Impacts of Urban Forestry on California's Economy in 2009

for

Mary Klaas-Schultz
Economist
Fire and Resources Assessment Program
California Department of Forestry and Fire Protection—CALFIRE
P.O. Box 944246
Sacramento, CA 94244-2460

by

Scott R. Templeton
Associate Professor and Principal Investigator

Wallace Campbell
Graduate Research Assistant

Mark Henry
Professor Emeritus

Jamey Lowdermilk
Former Graduate Research Assistant

Dept. of Applied Economics and Statistics
Clemson University
Clemson SC 29634-0313

December 20, 2010

Executive Summary

Urban forests provide Californians numerous benefits. Californians incur monetary costs to obtain these benefits. Their spending money creates revenues to producers of arboricultural services, ornamental trees, agricultural chemicals, tree-care tools, trucking, and retailing. The revenues directly associated with urban forestry in California were $3.290 billion in 2009. As a result of direct, indirect, and induced effects of these sales, urban forestry supported 62,471 jobs and accounted for $3.596 billion in income to residents of the state in 2009. California's urban forestry added $3.899 billion in value to the state's economy. Jobs supported and value added by urban forestry represents 0.3 percent and 0.2 percent of all jobs and gross domestic product of California in 2009.

Impacts of Urban Forestry on California's Economy

Introduction

Urban forests provide Californians numerous benefits. Trees in cities, towns, and other communities of people beautify the surroundings. Properly located trees near houses and other buildings also provide shade during summer and, thereby, enable reductions in energy use for cooling. Ornamental trees provide habitat for birds, which people enjoy watching. Urban forests also provide other ecosystem services: carbon sequestration, reduction of peak flows of stormwater runoff, noise abatement, and removal of airborne particulate pollutants. The trees can also be a source of compostable material, mulch, firewood, wood chips for fuel, and even wood for furniture. In short, urban forests enhance residential living, commerce, recreation, education, other human activities, and the ecosystems on which these activities depend.

To obtain these benefits, Californians incur monetary costs. Household members spend money to care for trees in their yards. Some city governments plant, maintain, and, if necessary, remove trees in parks, street medians, roadsides, easements along sidewalks, and perimeters of city-owned parking lots. Some city governments repair damage to sidewalks and curbs from tree roots. Some county governments and park districts care for ornamental trees along roads and in parks. Public universities employ people who manage trees on campus grounds. Utilities keep power lines in urban areas clear of tree branches to provide electricity. Electric utilities also incur costs to sponsor shade-tree programs.

Of course, those who are responsible for urban forests do not necessarily do not necessarily do all of the work themselves, in-house. For example, households, government agencies, and other landscape owners typically purchase containerized trees or seedlings from nurseries rather than grow them from seeds or grafts. Californian nurseries also export tree stock outside of the

state. A few households, many government agencies, all electric utilities, and other institutions contract with others, usually professional arborists, to plant, prune, and, if necessary, remove trees on their property (e.g., O'Bryan et al.).

California's nurseries that grow ornamental trees, manufacturers that produce agricultural chemicals and hand tools that households use for do-it-yourself tree care, truckers that ship the trees and tree-care inputs to retail stores or final customers, retailers of the trees and tree-care inputs, and households, government agencies, public universities, and private businesses that supply arboricultural services directly generate sales. Direct sales add value to the state's economy to the extent that they become income that Californians receive or indirect business taxes that they pay to local or state governments. The state's suppliers of ornamental trees, agricultural chemicals, tree-care tools, shipping, retail service, and arboricultural services also create 'indirect effects' because they purchase inputs from other businesses in the state and those businesses, in turn, also hire people and purchase some inputs that are made in the state (e.g., Davis 1993, 53-58, 92). Direct sales also create 'induced effects' because California's households spend some of the income that they earn from the nurseries, arboricultural-service producers, transport firms, retailers, and the other companies that supply inputs to these producers (e.g., Davis 1993, 59-62, 92). The indirect and induced effects on sales also add value to the economy and support jobs within the state. The total value added—individual income and indirect business taxes—and the total employment associated with urban forestry in the state are the primary subjects of this report.

Sources of Secondary Data

Data used to estimate sales by California's nurseries of ornamental trees come from the 1998 Census of Horticultural (NASS, 2000), the 2007 Census of Agricultural (NASS, 2009), and the

California Field Office of the National Agricultural Statistics Service (CANASS, 2010). Information to estimate transportation costs and retail margins of ornamental trees comes from the Input-Output Commodity Composition of Personal Consumption Expenditures in the National Income Product Accounts (Stewart et al. p. 42).

Data to estimate contractual sales by businesses in California of arboricultural services come from three sources. Receipts for ornamental shrub and tree services, Product and Services Code (PSC) 38252, under North American Industrial Classification System (NAICS) Code 5617, 'Services to Buildings and Dwellings', are available from the 2002 Economic Census (Census Bureau, 2005). Information about contractual sales of ornamental shrub and tree services was not collected for the 2007 Economic Census (Census Bureau, 2010); PSC 38252 was eliminated by the Census Bureau. Nonetheless, receipts for landscaping care and maintenance services (PSC 38250), also under NAICS Code 5617, were available in the 2002 Economic Census (Census Bureau, 2005). Receipts for residential landscaping services (PSC 33520), commercial landscaping services (PSC 33530), landscape architectural services (PSC 33560), and landscape construction services (PSC 33570), which form the equivalent of landscaping care and maintenance services, are available from the 2007 Economic Census (Census Bureau, 2010).

California's Department of Finance (2010) provides on-line information about the number of households, or occupied housing units, in the state on April 1, 2000 and the first day of January of each subsequent year through 2010. The estimated number of households on July 1 of a given year is the mean of the number of households on January 1 in the same and subsequent years. For example, the estimated number of households in the state on July 1, 2009 was 12,761,350, which is mean of the estimates for Jan. 1, 2009 and 2010.

The National Gardening Association's proprietary annual survey, conducted by Harris

Interactive on Jan. 28 – Feb. 1 2010, has information about household participation in do-it-yourself tree care and purchases of inputs for it and the fraction of households that pay for professional tree care and their expenditures on it in the West. The West consists of Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, New Mexico, Nevada, Utah, and Wyoming (Harris Interactive, pg. 122). The information is the best available information about households in California (Butterfield).

Collection of Primary Data

Households are not the only major purchasers of contractual arboricultural services and are not the only major producers of in-house arboricultural services. Cities, counties, park districts, electric utilities, and campuses of the University of California and California State University also purchase contractual services, produce them, or do both. As suppliers of in-house arboriculture, these organizations do not earn revenues from 'arms-length' transactions in arboricultural markets. Yet their expenditures on in-house arboriculture can treated as sales by these organizations because people pay taxes, special assessments, fees, electricity bills, college tuition, and other charges to them to supply, among other things, arboricultural services.

Data to estimate expenditures by each major buyer on in-house urban forestry were collected through surveys. To conduct the surveys, databases about each major buyer were constructed. Each buyer database contains names, job titles, employer, addresses, phone numbers, email addresses, and other information about individuals who are involved in urban forestry for their organization. When possible, multiple contacts were selected for each organization. CALFIRE provided information about an urban forester in each of California's Tree Cities, Tree Campuses, and Tree Line utilities. The website of the International Society of Arboriculture was the source of information about each certified arborist in the state. Many of the state's certified arborists are

employed by cities, counties, park districts, utilities, and universities. Websites of all cities, counties, park districts, electric utilities, and UC and CSU campuses were the third major source of contact information. The website of the California Association of Recreation and Park Districts (CARPD) lists the names of 68 members and, if available, their individual websites. An online map of the California Energy Commission lists 48 electric utilities.

The contacts in the city database are usually members of public works or park departments. Many contacts in these departments are city arborists, public works directors, and tree supervisors. City clerks and city managers are contacts in cities that do not have staff dedicated to the maintenance of trees. Contacts in the university database work for the grounds maintenance or landscaping department of their UC or CSU campus. The contacts within each park district are district managers and members of the administrative staff. Within larger utilities, the chosen contacts are members of the utility's vegetation management department. For utilities that do not have a department that specializes in vegetation management, the only available contacts were utility managers and administrative personnel. The final databases contain 1,194 contacts in city governments, 117 contacts in electric utilities, 63 contacts in public universities, 101 contacts in county governments, and 78 park district contacts.

Before distributing the survey, we sent a primer email to each contact in the databases. In the primer email, we informed the recipients of the contents of the survey and requested that the survey be forwarded to the most appropriate contact. One week after sending the primer email, we emailed a downloadable PDF survey to the original contact or the contact recommended in response to the primer email. Over a period of six weeks, we sent each contact the survey three times until we received a response, allowing a two week response period between each contact. In between each batch of surveys, a large amount of follow-up was necessary for the surveys that

we received. We conducted follow-up through emails and phone calls to clarify inconsistencies in responses, request answers to unanswered questions, and to find the remainder of expenditure information if multiple departments provided urban forestry services.

Although most cities and counties in California are involved in tree planting, tree pruning, sidewalk repair, and tree removal on their property, not all spend money on urban forestry. We used the final email contact to determine which cities and county public works departments did not spend any money on urban forestry. County park departments and park districts maintain community parks and, by assumption, spend money on urban forestry. Only one of the 68 members of the CARPD did not spend money on urban forestry. The presence of landscaping and grounds departments at all UC and CSU campuses indicates that some tree work is performed at every campus.

For estimation purposes, usable surveys are those that contain total and contractual expenditures on urban forestry. Respondents from 168 cities provided usable information in their surveys. Respondents from an additional 36 cities reported total expenditures for one but not all their departments engaged in urban forestry. The usable surveys from 168 cities represent 39.4 percent of California's 481 cities. Households in these cities accounted for 32.5 percent of all of the households in the state.

Respondents from 12 of the state's 57 county public works departments returned usable surveys, a response rate of 21.1 percent. Households in these 12 counties accounted for 38.43 percent of the households in the state. Eight, or 24.4 percent, of the 33 University of California or California State University campuses returned surveys with usable information. There are 27 counties in with parks departments and 67 park districts that spend money on urban forestry in the state. Fifteen of the 94 county park departments and park districts in the state reported usable

information; the rate of response was 16.0 percent. Officials at five of the state's 48 electric utilities responded to the survey, a 10.4 percent response rate. Customers of the five respondents represent 36.6 percent of all electric utility customers in the state.

Components of Direct Sales and Their Estimation with Secondary Data

California businesses supplied $1.444 billion of ornamental shrub and tree services in 2002 (Census Bureau, 2005). Ornamental shrub and trees services include planting, pruning, spraying, and removing ornamental trees and trimming trees that interfere with utility lines. Sales of these services were 28.3 percent of $5.105 billion, sales of 'landscaping care and maintenance services' in 2002 (Census Bureau, 2005). Sales of landscape services were $7.158 billion in 2007 (Census Bureau, 2010). To adjust for inflation of prices of landscape services, multiply $7.158 billion by 1.031 ($\cong$ 109.6/106.3), the ratio of the implicit price deflator for gross domestic product in 2009 to the implicit deflator in 2007 (BEA). Thus, sales in 2009 dollars of landscape services in 2007 were $7.382 billion. To adjust sales for growth in demand for services, multiply $7.382 billion by 1.0137 ($\cong$ 12,761,350 $\div$ 12,588,268), the ratio of the estimated number of households on July 1, 2009 in the state to the estimated number on July 1, 2007 (Department of Finance, 2010). The result is $7.483 billion, estimated sales of landscape services in 2009. Thus, sales in 2009 dollars of ornamental shrub and tree services provided by private arboricultural businesses in 2009 were $2.117 billion, if these sales again represented 28.3 percent of sales of landscape services. Ornamental shrub and trees services are a subset of services to buildings and dwellings. Businesses that supply services to buildings and dwellings belong to Sector 388 in the IMPLAN model, an input-output model of California's economy. Thus, sales of private arboricultural businesses are sales of Sector 388 (Table 1).

California's nurseries sold $346.095 million worth of ornamental trees in 1998 (NASS,

2000). Ornamental trees consist of deciduous shade trees, deciduous flowering trees, broadleaf evergreens, coniferous evergreens, and landscape palms. Sales of ornamental trees represented 25.6 percent of all nursery-product sales in 1998 (NASS, 2000). Nursery products include, in addition to ornamental trees, deciduous shrubs, fruit and nut plants, sod, propagative materials, food crops grown in greenhouses, and mushrooms (NASS 2000 and NASS 2009, pg. B-32).

Nurseries in California sold an estimated $584.287 million of ornamental trees in 2008, if these sales accounted for 25.6 percent of the $2.2816 billion in farm-gate sales of all nursery products in 2008 (NASS-CA) as they did in 1998. To adjust sales for deflation in the prices of nursery products, multiply $584.287 million by 0.834 ($\cong$ 134.6/161.3), the ratio of the index of prices that farmers received for their products in 2009 to the index in 2008 (BLS, 2009). Hence, the sales of ornamental trees in 2008 were $487.570 million in 2009 prices. To adjust sales for growth in demand, multiply $487.570 million by 1.005 ($\cong$ 12,761,350 $\div$ 12,692,200), the ratio of the number of households in the state on July 1, 2009 to the number on July 1, 2008 (Department of Finance, 2010). The result is $490.226 million, the estimated sales by California nurseries in 2009 prices of ornamental trees in 2009.

California's nurseries ship 20 percent of their products to other states and one percent to other countries (Carman, pp. 5). Assume the percentages apply to ornamental trees sales in 2009. Thus, nurseries received $387.278 million ($\cong$ 0.79 x $490.226 million) from buyers in California and $102.947 million from buyers outside of the state for the trees. Sector 6 in the IMPLAN model includes nurseries and, therefore, had exports of $102.947 million (Table 1).

Planting of ornamental trees is an incidental service that suppliers of arboricultural services provide. To avoid double counting, reduce the estimated $387.278 million in within-state sales of ornamental trees by the amount that nurseries sold to these suppliers. In IMPLAN's 2009

model of California, Sector 388 purchased $84.834 million of Sector 6's output, namely greenhouse, nursery, and floricultural products. Landscaping businesses are the businesses in Sector 388 that purchase from Sector 6 and had estimated sales of $7.483 billion in 2009. Thus, landscape businesses spent $0.0113 (≅ 0.084834/7.483187) of inputs from Sector 6 to produce $1 of output. Assume that arboricultural companies purchase $0.0113 of ornamental trees directly from nurseries to generate $1 of sales. If so, California's private suppliers of arboricultural services purchased $23.997 million (≅ $2.116813 billion x 0.0113) of ornamental trees in 2009. Thus, nurseries, which belong to Sector 6, sold $363.281 million (≅ 387.278 – 23.997) of ornamental trees in 2009 California buyers other than arboricultural companies (Table 1): $335.573 million to retailers and $27.709 million to direct customers in the state.

California-based companies ship the trees from the nurseries to the retailers and retail customers. Shippers earned approximately $0.0719 for each $1.00 of production of flowers, seeds, and potted plants (Stewart et al. p. 42). Hence, companies earned an estimated $33.543 million [≅ 0.0719 x $(363.281 + 102.947) million] to ship ornamental trees to buyers other than tree-service companies (Table 1). Truck transportation is Sector 335 in the IMPLAN model.

Lawn and garden centers and other retailers sell ornamental trees. Retailers earned approximately $0.8794 in revenues for each $1.00 of production of flowers, seeds, and potted plants (Stewart et al., p. 42). Assume that retailers of ornamental trees have, on average, the same markup. As a result, retailers in California earned an estimated $295.102 million (≅ 0.8794 x 335.573 million) in markups on ornamental trees in 2009 (Table 1). In the IMPLAN model, Sector 323 represents retailers of building materials and garden supplies.

The California Department of Transportation (CALTRANS) manages at least 230,000 acres of right-of-way along the state's highways (Jones and Stokes Associates, Inc.). Tree planting,

care, and removal are part of CALTRAN's management of the right-of-ways. CALTRANS spent $8.791 million on tree-related landscape design and tree planting, trimming, pruning, and removal that its employees did in 1992-1993. Assume that CALTRANS's inflation-adjusted spending on these arboricultural services has not changed since then. The ratio of the implicit price deflator for gross domestic product in 2009 to GDP price deflator in 1993 is 1.401 (≅ 109.615/78.224). Thus, inflation-adjusted spending by CALTRANS on in-house arboriculture was $12.319 million in 2009. CALTRANS's spending to produce arboricultural services is treated as sales to taxpayers by a public arboricultural business in Sector 388.

Some households produce arboricultural services for trees in their yards. In the West, 22.8 percent of all households participated in tree care (Harris Interactive 2010a, p. 131). Sales associated with do-it-yourself care of trees in a yard are measured by a household's expenditures on fertilizers, insecticides, saws, pruning shears, and other inputs that it uses for tree care. Of course, a household can produce arboricultural services but not purchase any tree-care inputs in a particular year. Among households that participated in tree care in the West, 71.1 percent of them also spent money for the activity (Harris Interactive 2010a, p. 148). Mean expenditures in 2009 on inputs for do-it-yourself tree care were $102 per participating-spending household in the West (Harris Interactive 2010a, p. 148). Assume these proportions and mean are the same among California's households, for lack of any better information. Given this assumption, households spent $210.685 million on inputs for do-it-yourself tree care in 2009 (Table 2).

Household production of arboricultural services does not fit a particular sector in the IMPLAN model of California because households do not engage in tree care as a business. However, the retailing, trucking, and manufacturing of inputs that households use for do-it-yourself tree care do correspond to various IMPLAN sectors. To allocation household

expenditures to revenues of retailers, truckers, and manufacturers, one must have information or make assumptions about the breakdown of expenditures into types of products and the retailing-trucking-manufacturing processes of each type of product.

Assume that 75 percent of the household expenditures were for fertilizers, pesticides, growth regulators, and other agricultural chemicals and 25 percent were for saws, pruners, and other tree-care tools. For each dollar that a buyer paid for agricultural chemicals in 2002, 56.5 cents went to retailers, 1.8 cents went to transportation suppliers, and 41.7 cents went to manufacturers (Stewart et al., p. 42). For each dollar that a buyer paid for hand tools in 2002, 51.5 cents went to retailers, 0.9 cents went to transportation suppliers, and 47.6 cents went to manufacturers (Stewart et al., p. 42). Assume that the margins in 2009 were the same as those in 2002. If so, retailers earned $65.827 million, truckers earned $2.916 million, and manufacturers earned $89.270 million from the $158.014 million that households spent in 2009 on agricultural chemicals for their do-it-yourself tree care. Also, retailers earned $25.051 million, truckers earned $0.469 million, and manufacturers earned $27.151 million from the $52.671 million that households spent on tools for do-it-yourself tree care.

How much of these revenues can be allocated to sectors in the California IMPLAN model? Assume that retailers and truckers of the inputs that California households purchased were all located in the state. Thus, Sector 323 (Building Materials and Garden Supply) earned $90.878 million from retailing and Sector 335 (Truck Transportation) earned $3.385 million from transporting agricultural chemicals and tools that households purchased for do-it-yourself tree care in 2009. However, assume that only 60 percent of the revenues from manufacturing agricultural chemicals were earned by California businesses. Moreover, assume that 10 percent of the California revenues were earned by manufacturers of fertilizers, and 90 percent of the

California revenues were earned by manufacturers of pesticides, growth regulators, and other agricultural chemicals except fertilizers. Thus, Sector 130 (Fertilizers) earned $5.356 million and Sector 131 (Other Agricultural Chemicals) earned $48.206 million. Also, assume that 20 percent of the revenues from manufacturing tree-care tools were earned by California businesses. Thus, Sector 185 (Hand tools) earned $5.430 million in 2009 (Table 1).

Of course, some households hire professionals to care for their yard trees. Tree-care businesses prune, fertilize, repair, manage pests in, and remove trees. In the West, 13 percent all households hired professionals to provide tree care (Harris Interactive 2010b, pg. 7). In the West a household that hired professional tree care spent, on average, $304 for the care. If the proportion of households that hired and their mean expenditure on professional tree care in the West are the same in California, Golden State households spent $504 million ($\cong$ $304 x 0.130 x 12,761,350) on contractual arboriculture in 2009 (Table 2). This spending is included in the sales by private arboricultural businesses of $2.117 billion.

Components of Direct Sales and Procedures to Estimate Them with Primary Data

The estimation of city expenditures involved a two step process to fill in missing information in the survey data. The largest unanswered category of expenditures was for repair of sidewalks damaged by tree roots. Before estimating total urban forestry expenditures, sidewalk repair expenditures were estimated for the 63 survey responses that lacked this information. The average spending per household for the 105 cities that reported expenditures on sidewalk repair was used to estimate the expenditures of 63 cities that did not report the information. For the 63 city surveys that omitted sidewalk repair expenditures, the estimated sidewalk repair expenditures were added to the total expenditure reported in the survey.

Among cities that spent money on urban forestry in 2009, mean expenditures were $24.27

per household for all urban forestry activities, $11.00 per household for contractual services, and $0.43 for nursery stock. Almost all households live in cities that spend money on urban forestry; only 0.265 percent of households live in cities that do not. In 2009, incorporated cities in California spent a total of $308.846 million for urban forestry, $136.335 million for urban forestry services performed by contractors, and $5.453 million for nursery stock (Table 2). Thus, spending on in-house arboriculture in 2009 was $167.058 million (Table 1).

Among county public works departments that spent money on urban forestry in 2009, mean expenditures were $2.09 per household for arboricultural services, $0.24 per household for contractors to provide arboricultural services, and $0.03 for nursery stock. Only 0.677 percent of households live in counties that did not spend money on urban forestry. In 2009, the total expenditures by counties in the state on urban forestry were $26.468 million (Table 2). $3.014 million of this total was paid to contractors and $391 thousand was spent on nursery stock. Spending on urban forestry performed by county employees was $23.063 million (Table 1).

County parks departments and park districts were grouped for estimation purposes because they both care for trees in parks that are not administered by cities. In 2009, each district or department spent an average of $169 thousand for all arboriculture, $48 thousand for contractual work, and $4,723 for nursery stock. For the entire state, park districts and county park departments spent $15.895 million with $4.467 million of this amount paid to contractors and $443.993 thousand spent on nursery stock (Table 2). Spending on in-house arboriculture amounted to $10.984 million in 2009 (Table 1).

In 2009, each university spent an average of $211 thousand for urban forestry services, $53 thousand on urban forestry services performed by contractors, and $2.8 thousand on nursery stock. The total expenditures by all UC and CSU campuses were $6.947 million, with $1.760

million spent on contractual services and $92 thousand spent on nursery stock. Total expenditures for work performed by university employees were $5.095 million.

Utilities that produce electricity had 12,910,856 residential and 1,801,936 commercial customers in the state in 2009 (EIA). Utilities spent $7.69 per customer for all urban forestry activities and $7.29 per customer for contractual arboriculture. None of the respondents indicated that a utility purchased any nursery stock. The total expenditure for all utilities in the state was $113.725 million and $107.298 million of this total was spent on contractual work (Table 2). Thus, utilities spent $6.427 million on in-house arboriculture (Table 1).

Economic Impacts

An input-output model of California's economy, the 2009 IMPLAN model (Minnesota IMPLAN Group), is used to estimate the indirect, and induced effects of direct sales on employment, individual income, and value added. In particular, estimation of indirect and induced effects requires use of input-output coefficients that represent linkages between 440 sectors of California's economy in the IMPLAN inter-industry model. Direct sales are drivers of, or shocks to, the IMPLAN model. Multipliers of direct sales, derived from the so-called table of total requirements, generate indirect and induced effects on sales. The direct, indirect, and induced effects of urban forestry on sales generate corresponding effects on employment, personal income, and value added. Total effects comprise direct, indirect and induced effects.

The sales of services and products directly associated with urban forestry in California were $3.290 billion in 2009 (Table 1). These so-called 'sales to final demand' are the sum of revenues earned in seven different sectors: 1) $2.342 billion in Sector 388, 2) $466 million in Sector 6, 3) $386 million in Sector 323, 4) $48.2 million in Sector 131, 5) $36.9 million in Sector 335, 6) $5.43 million in Sector 185, and 7) $5.36 million in Sector 130. Three major kinds of

impacts of sales to final demand are displayed in Table 3: employment, individual income, and value added. As expected, the sectors that include arboricultural services (Sector 388), nurseries (Sector 6), and retail stores that sell ornamental trees and other garden supplies exhibit the largest economic impacts (Tables 4-6).

Direct sales associated with urban forestry in California directly supported 41,867 jobs, not all necessarily full time. The biggest impacts of urban forestry on employment were in Sectors 388, 323, and 6 (Table 4). In particular, production of arboricultural services by private businesses, electric utilities, and governmental organizations entailed 34,235 jobs. Retailing ornamental trees to California buyers and agricultural chemicals and hand tools to California households that care for their trees entailed 4,784 jobs. Growing ornamental trees at California's nurseries entailed 2,520 jobs. The indirect and induced effects of sales associated with urban forestry on employment were an additional 20,874 jobs. Total impacts exceed 1,000 jobs in 'Food Services' and 'Real Estate Establishments' because of linkages to the urban forestry. In total, urban forestry was responsible for 62,741 jobs in California (Tables 3 and 4).

Individual income comprises employee compensation, proprietor's income, and other property income. In common parlance, income is essentially before-tax wages, salaries, profits, and rent. Residents of California earned $1.786 billion in income from the direct sales associated with urban forestry in the state (Table 5). In particular, suppliers—employees, sole proprietors, managers, and property owners—who sold arboricultural services earned $1.255 billion in income. Retailers—employees, sole proprietors, managers, and store owners— who sold ornamental trees for California buyers and agricultural chemicals and hand tools for California households earned income of $261 million in income. Growers, farm workers, and land owners earned $240 million in income from the production of ornamental trees at

California's nurseries. The indirect and induced effects of sales associated with urban forestry on income were $1.810 billion. In total, urban forestry in California enabled residents to earn $3.596 billion in income (Tables 3 and 5).

Value added consists of income of residents and indirect business taxes, such as sales and other excise taxes that businesses collect. Direct sales associated with urban forestry in California directly added $1.916 billion of value to the state's economy (Table 6). In particular, production of arboricultural services by private businesses, electric utilities, and governmental organizations directly added $1.310 billion of value. Retailing ornamental trees to California buyers and agricultural chemicals and hand tools to California households that care for their trees directly added $331 million of value. Growing ornamental trees at California's nurseries directly added $244 million of value. The indirect and induced effects of sales directly associated with urban forestry on value added were $1.983 billion. Both housing sectors and wholesale traders added at least $100 million in value to the economy because of indirect and induced effects. In total, urban forestry in California added $3.899 billion (Tables 3 and 6).

In addition to generating revenues that become income, people who work in urban forestry and businesses that are linked to it also add value to the state's economy by generating revenues from which 'indirect' business taxes are paid. Governmental organizations received $303 million in indirect business taxes in 2009 because of urban forestry (Table 7). In other words, $303 million of the $3.899 value that urban forestry added to California's gross state product in 2009 represented indirect business taxes.

Of course, urban forestry, linked businesses, and people who obtain income from them also pay contributions for social insurance, income taxes, other taxes, and dividends to government agencies. Urban forestry accounted for $147 million in corporate, personal, and social insurance

taxes to state and local governments and $463 million to the federal government in 2009 (Table 7). Thus, if urban forestry had not existed in 2009, tax revenues to all levels of government would have been $913 million less in that year.

References

BEA. National Income and Products account Table: Table 1.1.9. Implicit Pprice Deflators for Gross Domestic Product. Bureau of Economic Analysis, U.S. Department of Commerce, Washington DC, Nov. 23, 2010. Retrieved from http://www.bea.gov/national/nipaweb/TableView.asp?SelectedTable=13&FirstYear=2005&LastYear=2020&Freq=Qtr

BLS. Producer Price Indices-Commodities, Series ID: WPU01, Not Seasonally Adjusted, Group and Item: Farm Products. Bureau of Labor Statistics, United States Department of Labor, Washington DC, accessed on Nov. 19, 2009 from http://data.bls.gov/cgi-bin/dsrv?wp

Butterfield, Bruce. Personal communication, Research Director, National Gardening Association, South Burlington VT, Nov. 2010.

Carman, Hoy. 2003. Urban Farmers: A Profile of the California Nursery and Floral Industry, *Agricultural and Resource Economics Update*, 7 (2, Nov.-Dec.): 5-7. Retrieved at http://agecon.ucdavis.edu/extension/update/articles/v7n2_2.pdf

CARPD. Member Districts. California Association of Recreation and Parks Districts, Sacramento CA, 2007. Accessed in Oct. 2010 from http://www.carpd.net/Members.html

CANASS. Commodity Rank, Acreage, Production, Value and Leading Producing Counties, 2008. *California Agricultural Statistics, 2008*. California Field Office, National Agricultural Statistics Service, U. S. Department of Agriculture, pg. 7, released in 2010 and accessed at www.cdfa.ca.gov/Statistics/PDFs/AgResourceDirectory2008/1_2008_OverviewSection.pdf

Census Bureau. 2007 Economic Census, Sector 56: EC0756SLLS1: Administrative and Support and Waste Management and Remediation Services: Subject Series - Product Lines: Product Lines Statistics by Kind of Business for the United States and States: 2007. U.S. Dept. of Commerce, Washington DC, Nov. 23, 2010. Accessed on December 1, 2010 from American FactFinder at http://factfinder.census.gov/servlet/IBQTable?_bm=y&-geo_id=04000US06&-ds_name=EC0756SLLS1&-NAICS2007=5617&-_lang=en

Census Bureau. 2002 Economic Census, Sector 56: Administrative and Support and Waste Management and Remediation Services: Subject Series - Product Lines: Product Lines by Kind of Business: 2002. U. S. Dept. of Commerce, Washington DC, Nov. 16, 2005. Accessed on Oct. 1, 2009 from American FactFinder at http://factfinder.census.gov/servlet/IBQTable?_bm=y&-geo_id=04000US06&-NAICS2002=5617&-ds_name=EC0256SLLS1&-_lang=en

Department of Finance. *E-5 Population and Housing Estimates for Cities, Counties and the State, 2001-2010, with 2000 Benchmark.* State of California, Sacramento CA, May 2010. Accessed from http://www.dof.ca.gov/research/demographic/reports/estimates/e-5/2001-10/ on Nov. 21, 2010.

Department of Finance. *E-8 Historical Population and Housing Estimates for Cities, Counties and the State, 1990-2000*, State of California, Sacramento CA, August 2007. Accessed on Nov. 20, 2009 from http://www.dof.ca.gov/research/demographic/reports/estimates/e-8

EIA. *Number of Retail Customers by State.* Energy Information Administration, U.S. Department of Energy, Washington DC, November 2010. Accessed on Dec. 16, 2010 from http://www.eia.doe.gov/cneaf/electricity/epa/epa_sprdshts.html

Gilbreath, Jacque and Terry Rose. California Electric Utility Service Areas. Cartography Unit,

Siting, Transmission and Environmental Protection Division, California Energy Commission, State of California, Sacramento, CA, May 2010. Accessed on Dec. 16, 2010 from http://www.energy.ca.gov/maps/maps-pdf/UTILITY_SERVICE_AREAS_DETAIL.PDF

Harris Interactive. 2010a. *National Gardening Survey 2010*. National Gardening Association, Inc., South Burlington VT.

Harris Interactive. 2010b. *2010 Lawn and Landscape Services Tables*. National Gardening Association, Inc., South Burlington VT.

Minnesota IMPLAN Group. 2010. 2009 IMPLAN State Totals for California. MIG, Inc. Hudson, WI.

NASS. *2007 Census of Agriculture: United States: Summary and State Data*, Vol. 1, Geographic Area Series, Part 51, AC-07-A-51. National Agricultural Statistics Service, U. S. Department of Agriculture, Washington DC, issued February 2009 and updated December 2009. Available at http://www.agcensus.usda.gov/Publications/2007/Full_Report/usv1.pdf

NASS. *1998 Census of Horticultural Specialties*. National Agricultural Statistics Service, U. S. Department of Agriculture, Washington DC, March 2000. Available at www.agcensus.usda.gov/Publications/1997/Horticulture_Specialties/index.asp

O'Bryan, Christopher M., Thomas J. Straka, Scott R. Templeton, and Judith D. Caldwell. 2007 Economic Patterns in U. S. Arboriculture. *Arboriculture and Urban Forestry* 33 (4): 292-299.

Stewart, Ricky L., Jessica Brede Stone, Mary L. Streitwieser. 2007. U. S. Benchmark Input-Output Accounts, 2002. *Survey of Current Business* 87 (10): 19-48, Bureau of Economic Analysis, Economics and Statistics Administration, Dept. of Commerce, Oct. http://www.bea.gov/scb/pdf/2007/10%20October/1007_benchmark_io.pdf

Templeton, Scott and George Goldman. 1996. Estimating Economic Activity and Impacts of Urban Forestry in California with Multiple Data Sources from the Early 1990s. *Journal of Arboriculture* 22 (3): 131-143.

Table 1: Sales to Final Demand for Services and Products Associated with California's Urban Forestry in 2009

Service or Product and (IMPLAN Sector)	Sales ($1000s)
Ornamental Trees (Sector 6) Sold to Other States or Countries	$102,947
Ornamental Trees (Sector 6) Sold to Buyers within California except to Arboricultural Companies	$363,281
Fertilizers Manufactured in California (Sector 130) for Do-It-Yourself Tree Care by Households in California	$5,356
Agricultural Chemicals Except Fertilizers (Sector 131) Manufactured in CA for Do-It-Yourself Tree Care by Households in CA	$48,206
Saws, Pruning Shears, and Other Tools Manufactured in CA (Sector 185) for Do-It-Yourself Tree Care by CA Households	$5,430
Retailing of Ornamental Trees Produced and Sold in CA (Sector 323)	$295,102
Retailing of Agricultural Chemicals and Tree-Care Tools Sold by Retailers in CA (Sector 323) to CA Households for DIY Tree Care	$90,878
Trucking of Ornamental Trees (Sector 335) from CA Nurseries	$33,543
Trucking of Agricultural Chemicals and Tree-Care Tools (Sector 335) from Manufacturers to CA Retailers for CA Households	$3,385
Ornamental Shrub and Tree Services by Private Businesses (Sector 388)	$2,116,813
Arboriculture by CALTRANS (Sector 388)	$12,319
Arboriculture by Cities (Sector 388)	$167,058
Arboriculture by County Departments of Public Works (Sector 388)	$23,063
Arboriculture by Park Districts and County Parks Departments (Sector 388)	$10,984
Arboriculture by Four-Year Public Universities (Sector 388)	$5,095
In-House Arboriculture by Utilities (Sector 388)	$6,427
All Services or Products	**$3,289,887**

Table 2: Expenditures on Nursery Stock, Contractual Arboriculture, In-House Arboriculture, and All Urban Forestry in 2009 by Type of Buyer

Type of Buyer	Nursery Stock	Contractual Arboriculture	In-House Arboriculture	All Urban Forestry
Households	not available	$503,582,504	$210,684,980	$714,267,484
CALTRANS	$0	$849,186	$12,318,850	$13,168,035
Cities	$5,453,182	$136,335,245	$167,057,535	$308,845,962
County Public Works	$391,800	$3,013,522	$23,062,653	$26,467,975
Park Districts and County Parks and Recreation	$443,993	$4,466,880	$10,983,743	$15,894,617
Four-Year Public Universities	$92,461	$1,759,808	$5,094,638	$6,946,907
Electric Utilities	$0	$107,298,300	$6,426,977	$113,725,277
All Selected Buyers	**$6,381,437**	**$757,305,445**	**$435,629,376**	**$1,199,316,257**

Table 3: Economic Impacts of California's Urban Forestry in 2009

Kind of Effect	Kind of Economic Impact						
	Employ-ment (Jobs)	Employee Compensation (Column 3)	Proprietor's Income (Column 4)	Other Property Income (Column 5)	Resident Income (Sum of Columns 3, 4, and 5)	Indirect Business Taxes (Column 7)	Value Added (Column 6 + Column 7)
Direct	41,867	$1,150,908,011	$254,690,319	$380,367,527	$1,785,965,856	$130,019,387	$1,915,985,243
Indirect	8,101	$382,602,700	$100,986,880	$278,601,187	$762,190,767	$58,886,221	$821,076,988
Induced	12,773	$542,643,009	$101,221,407	$403,992,935	$1,047,857,350	$113,719,153	$1,161,576,504
Total Effect	**62,741**	**$2,076,153,720**	**$456,898,605**	**$1,062,961,649**	**$3,596,013,973**	**$302,624,761**	**$3,898,638,734**

Table 4: Employment Impacts of California's Urban Forestry in 2009 by Sector and Effect

Sector	Description of Sector	Direct	Indirect	Induced	Total
388	Services to buildings and dwellings	34,235	315	216	34,766
323	Retailers of building materials and garden supplies	4,784	10	144	4,938
6	Greenhouse, nursery, and floricultural products	2,520	566	8	3,094
413	Food services and drinking places	0	269	1,335	1,604
360	Real estate establishments	0	569	655	1,224
382	Employment services	0	737	224	961
19	Support activities for agriculture and forestry	0	732	32	763
319	Wholesale trade businesses	0	320	443	763
394	Offices of physicians, dentists, and other health care specialists	0	0	666	666
335	Transport by truck	270	152	128	550
131	Manufacturing of agricultural chemicals except fertilizers	28	2	0	30
185	Hand tool manufacturing	27	2	0	29
130	Fertilizer manufacturing	3	6	0	9
	All other sectors	0	4,421	8,923	13,343
	Total	**41,867**	**8,101**	**12,773**	**62,741**

Table 5: Income ($1000s) Impacts of Urban Forestry in 2009 by Sector and Effect

Sector	Description of Sector	Direct	Indirect	Induced	Total
388	Services to buildings and dwellings	$1,255,426	$11,556	$7,907	$1,274,889
6	Greenhouse, nursery, and floricultural products	$239,539	$53,806	$757	$294,102
323	Retail Stores for building material and garden supplies	$260,803	$572	$7,840	$269,215
360	Real estate establishments	$0	$65,761	$75,689	$141,450
361	Imputed rental activity for owner-occupied dwellings	$0	$0	$120,186	$120,186
319	Wholesale trade businesses	$0	$35,031	$48,424	$83,455
351	Telecommunications	$0	$51,034	$21,798	$72,832
115	Petroleum refineries	$0	$65,648	$6,475	$72,123
357	Insurance carriers	$0	$23,808	$34,080	$57,888
394	Offices of physicians, dentists, and other health specialists	$0	$0	$54,984	$54,984
335	Transport by truck	$16,349	$9,187	$7,766	$33,301
131	Manufacturing of agricultural chemicals except fertilizers	$10,810	$608	$60	$11,479
185	Hand tool manufacturing	$2,602	$160	$47	$2,810
130	Fertilizer manufacturing	$437	$766	$40	$1,243
	All other sectors	$0	$444,253	$661,806	$1,106,059
	Total	**$1,785,966**	**$762,191**	**$1,047,857**	**$3,596,014**

Table 6: Value Added ($1000s) by Urban Forestry in 2009 by Sector and Effect

Sector	Description of Sector	Direct	Indirect	Induced	Total
388	Services to buildings and dwellings	$1,309,827	$12,057	$8,249	$1,330,133
323	Retail stores for building material and garden supplies	$331,393	$727	$9,962	$342,082
6	Greenhouse, nursery, and floricultural products	$243,946	$54,796	$771	$299,512
360	Real estate establishments	$0	$77,981	$89,753	$167,734
361	Imputed rental activity for owner-occupied dwellings	$0	$0	$145,468	$145,468
319	Wholesale trade businesses	$0	$44,624	$61,685	$106,310
351	Telecommunications	$0	$58,405	$24,947	$83,352
115	Petroleum refineries	$0	$68,311	$6,737	$75,048
357	Insurance carriers	$0	$26,056	$37,297	$63,353
413	Food services and drinking places	$0	$9,713	$48,177	$57,890
335	Transport by truck	$16,729	$9,400	$7,946	$34,075
131	Manufacturing of agricultural chemicals except fertilizers	$10,999	$619	$61	$11,679
185	Hand tool manufacturing	$2,624	$161	$47	$2,833
130	Fertilizer manufacturing	$468	$820	$43	$1,331
	All other sectors	$0	$457,407	$720,432	$1,177,839
	Total	**$1,915,985**	**$821,077**	**$1,161,577**	**$3,898,639**

Table 7: Impacts of California's Urban Forestry on Local, State, and Federal Taxes in 2009

Type of Tax	State and Local	Federal	All Government
Corporate Profits Tax	**$17,697,537**	**$43,136,332**	**$60,833,869**
Dividends	**$35,594,751**	**$0**	**$35,594,751**
Indirect Business Tax: Excise Taxes	$0	$20,412,150	$20,412,150
Indirect Business Tax: Custom Duties	$0	$6,603,929	$6,603,929
Indirect Business Tax: Fines, Fees, and Other Non Taxes	$11,121,738	$17,524,715	$28,646,453
Indirect Business Tax: Sales Taxes	$105,505,926	$0	$105,505,926
Indirect Business Tax: Property Taxes	$118,242,075	$0	$118,242,075
Indirect Business Tax: Motor Vehicle Licenses	$2,420,851	$0	$2,420,851
Indirect Bus Tax: Severance Taxes	$40,649	$0	$40,649
Indirect Bus Tax: Other Taxes	$20,752,730	$0	$20,752,730
Indirect Business Tax: Subtotal	**$258,083,970**	**$44,540,794**	**$302,624,764**
Personal Tax: Income Tax	$60,812,426	$164,859,087	$225,671,513
Personal Tax: Fines, Passport Fees, and Donations	$18,211,903	$0	$18,211,903
Personal Tax: Motor Vehicle Licenses	$2,837,503	$0	$2,837,503
Personal Tax: Property Taxes	$1,260,248	$0	$1,260,248
Personal Tax: Fishing and Hunting Licenses and Other Taxes	$587,114	$0	$587,114
Personal Tax: Subtotal	**$83,709,195**	**$164,859,087**	**$248,568,282**
Social Insurance Tax: Employee Contribution	$2,951,910	$137,934,089	$140,885,999
Social Insurance Tax: Employer Contribution	$7,332,165	$117,349,826	$124,681,991
Social Insurance Tax: Subtotal	**$10,284,075**	**$255,283,915**	$265,567,990
Total	**$405,369,528**	**$507,820,128**	**$913,189,656**