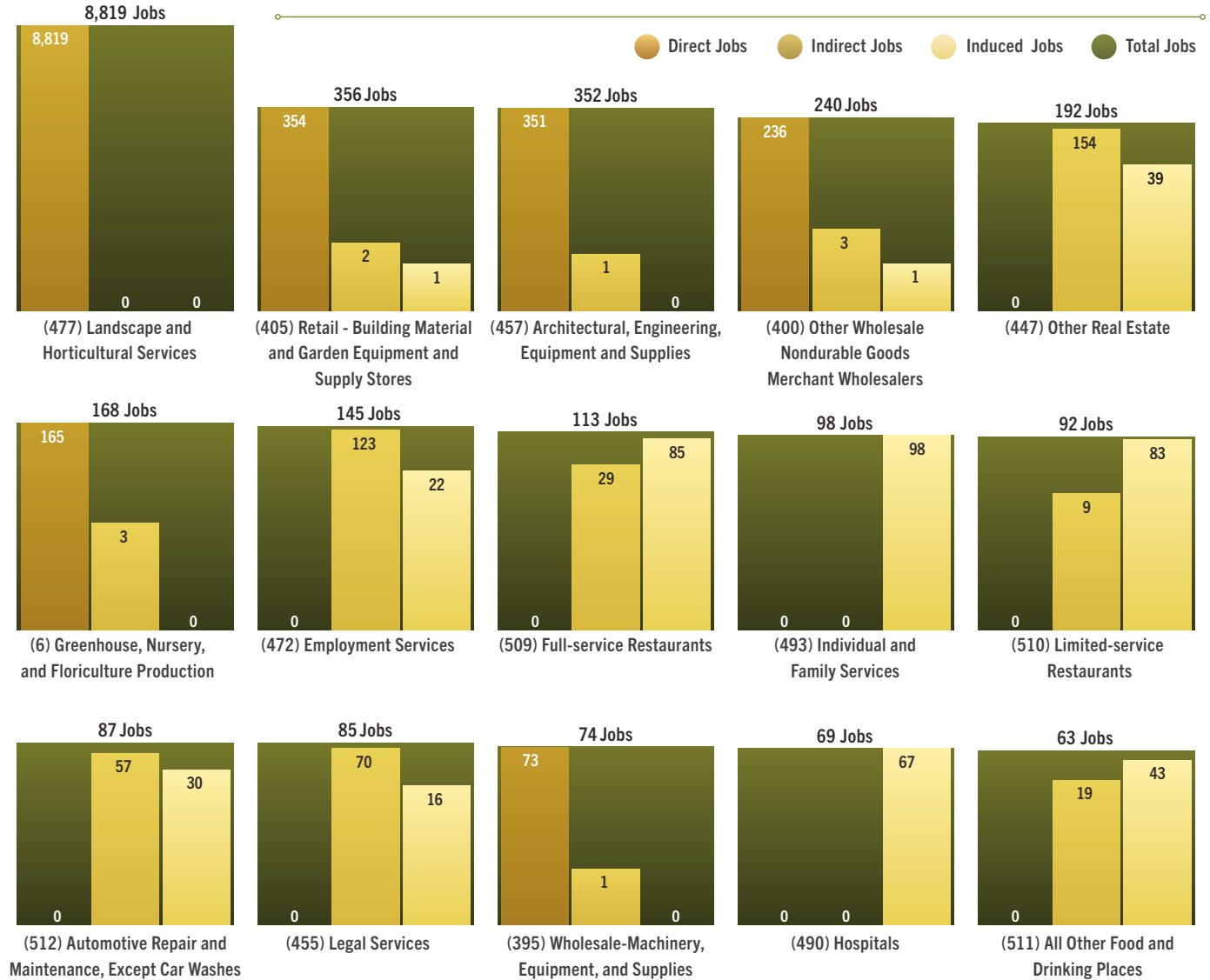


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**FIGURE 8** presents the top 15 industries in Bay Area, California that have the highest employment contributions from U&CF. U&CF employment contributed 8,818 jobs in landscape and horticultural services to the select region economy. Through the indirect and induced effects, other critical sectors in the regional economy such as real estate, employment services, legal and warehousing businesses benefited substantially from the existence of various U&CF activities in the Bay Area, California.

**F8 TOP 15 INDUSTRIES AFFECTED BY U&CF EMPLOYMENT: BAY AREA, CALIFORNIA, 2021**



## VIII. CONCLUSION

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With its growing importance in terms of intrinsic values in urban and suburban landscapes, urban and community forestry as a part of broader urban greening is considered an integral component of urban region planning and management. Along with various ecosystem benefits, U&CF is found to contribute significantly in terms of jobs and overall economic activities to the regional economy. In this report, by using a similar approach to the state U&CF economic report, we estimated the economic contributions of U&CF in the Bay Area, California in 2021.

Results from our IMPLAN model indicate that in 2021, U&CF in the Bay Area, California, in aggregate, contributed about \$2.2 billion to the select region economy by supporting 13,063 full- and part-time jobs. Results also suggest that most U&CF-related employment opportunities in this region are in the private sector, which collectively represents industries related to urban tree care services, nursery and tree production, machinery supplies, and landscape architecture. The results also indicate that landscaping and tree care services were the most dominant private sectors, contributing to nearly 8,230 direct jobs in the Bay Area. Similarly, public agencies through public sector investments and support in U&CF contributed about 528 total jobs to the regional economy.

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

- For consistency as well as an apples-to-apples comparison purpose, we closely followed the peer-reviewed economic contribution methodology developed by Parajuli et al. (2022) to conduct the economic contribution analysis in the Bay Area, California using survey data collected from U&CF respondents and the IMPLAN model specific to California in 2021.
- Our findings could provide justification for enhancement of current programs or creation of new measures to support U&CF activities in this select region in California.
- The comprehensive nature of this study leads to a robust picture of U&CF contributions, including areas that require attention specifically in public and non-profit sectors.
- 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 their jurisdictions while communicating with the public and policymakers on issues pertinent to their industries.

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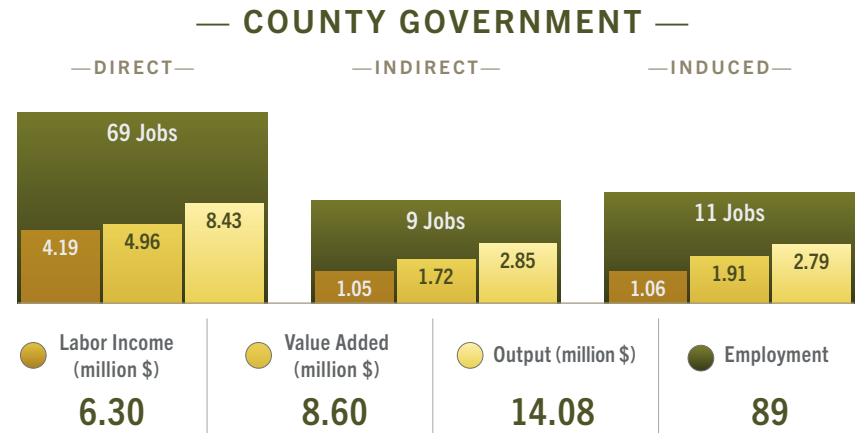
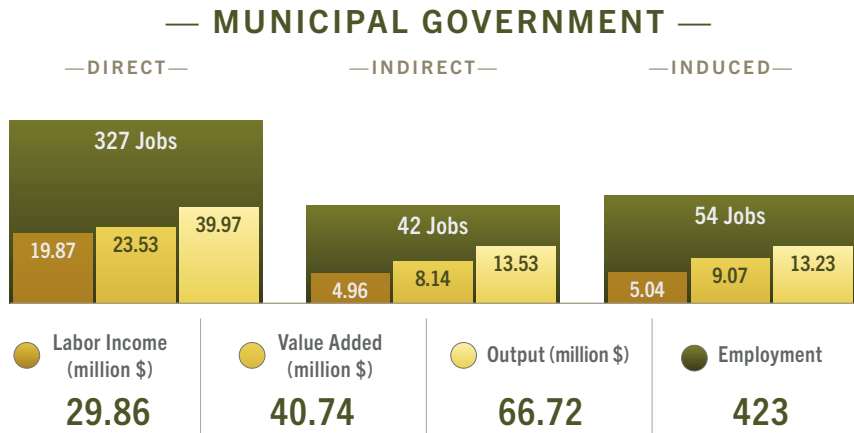
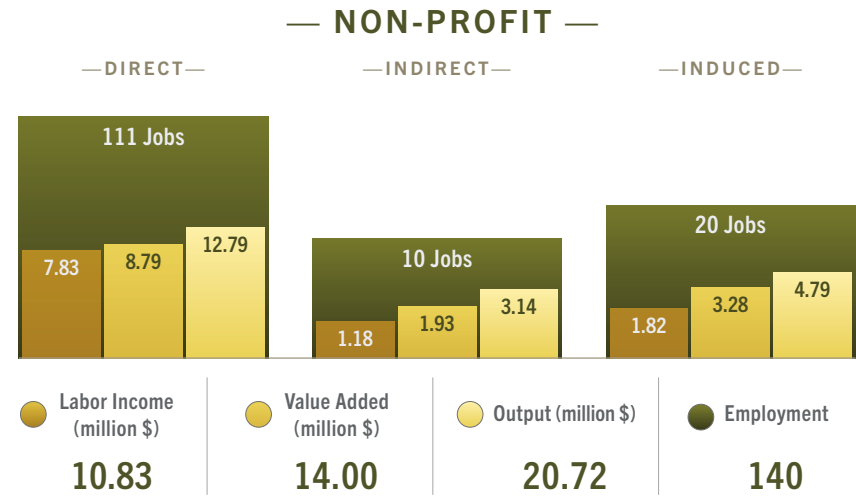
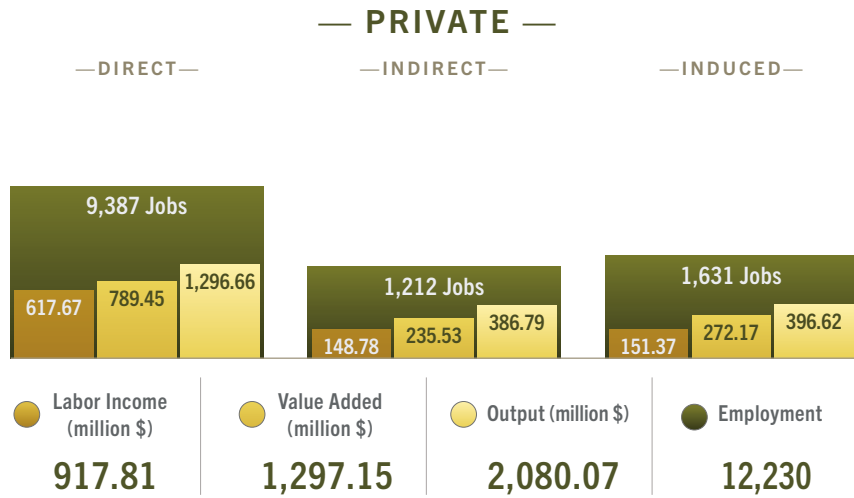
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# APPENDIX A

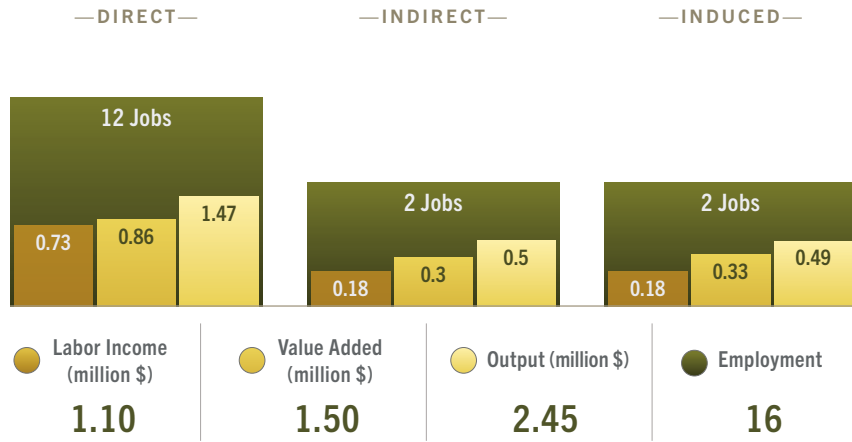
## ECONOMIC CONTRIBUTIONS (DIRECT, INDIRECT, INDUCED, AND TOTAL) OF ALL U&CF SECTORS INCLUDED IN THE STUDY: BAY AREA, CALIFORNIA, 2021



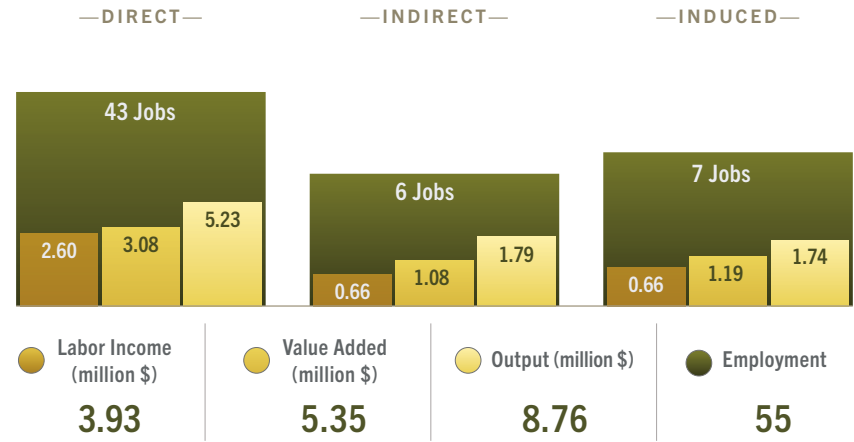
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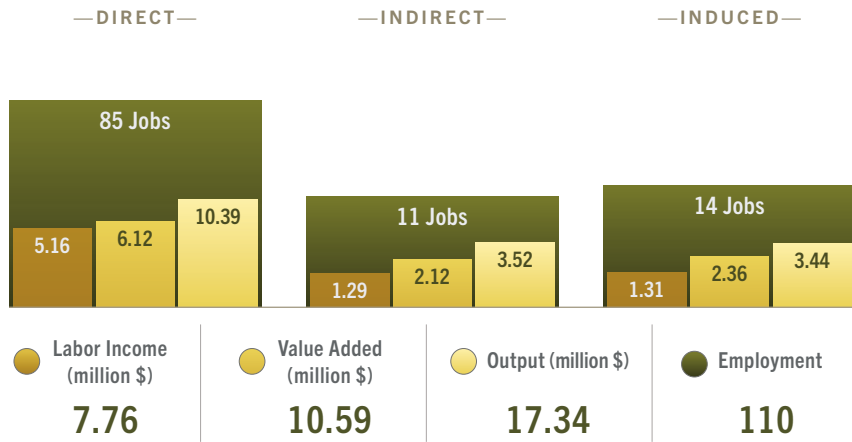
— STATE AGENCIES —



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