

Production & Marketing Reports

The Economic Impact of the Green Industry in the United States

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ADDITIONAL INDEX WORDS. environmental horticulture industry

SUMMARY. The United States environmental horticulture industry, also known as the Green Industry, is comprised of wholesale nursery and sod growers; landscape architects, designers/builders, contractors, and maintenance firms; retail garden centers, home centers, and mass merchandisers with lawn and garden departments; and marketing intermediaries such as brokers and horticultural distribution centers (re-wholesalers). Environmental horticulture is one of the fastest growing segments of the nation's agricultural economy. In spite of the magnitude and recent growth in the Green Industry, there is surprisingly little information regarding its economic impact. Thus, the objective of this study was to estimate the economic impacts of the Green Industry at the national level. Economic impacts for the U.S. Green Industry in 2002 were estimated at \$147.8 billion in output, 1,964,339 jobs, \$95.1 billion in value added, \$64.3 billion in labor income, and \$6.9 billion in indirect business taxes, with these values expressed in 2004 dollars. In addition, this study evaluated the value and role of urban forest trees (woody ornamental trees); the total output of tree production and care services was valued at \$14.55 billion, which translated into \$21.02 billion in total output impacts, 259,224 jobs, and \$14.12 billion in value added.

The U.S. environmental horticulture industry, also known as the Green Industry, is comprised of wholesale nursery and sod growers,

This research was made possible by a grant from the National Urban and Community Forestry Advisory Committee of the U.S. Forest Service, along with funding from the American Nursery and Landscape Association (ANLA) and the Associated Landscape Contractors of America (formerly ALCA, now PLANET—the Professional Landcare Network).

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landscape architects, designers/builders, contractors and maintenance firms, retail garden centers, home centers and mass merchandisers with lawn and garden departments, and marketing intermediaries such as brokers and horticultural distribution centers (re-wholesalers). This industry is one of the fastest growing sectors in the nation's agricultural economy, often experiencing growth and expansion even during recessionary periods.

The relationship between urban/community forestry and the Green Industry has become more widely recognized as urban forestry has become more acknowledged as an integral segment of the infrastructure of our communities. However, this

relationship is still vastly unappreciated in terms of the degree of synergy that the two segments share. Not only is the Green Industry crucial for the support of urban forestry in providing quality plant material used in our cities, it also offers professional personnel with specialized expertise for growing, maintaining, and managing city trees. Both entities enjoy the benefits of this symbiotic relationship, and each would be diminished without the other. The importance of developing a mechanism by which this relationship can be measured, therefore, is crucial to understanding how to best plan for the future strengthening of each.

In spite of the magnitude and recent growth and interest in the Green Industry, there is surprisingly little information that has been developed on the national level regarding the economic impact of the Green Industry. The U.S. Department of Agriculture (USDA) conducts floriculture and nursery crop surveys to collect information at the grower level, but data are often incomplete for some states, do not include small growers, and cash receipts reported do not reflect the further economic impacts generated from this production activity. The census of agriculture data, including the 10-year census of horticultural specialties, are subject to the same limitations and have historically had other mitigating problems, such as low response rate, that reflect poorly on the data's accuracy. For firms downstream in the supply chain, such as landscapers, re-wholesalers, and retailers, there are economic statistics and employment data maintained by each state's office of the comptroller. However, misclassification errors and noncompliance on the part of industry participants have made some state data speculative at best. To date, no one source of data has proven historically to be instrumental in capturing the total economic importance of the Green Industry.

Recognizing the limitations of existing data sources and also the critical need for this type of economic impact data, several state nursery and landscape associations have sponsored and developed their own economic impact studies for their respective Green Industries. Such states have found these studies to be useful in communicating the importance of the Green Industry to decision makers, and in combating

proposed legislation that would have had severe negative impacts on urban or community forestry initiatives and the Green Industry (e.g., labor regulations, constraints on water usage, etc.). As useful as these state-specific studies have been, there have not been similar analyses conducted at the national level, which would provide similar benefits on a national scale. Additionally, these studies have used differing methodologies and included, in many cases, differing industry sectors. This has inhibited the direct comparison of these state studies across state lines.

The objective of this study was to estimate the economic impacts of the Green Industry at the national level, reviewing the studies that have already been conducted by several states, and complementing those with data from other primary and secondary sources. In addition, this study evaluated the value and role of forest tree species (woody ornamental trees) as a Green Industry product.

Methodology

INDUSTRY SECTOR CLASSIFICATION. The economic sectors associated with the Green Industry were identified based on their primary product or service activity as described in the North American Industry Classification System (U.S. Census Bureau, 2005a) as indicated in Table 1. Production and manufacturing includes the sectors for nursery and greenhouse growers, lawn and garden equipment manufactur-

ers, and greenhouse manufacturers (prefabricated metal buildings). The horticultural services sector includes lawn and landscape service firms and landscape architects. Wholesale and retail trade of horticultural goods includes sectors for flower, nursery stock, and florist supply wholesalers, lawn and garden stores, and florists. In addition, building material and supply dealers, food and beverage stores, general merchandise stores, and farm and garden equipment wholesalers all have significant sales of horticultural merchandise as part of their overall business.

INFORMATION SOURCES. Economic information on the Green Industry in the U.S. was compiled from a variety of sources. For the nursery and greenhouse sector, national and state information on number of farms and value of sales was taken from the census of agriculture for 2002 (USDA, 2004a). For the various service and trade sectors, information on number of establishments, employment, and sales (receipts) were taken from the 2002 economic census industry report series (U.S. Census Bureau, 2004a-j, 2005b), while state-level information on number of firms, employment, and payroll in 2002 were taken from county business patterns (U.S. Census Bureau, 2004k). For the sectors whose primary business is not in horticulture (such as general merchandise stores), employment and payroll were estimated in proportion to horticulture merchan-

dise or product line sales as a share of total sales, which ranged from 1% for food and beverage stores to 27% for garden equipment wholesalers. Also, state-level information on number of firms, employment and payroll were adjusted to match the U.S. totals. The census of agriculture and economic census were considered to be the most reliable information sources available, since they have well-established statistical methodologies, with adjustment for small or non-responding firms, and provide published confidence parameters. For some states in which employment and wages were not disclosed because of a small number of firms reporting, employment was estimated at the midpoint of the range indicated, and payroll was estimated at the national average annual wages per employee.

According to census data, the number of establishments, employment, payroll, and sales receipts for sectors of the Green Industry in the U.S. in 2002 are shown in Table 2. There were a total of 255,389 business establishments involved in the industry, including 56,233 nursery producers or manufacturers, 82,683 horticultural services firms, and 116,473 wholesale/retail trade firms. Total reported employment was 1.085 million employees, and total payroll was \$46 billion, excluding the nursery and greenhouse sector. Total sales receipts in 2002 were \$147.1 billion, including \$23 billion for producers, \$38.8 billion

Table 1. Classification of economic sectors associated with the Green Industry (i.e., environmental horticulture industry) as defined by the North American Industrial Classification System (NAICS) and IMPLAN sector classification.

Industry sector	NAICS code no. ^z	IMPLAN sector (no.) ^y
Nursery and greenhouse	1114	Nursery and greenhouse (6)
Lawn and garden equipment manufacturing	333112	Lawn and garden equipment manufacturing (258)
Greenhouse manufacturing ^x	332311	Prefabricated metal building and component manufacturing (232)
Landscaping services	56173	Services to buildings and dwellings (458)
Landscape architectural services	54132	Architectural and engineering services (439)
Flower, nursery stock, and florist supply wholesalers	42493	Wholesale trade (390)
Lawn and garden equipment and supply stores	4442	Building material and garden supply stores (404)
Florists	4531	Miscellaneous store retailers (411)
Building material and supply dealers ^x	4441	Building material and garden supply stores (404)
Food and beverage stores ^x	445	Food and beverage stores (405)
General merchandise stores ^x	452	General merchandise stores (410)
Farm and garden machinery and equipment wholesalers ^x	421820	Wholesale trade (390)

^zThe North American Industrial Classification System (NAICS) replaced the Standard Industrial Classification (SIC) coding system and uses a 6-digit hierarchical coding system to classify all economic activity into 20 industry sectors. Five sectors are mainly goods-producing sectors and 15 are entirely services-producing sectors. This 6-digit hierarchical structure allows greater coding flexibility than the 4-digit structure of the SIC. NAICS allows for the identification of 1170 industries compared to the 1004 found in the SIC system.

^yIMPLAN classifies business according to 509 industrial sectors that are typically 5-digit NAICS in manufacturing and 2-4 digit NAICS for other sectors.

^xBusinesses are classified according to primary business activity. Thus, merchandise or product line sales of horticultural goods represents a portion of overall business of the sectors indicated.

for horticultural services, and \$85.3 billion for wholesale/retail trade.

Primary market research data regarding the structure and performance of the nursery industry were generated by the fourth national nursery industry survey conducted by the S290 multi-state regional research committee, a group of agricultural economists and horticulturists from 24 land-grant institutions across the country (including the authors of this paper). A total of 44 states participated in this survey. It is through the S290 survey efforts conducted in early 2004 that detailed data regarding sales of urban forest tree species were collected. For the first time in the survey's history, a standard methodology of obtaining a sample frame was used. The population lists for each state were assembled from the respective department of agriculture offices responsible for licensing nursery producers. A master file of all certified/licensed nursery operations was compiled at the University of Florida. Two states that had recently completed nursery surveys were excluded (Alabama and Arizona) in addition to four other states that had extremely small nursery numbers (Arkansas, Kansas, Maryland, and Wisconsin). The remaining 44 states resulted in a

combined listing of 38,269 certified/licensed nursery operations. Based on considerations of budget and statistical reliability, a sample of 15,888 firms was selected for the survey, with sampling in each state based on its proportion of the overall nursery population. Where information was available on nursery production area, inventory, or sales volume, sampling was stratified for three size classes: small [less than 5 acres (1 acre = 0.4047 ha)], medium (5 to 19 acres), and large (20 or more acres). Sampling was weighted on larger firms, with 100% of the large nurseries, 60% of the medium nurseries, and 25% of the small nurseries. In several states, the nursery acreage values were not available, or not available for all certified or licensed operations, and in these states 40% of the identified firms were sampled. The final sample included 3476 large nurseries, 3778 in the medium category, 5996 of the small firms, and 2338 of unknown size. There were a total of 2485 usable returned questionnaires returned, representing an overall response rate of 15.9%. The number of respondents from individual states ranged from as few as 10 in Nevada to 476 in Florida.

ECONOMIC IMPACT ANALYSIS. To evaluate the broad regional economic

impacts of the Green Industry in the U.S., regional economic models were developed for each state using the IMPLAN software system and associated state datasets (Minnesota IMPLAN Group, 2004). The IMPLAN system includes over 500 distinct industry sectors. The sectors pertinent to the Green Industry are indicated in Table 3. The structure of the Green Industry is diagrammed in Fig. 1, indicating the linkages giving rise to indirect and induced impacts. The information for these models was derived from the U.S. national income and product accounts, together with regional economic data collected by the U.S. Department of Commerce, Bureau of Economic Analysis. Input-output models represent the structure of a regional economy in terms of transactions between industries, employees, households, and government institutions (Miller and Blair, 1985). The IMPLAN data used for this analysis was based on fiscal year 2001.

According to the logic of input-output analysis, changes in local final demand or exports cause a change in direct output or employment, which leads to a corresponding change in the activity of input supply firms (indirect effects), and to changes in employee

Table 2. Number of establishments, employment, payroll, and sales receipts in the U.S. Green Industry (i.e., environmental horticulture industry) by sector in 2002.

Sector (NAICS code no.) ^z	Establishments (no.) ^y	Paid employees (no.) ^y	Annual payroll ^y (million \$)	Sales receipts ^y (million \$)
Production and manufacturing	56,233	173,403	26,896	23,000
Nursery and greenhouse (1114)	56,070	150,543	4,459	16,362
Lawn and garden equipment manufacturing (33311)	145	22,201	681	6,517
Prefabricated metal buildings (332311) (greenhouses) ^x	18	659	21,756	121
Horticultural services	82,683	551,641	12,839	38,804
Landscaping services (56173)	76,458	514,962	11,509	35,235
Landscape architectural services (54132)	6,225	36,679	1,330	3,569
Wholesale and retail trade of horticulture products	116,473	510,512	10,676	85,305
Flower, nursery stock and florist supply wholesalers (42493)	4,816	60,010	1,580	10,022
Lawn and garden equipment and supply stores (4442)	21,065	171,149	3,769	30,953
Florists (4531)	22,753	113,929	1,489	6,597
Building material and supply dealers (4441) ^x	18,623	60,450	1,608	13,201
Food and beverage stores (445) ^x	22,465	19,222	330	3,090
General merchandise stores (452) ^x	22,710	56,651	955	9,898
Farm and garden equipment wholesalers (42382) ^x	4,041	29,102	945	11,541
Total all sectors	255,389	1,235,557	50,410	147,109

^zThe North American Industrial Classification System (NAICS) replaced the Standard Industrial Classification (SIC) coding system and uses a 6-digit hierarchical coding system to classify all economic activity into 20 industry sectors. Five sectors are mainly goods-producing sectors and 15 are entirely services-producing sectors. This 6-digit hierarchical structure allows greater coding flexibility than the 4-digit structure of the SIC. NAICS allows for the identification of 1170 industries compared to the 1004 found in the SIC system.

^yMinnesota IMPLAN Group, Inc., 2004; U.S. Census Bureau, 2004a-j; U.S. Department of Agriculture, 2004a.

^xPayroll and employment estimated in proportion to merchandise line sales as share of total sales: 6% for building material and supply dealers, 1% for food and beverage stores, 2% for general merchandise stores, 2% for prefabricated metal buildings, 27% for farm and garden equipment wholesalers.

Table 3. Economic impacts of the U.S. Green Industry (i.e., environmental horticulture industry) by sector in 2002.

Industry group/sector (NAICS code no.) ^z	Output (million \$) ^y	Employment (no. jobs)	Value added (million \$) ^y	Labor income (million \$) ^y	Indirect business taxes (million \$) ^y
Production and manufacturing	34,578	300,677	20,796	11,037	784
Nursery and greenhouse (1114)	26,053	261,408	18,076	9,612	647
Lawn and garden equipment manufacturing (333112)	8,281	37,343	2,610	1,346	129
Greenhouse manufacturing (332311)	244	1,927	110	78	7
Horticultural services	57,774	753,557	39,013	30,269	1,387
Landscaping services (56173)	52,971	704,875	35,564	27,719	1,312
Landscape architecture (54132)	4,803	48,683	3,449	2,549	74
Wholesale and retail trade	55,475	910,104	35,275	23,044	4,701
Wholesale flowers, nursery stock, and florist supplies (42293)	2,879	68,969	1,907	1,130	440
Garden equipment wholesalers (421820)	4,146	40,617	2,737	1,601	657
Lawn and garden stores (4442)	22,859	347,916	14,806	9,747	1,810
Building material supply stores (4441)	9,982	123,591	6,491	4,258	789
Florists (4531)	7,195	200,451	3,977	2,725	401
Food and beverage stores (445)	2,263	35,117	1,385	944	156
General merchandise stores (452)	6,150	93,443	3,973	2,639	448
Total all sectors	147,828	1,964,339	95,084	64,349	6,872

^zThe North American Industrial Classification System (NAICS) replaced the Standard Industrial Classification (SIC) coding system and uses a 6-digit hierarchical coding system to classify all economic activity into 20 industry sectors. Five sectors are mainly goods-producing sectors and 15 are entirely services-producing sectors. This 6-digit hierarchical structure allows greater coding flexibility than the 4-digit structure of the SIC. NAICS allows for the identification of 1170 industries compared to the 1004 found in the SIC system.

^yValues expressed in 2004 dollars using gross domestic product (GDP) implicit price deflator, an economic metric that accounts for inflation by converting output measured at current prices into constant-dollar GDP. The GDP deflator shows how much a change in the base year's GDP relies upon changes in the price level. Also known as the "GDP implicit price deflator" (U.S. Dept. of Commerce, 2005).

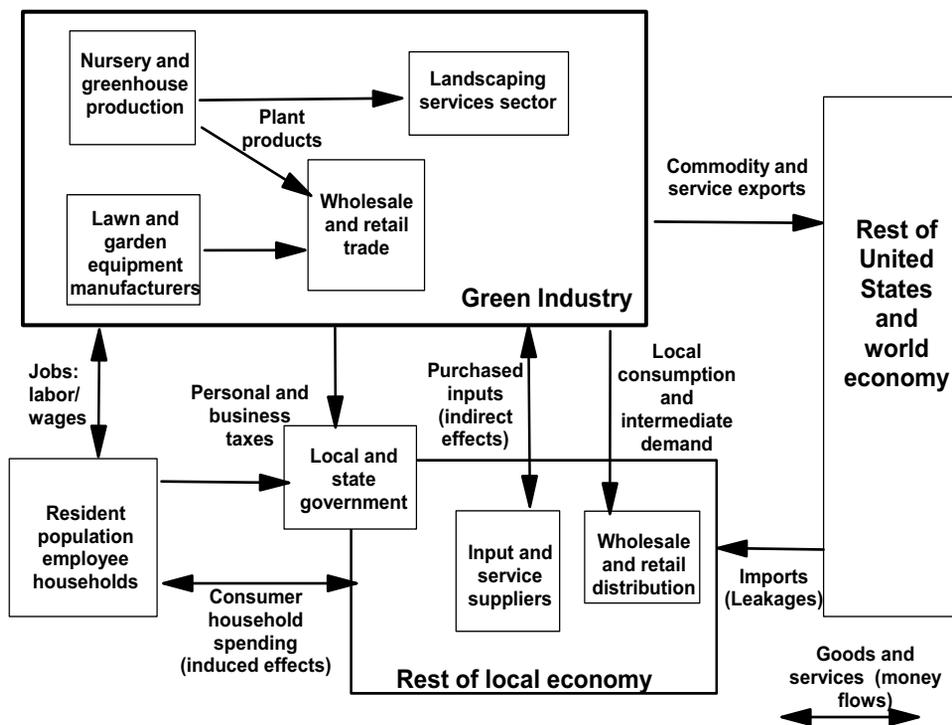


Fig 1. Market structure and economic linkages of the Green Industry (i.e., environmental horticulture industry) in the U.S.

income and spending (induced effects). The total economic impact is the sum of direct, indirect, and induced effects. Economic multipliers derived from the models were used to estimate these effects for the Green Industry in each state. Multipliers represent the multiple of economic activity generated by a unit change in direct output or employment. The regional IMPLAN models were constructed as fully closed models, with all household, government, and capital accounts treated as endogenous, to derive social accounting matrix (SAM)-type multipliers, which represent transfer payments as well as earned income. Separate multipliers are provided for output (sales), employment, value added, labor income, and business taxes. The multipliers for output, value added, labor income, and indirect business

taxes are expressed in units of dollars per dollar output, while the employment multiplier is expressed in jobs per million dollars output. The total output multipliers generally ranged from 1.5 to 2.8. Differences in values of the multipliers reflect the structural linkages of industry sectors, the regional mix of supplier industries, and the size of the regional economy. The multipliers were applied to estimated industry sales or output in order to estimate total economic impacts. For the producer and service sectors, total economic impacts were estimated as:

$$I_{bij} = S_{bi} \times [A_{bij} + E_{bi} \times (B_{bij} + C_{bij})];$$

for the wholesale trade sectors, impacts were estimated as:

$$I_{bij} = S_{bi} \times G_i [A_{bij} + E_{bi} \times (B_{bij} + C_{bij})];$$

and for the retail trade sectors, impacts were estimated as:

$$I_{bij} = S_{bi} \times G_i [A_{bij} + B_{bij} + C_{bij}],$$

where I_{bij} is total impact for measures (j) of output, employment, value added, labor income, or indirect business taxes, in each sector (i), and state (b); S_{bi} is industry sales in sector i and state b ; E_{bi} is the proportion of industry sales exported or shipped outside the state, by sector i in state b ; A_{bij} is the direct effects multiplier for measure j in sector i and state b ; B_{bij} is the indirect effects multiplier for measure j in sector i and state b ; C_{bij} is the induced effects multiplier for measure j in sector i and state b ; and G_i is the gross margin on retail sales for sector i .

The calculation for the producer, wholesale, and service sectors assumes that only the export portion of output is sold to final demand, while the remainder of in-state sales represents intermediate demand from other business sectors. Therefore, export sales for the production and service sectors are subject to the indirect and induced effects multipliers in a fully closed I-O/SAM model. Local sales do not represent final demand for the production and service sectors, so they are subject only to the direct effects multipliers; however, local sales do represent final demand for the retail sector. Data on exports were taken from the IMPLAN database for 2001 or 1999, except in the case of the nursery and greenhouse sector, where information for some states was taken from the 2003 S290 national nursery survey. For the wholesale and retail trade sectors, output was

taken as the gross margin on sales according to national averages: 20.1% for flower and nursery stock wholesalers, 24.7% for general merchandise stores, 26.5% for lawn and garden equipment wholesalers, 28.5% for food and beverage stores, 29.5% for lawn and garden stores, 29.5% for building materials and supply stores, and 42.3% for florists (miscellaneous retailers) (U.S. Census Bureau, 2004-m).

All results were stated in 2004 dollars by adjusting values using the gross domestic product (GDP) implicit price deflator (U.S. Department of Commerce, 2005).

Results

NATIONAL RESULTS. Economic impact estimates for each group and sector of the U.S. Green Industry are summarized in Table 3. Estimated impacts for all states were \$147.8 billion in output, 1,964,339 jobs, \$95.1 billion in value added, \$64.3 billion in labor income, and \$6.9 billion in indirect business taxes. Again, note that values for 2002 were stated in 2004 dollars, which were approximately 4.07% higher. The value added impact represents the net change in value of commodities and services after deducting the cost of inputs purchased from other businesses, and is a broad measure of income generated by the industry. The employment impact estimate includes all jobs, both full-time and part-time, with no adjustment for a full-time equivalent (FTE) basis. The labor or "earned" income impact includes employee wages and salaries and proprietor's income to business owners.

For the production and manufacturing sectors, including nurseries and greenhouses, lawn and garden equipment manufacturers, and greenhouse manufacturers, total output impacts were \$34.6 billion, employment impacts were 300,677 jobs, and value added impacts were \$20.8 billion. For the horticultural services sectors, including landscape services and landscape architects, total output impacts were \$57.8 billion, employment impacts were 753,557 jobs, and value added impacts were \$39.0 billion. For the wholesale/retail trade sectors, total output impacts were \$55.5 billion, employment impacts were 910,104 jobs, and value added impacts were \$35.3 billion.

The largest individual sectors in

terms of output impact were landscaping services (\$53.0 billion), nurseries and greenhouses (\$26.1 billion), retail lawn and garden stores (\$22.9 billion), building material supply stores (\$10.0 billion), lawn and garden equipment manufacturers (\$8.3 billion), and florists (\$7.2 billion). In terms of employment impacts, the largest individual sectors were landscaping services (704,875 jobs), lawn and garden stores (347,916 jobs), nurseries and greenhouses (261,408 jobs), florists (200,451 jobs), and building material supply stores (123,591 jobs). Value added impacts by sectors were as follows: landscaping services (\$35.6 billion); nurseries and greenhouses (\$18.1 billion); lawn and garden stores (\$14.8 billion); building material and supply stores (\$6.5 billion); general merchandise stores (\$4.0 billion); florists (\$4.0 billion); landscape architects (\$3.4 billion); lawn and garden equipment manufacturers (\$2.6 billion); lawn and garden equipment wholesalers (\$2.7 billion); wholesale flower, nursery stock, and florist supplies (\$1.9 billion); and food and beverage stores (\$1.4 billion).

STATE AND REGIONAL RESULTS. Total output, employment, and value added impacts are summarized by state and region in Table 4. The largest individual states in terms of output impacts, all exceeding \$4 billion, were California (\$20.4 billion), Florida (\$9.9 billion), Texas (\$9.7 billion), Illinois (\$6.9 billion), Ohio (\$5.9 billion), Pennsylvania (\$5.6 billion), New York (\$5.3 billion), North Carolina (\$5.2 billion), Michigan (\$4.8 billion), and Georgia (\$4.2 billion). The largest individual states in terms of employment, all exceeding 60,000 employees, were California (253,977), Florida (147,795), Texas (140,295), Ohio (79,841), Pennsylvania (75,829), Illinois (75,110), North Carolina (67,472), Georgia (62,493), and New York (62,113). Total value added impacts were largest in the mid-western U.S. region (\$19.2 billion), followed by the pacific U.S. region (\$18.4 billion), the northeastern U.S. (\$17.9 billion), and the southeastern U.S. (\$13.5 billion). The largest individual states in terms of value added impacts, all exceeding \$3 billion, were California (\$13.7 billion), Florida (\$7.1 billion), Texas (\$6.1 billion), Illinois (\$4.3 billion), Pennsylvania (\$3.7 billion), New York (\$3.5 billion), and Ohio (\$3.5 billion).

Table 4. Economic impacts of the U.S. Green Industry (i.e., environmental horticulture industry) by state/region and industry group in 2002.

Region/state	Output impacts (million \$) ^z				Employment impacts (no. jobs)				Value added impacts (million \$) ^z			
	Production				Production				Production			
	All sectors	and mfg.	Hort. services	Trade	All sectors	and mfg.	Hort. services	Trade	All sectors	and mfg.	Hort. services	Trade
East	41,118	8,543	17,282	15,293	540,496	82,198	208,434	249,865	27,033	5,494	11,749	9,790
Northeast	26,568	4,283	11,993	10,292	336,027	43,799	131,563	160,664	17,867	2,986	8,250	6,632
Connecticut	2,350	453	1,143	754	27,026	4,807	11,213	11,006	1,659	375	787	496
Delaware	448	53	228	166	6,359	375	3,194	2,789	297	44	148	104
Maine	509	56	253	201	7,825	665	3,252	3,908	331	39	166	126
Maryland	3,524	605	1,807	1,112	46,725	5,666	22,596	18,463	2,440	478	1,230	732
Massachusetts	3,239	199	1,787	1,252	37,553	3,411	16,549	17,593	2,159	122	1,225	811
New Hampshire	729	104	316	309	10,153	1,470	3,584	5,099	465	63	208	194
New Jersey	4,210	580	2,128	1,502	52,929	7,042	23,219	22,668	2,875	436	1,459	980
New York	5,265	751	1,887	2,627	62,113	5,344	18,704	38,065	3,511	437	1,363	1,711
Pennsylvania	5,589	1,377	2,091	2,120	75,829	13,803	25,433	36,593	3,672	924	1,430	1,319
Rhode Island	403	67	233	103	5,289	895	2,474	1,920	262	41	156	65
Vermont	302	37	119	146	4,225	322	1,344	2,559	196	25	78	93
Appalachian	14,550	4,260	5,289	5,001	204,469	38,398	76,871	89,200	9,166	2,508	3,500	3,159
Kentucky	1,257	138	373	746	21,649	1,941	5,644	14,065	821	112	245	464
North Carolina	5,155	1,756	1,925	1,473	67,472	12,992	29,072	25,408	3,583	1,387	1,261	935
Tennessee	3,854	1,741	975	1,138	50,812	16,603	13,793	20,416	2,050	689	648	713
Virginia	3,914	584	1,869	1,460	56,905	5,771	26,059	25,074	2,493	308	1,249	936
West Virginia	371	40	147	183	7,631	1,091	2,303	4,237	220	13	96	111
Central	34,825	7,017	11,887	15,920	439,955	46,114	136,824	257,016	21,070	3,142	7,958	9,970
Midwest	31,825	6,663	11,179	13,984	397,099	44,061	127,054	225,984	19,243	2,994	7,494	8,754
Illinois	6,897	958	2,876	3,063	75,110	4,666	26,727	43,718	4,335	430	1,972	1,933
Indiana	3,010	522	1,140	1,348	41,714	3,407	14,632	23,676	1,804	229	745	830
Iowa	1,459	134	329	996	20,820	823	4,371	15,627	906	62	216	627
Michigan	4,845	1,122	1,796	1,927	58,745	9,269	18,110	31,365	2,991	564	1,221	1,205
Minnesota	3,099	557	932	1,610	37,696	3,152	10,080	24,465	1,864	237	616	1,010
Missouri	2,488	363	704	1,422	37,690	2,539	9,994	25,157	1,495	134	470	890
Ohio	5,855	1,303	2,354	2,198	79,841	10,077	31,493	38,271	3,532	607	1,556	1,369
Wisconsin	4,170	1,704	1,046	1,420	45,483	10,130	11,647	23,706	2,317	731	697	890
Great Plains	2,999	355	708	1,936	42,855	2,053	9,770	31,032	1,827	147	463	1,216
Kansas	1,362	231	417	714	19,316	1,395	5,837	12,084	813	93	274	446
Nebraska	961	75	214	672	13,383	385	2,783	10,215	596	32	141	424
North Dakota	307	22	32	254	4,500	138	452	3,910	189	9	21	160
South Dakota	369	27	46	297	5,657	135	699	4,823	228	13	28	187
South	34,559	10,189	12,270	12,100	498,420	93,753	188,420	216,247	22,150	6,301	8,194	7,656
Southcentral	13,992	3,644	4,601	5,746	209,935	36,629	70,909	102,397	8,615	1,974	3,039	3,602
Arkansas	1,395	628	255	513	16,680	3,349	4,135	9,197	675	195	166	315
Louisiana	1,069	157	265	647	19,617	1,762	4,785	13,070	679	100	173	406
New Mexico	520	87	207	226	8,739	660	3,437	4,642	353	72	137	145
Oklahoma	1,352	449	322	580	24,603	5,498	7,158	11,947	819	247	212	359
Texas	9,656	2,324	3,551	3,781	140,295	25,360	51,394	63,541	6,088	1,360	2,351	2,377
Southeast	20,568	6,545	7,669	6,354	288,486	57,124	117,511	113,850	13,535	4,327	5,155	4,054
Alabama	1,681	437	668	576	26,804	4,521	10,617	11,666	1,148	353	434	360
Florida	9,997	3,025	4,051	2,921	147,795	32,966	62,632	52,197	7,076	2,463	2,747	1,866
Georgia	4,726	1,143	1,782	1,800	62,493	7,362	25,620	29,511	3,020	644	1,213	1,162
Mississippi	977	296	190	491	14,236	1,789	3,309	9,138	548	120	122	306
South Carolina	3,187	1,644	978	565	37,157	10,486	15,333	11,337	1,745	747	638	359
West	37,326	8,829	16,335	12,162	485,467	78,612	219,879	186,976	24,830	5,859	11,112	7,859
Mountain	9,824	1,473	4,750	3,601	132,982	10,557	64,279	58,146	6,449	954	3,185	2,309
Arizona	3,206	826	1,508	873	43,882	5,796	23,198	14,888	2,081	506	1,013	563
Colorado	3,085	294	1,612	1,179	37,630	1,554	19,059	17,017	2,019	178	1,083	758
Idaho	853	107	250	496	12,000	923	3,534	7,543	576	91	164	320

Table 4 continued on next page.

Table 4. Continued from previous page.

Region/state	Output impacts (million \$) ^a				Employment impacts (no. jobs)				Value added impacts (million \$) ^a			
	Production			Trade	Production			Trade	Production			Trade
	All sectors	and mfg.	Hort. services		All sectors	and mfg.	Hort. services		All sectors	and mfg.	Hort. services	
Montana	357	57	68	232	5,988	492	931	4,564	219	31	43	145
Nevada	1,248	16	929	303	17,324	121	12,433	4,770	844	13	633	198
Utah	901	165	316	420	13,577	1,614	4,388	7,575	600	130	206	264
Wyoming	174	8	68	98	2,581	57	736	1,788	109	4	44	61
Pacific	27,502	7,356	11,585	8,561	352,485	68,055	155,600	128,830	18,382	4,905	7,927	5,550
Alaska	159	18	53	88	2,110	146	467	1,497	104	10	36	58
California	20,362	4,736	9,371	6,255	253,977	36,236	126,428	91,313	13,656	3,165	6,429	4,063
Hawaii	745	254	320	171	11,166	3,394	4,492	3,281	531	200	220	112
Oregon	3,173	1,711	660	802	43,980	21,632	9,171	13,177	2,010	1,048	448	515
Washington	3,064	636	1,181	1,246	41,251	6,647	15,042	19,561	2,080	482	795	803
Total all regions	147,828	34,578	57,774	55,475	1,964,339	300,677	753,557	910,104	95,084	20,796	39,013	35,275

^aValues expressed in 2004 dollars using gross domestic product (GDP) implicit price deflator, an economic metric that accounts for inflation by converting output measured at current prices into constant-dollar GDP. The GDP deflator shows how much a change in the base year's GDP relies upon changes in the price level. Also known as the "GDP implicit price deflator" (U.S. Department of Commerce, 2005).

The Green Industry share of gross state product (GSP) is an important indicator of the relative importance of the industry in each state. In concept, GSP represents total value added of all industry sectors, and is equivalent to its gross output (sales or receipts and other operating income, commodity taxes, and inventory change) minus intermediate inputs purchased from other U.S. industries or imported. Thus, GSP is often considered the state counterpart of the nation's GDP—the broadest measure of the U.S. economy. In the U.S., the total value added of the Green Industry (\$95.1 billion) represented slightly less than 1% of the GSP sum of all states (\$10,830 billion). The top five states with the highest percentage contribution of the Green Industry to GSP were Oregon (1.7%), Idaho (1.4%), South Carolina (1.4%), Florida (1.3%), and Wisconsin (1.2%).

ECONOMIC IMPACTS OF TREE SALES AND TREE CARE SERVICES. Economic impacts of the portion of urban forestry related to commercial tree production and tree care services are summarized in Table 5. The estimates are based on tree production by the nursery and greenhouse sector, and tree care by the landscaping services sector. The total value of tree production suitable for urban forestry, including deciduous, evergreen, fruit, and Christmas trees, was \$4.63 billion. This value represented 27.2% of total output by the nursery and greenhouse sector for the U.S. as a whole, but for individual

states ranged from as high as 82% (Mississippi) to less than 1% (Hawaii). The value of tree care services was \$9.92 billion, which represented 27.1% of the output of the landscaping services sector. The total output of tree production and care services was valued at \$14.55 billion. This translated into \$21.02 billion in total output impacts, 259,224 jobs, \$14.12 billion in value added, \$9.93 billion in labor income, and \$516 million in indirect business tax impacts.

In the leading states of California and Florida, tree production represented 19% and 18%, respectively, of total nursery and greenhouse output. For California, output impacts of urban forestry were in excess of \$3 billion, employment impacts were 37,769 jobs, and value added impacts were \$2.11 billion; while in Florida, output impacts were \$1.55 billion, employment impacts were 21,946 jobs, and value added impacts were \$1.12 billion. Other states with large value added impacts for urban forestry included Texas (\$757 million), Ohio (\$633 million), Pennsylvania (\$621 million), North Carolina (\$602 million), Illinois (\$568 million), Oregon (\$537 million), New Jersey (\$470 million), and Maryland (\$445 million).

CONCLUSIONS. Nationwide, the Green Industry generates a total of \$147.8 billion in output or sales, 1.9 million jobs, and \$95.1 billion in value-added impacts, including \$64.3 billion in labor income and \$6.9 billion in indirect business taxes. Results of the

study will be beneficial in educating legislators, regulators, and the public at large as to the economic importance of the environmental horticulture industry and urban forestry. This research is the first to evaluate the economic impacts of the Green Industry for the entire U.S., and it shows how the industry contributes to personal income and job growth in local and regional economies. Also, this work serves to establish a standard methodology for future economic studies of the Green Industry, in terms of the sectors to be considered, information sources, and input-output analysis procedures.

Literature cited

- Minnesota IMPLAN Group, Inc. 2004. IMPLAN 2001 50 state data package. Minnesota IMPLAN Group, Inc., Stillwater, Minn.
- Minnesota IMPLAN Group, Inc. 1999. IMPLAN professional social accounting and impact analysis software: User's guide, analysis guide and data guide. Minnesota IMPLAN Group, Inc., Stillwater, Minn.
- Miller, R.E. and P.D. Blair. 1985. Input-output analysis: Foundations and extensions. Prentice-Hall, Englewood Cliffs, N.J.
- U.S. Census Bureau. 2005a. North American Industrial Classification System, United States. U.S. Dept. of Commerce, U.S. Census Bureau. 15 Jan. 2005. <<http://www.census.gov/epcd/www/naics.html>>.
- U.S. Census Bureau. 2005b. Prefabricated metal building and component manufacturing, 2002 economic census manufacturing

Table 5. Economic impacts of U.S. urban forestry tree sales and tree care services in 2002.

State	Nursery and greenhouse sector tree sales (million \$) ^z	Urban forestry tree sales (%)	Landscaping services tree care output (million \$) ^z	Total tree sales and services output (million \$) ^{z,y}	Output impacts (million \$) ^z	Employment impacts (no. jobs)	Value added impacts (million \$) ^z	Labor income impacts (million \$) ^z	Indirect business tax impacts (million \$) ^z
Alabama	71.2 ^y	27.2	109	180	281	3,905	203	125	8
Alaska	3.6	27.2	11	15	17	147	11	9	0
Arizona	80.5	27.2	233	313	539	7,243	370	268	16
Arkansas	20.7	42.4	45	66	96	1,387	66	45	2
California	642.6	18.8	1,482	2,125	3,077	37,769	2,105	1,549	75
Colorado	149.9	55.1	245	395	540	5,504	351	259	12
Connecticut	14.9	5.8	193	208	319	3,172	222	172	9
Delaware	21.3	61.5	34	55	90	1,045	65	41	2
Florida	335.3	17.5	698	1,033	1,553	21,946	1,122	768	42
Georgia	44.6	13.6	324	369	527	7,198	368	274	13
Hawaii	0.3	0.3	43	43	75	1,101	51	40	2
Idaho	19.4	28.1	43	62	95	1,179	68	49	2
Illinois	117.4	31.5	508	626	845	7,519	568	436	19
Indiana	121.8	62.4	208	330	469	5,197	290	209	11
Iowa	33.9	42.0	63	97	127	1,396	76	56	3
Kansas	16.3	27.2	72	88	133	1,673	82	63	3
Kentucky	53.1	53.1	70	123	166	2,468	121	79	4
Louisiana	15.1	16.6	59	74	91	1,478	59	45	2
Maine	14.4	36.9	37	52	81	1,048	54	40	2
Maryland	90.0	27.2	285	375	629	7,407	445	321	17
Massachusetts	39.0	24.4	290	329	470	4,798	317	252	11
Michigan	174.0	26.6	339	513	664	6,613	414	13	13
Minnesota	136.5	58.4	152	289	418	3,748	246	177	10
Mississippi	40.2	81.7	31	71	91	1,346	71	41	2
Missouri	17.9	17.0	167	185	207	2,893	135	110	3
Montana	13.6	38.6	13	26	39	425	23	16	1
Nebraska	16.1	45.3	43	59	72	782	43	34	1
Nevada	4.7	44.9	140	144	249	3,314	171	133	7
New Hampshire	1.4	2.4	51	53	83	962	54	43	2
New Jersey	89.6	24.1	383	472	672	7,599	470	352	17
New Mexico	31.3	49.9	37	68	93	1,171	68	48	2
New York	59.8	16.7	424	484	547	5,408	392	316	10
North Carolina	206.2	21.1	279	486	834	10,119	602	367	25
North Dakota	4.5	39.2	7	11	15	166	8	6	0
Ohio	313.4	53.5	445	758	1,013	12,331	633	451	19
Oklahoma	46.8	20.2	74	121	169	2,961	103	74	4
Oregon	343.8	40.9	119	462	856	11,107	537	376	24
Pennsylvania	227.5	29.8	406	633	910	10,427	621	450	22
Rhode Island	5.4	13.7	35	40	70	773	46	35	2
South Carolina	40.9	12.2	135	176	307	4,592	212	128	9
South Dakota	8.1	42.6	9	17	21	222	12	8	0
Tennessee	162.2	55.1	160	323	548	9,408	329	226	15
Texas	207.1	14.4	601	808	1,188	16,438	757	564	30
Utah	26.3	21.2	52	78	116	1,482	80	58	3
Vermont	7.5	31.8	20	27	41	440	27	20	1
Virginia	72.7	31.9	320	393	595	8,282	396	300	15
Washington	149.4	36.6	205	355	527	6,264	374	271	13
West Virginia	16.1	57.5	31	47	61	1,232	32	25	1
Wisconsin	66.4	27.2	177	243	374	3,938	236	178	9
Wyoming	2.4	36.4	12	15	20	202	12	10	0
Total all states	4,631.2	27.2	9,919	14,550	21,020	259,224	14,120	9,931	516

^aValues expressed in 2004 dollars using gross domestic product (GDP) implicit price deflator, an economic metric that accounts for inflation by converting output measured at current prices into constant-dollar GDP. The GDP deflator shows how much a change in the base year's GDP relies upon changes in the price level. Also known as the "GDP implicit price deflator" (U.S. Dept. of Commerce, 2005). Sources for these columnar data included U.S. Department of Agriculture, 2004b-c (nursery output); National Nursery Survey, 2004 (nursery output of trees); U.S. Census Bureau, 2004j (landscape services for tree care). Missing values for some states were estimated at the national average.

^yPercentage of landscape services for tree care = 27.05%.

- industry series, EC02-311-332311 (RV). U.S. Dept. of Commerce, Washington, D.C.
- U.S. Census Bureau. 2004a. Architectural, engineering and related services, 2002 economic census professional, scientific and technical services industry series, EC02-541-03. U.S. Dept. of Commerce, Washington, D.C.
- U.S. Census Bureau. 2004b. Building material and supplies dealers, 2002 economic census retail trade industry series, EC02-441-18. U.S. Dept. of Commerce, Washington, D.C.
- U.S. Census Bureau. 2004c. Farm, floral and nursery supplies, 2002 economic census wholesale trade industry series, EC02-421-15. U.S. Dept. of Commerce, Washington, D.C.
- U.S. Census Bureau. 2004d. Florists, 2002 economic census retail trade industry series, EC02-441-16. U.S. Dept. of Commerce, Washington, D.C.
- U.S. Census Bureau. 2004e. Food and beverage stores, 2002 economic census retail trade industry series, EC02-441-07. U.S. Dept. of Commerce, Washington, D.C.
- U.S. Census Bureau. 2004f. General merchandise stores, 2002 economic census retail trade industry series, EC02-441-11. U.S. Dept. of Commerce, Washington, D.C.
- U.S. Census Bureau. 2004g. Lawn and garden equipment and supplies stores, 2002 economic census retail trade industry series, EC02-441-08. U.S. Dept. of Commerce, Washington, D.C.
- U.S. Census Bureau. 2004h. Lawn and garden tractor and home lawn and garden equipment manufacturing, 2002 economic census manufacturing industry series, EC02-311-333112 (RV). U.S. Dept. of Commerce, Washington, D.C.
- U.S. Census Bureau. 2004i. Machinery, equipment and supplies, 2002 economic census wholesale trade industry series, EC02-421-09. U.S. Dept. of Commerce, Washington, D.C.
- U.S. Census Bureau. 2004j. Services to buildings and dwellings, 2002 economic census administrative and support and waste management and remedial services industry series, EC02-561-07. U.S. Dept. of Commerce, Washington, D.C.
- U.S. Census Bureau. 2004k. 2002 County business patterns county and state database on NAICS basis. U.S. Dept. of Commerce, Washington, D.C.
- U.S. Census Bureau. 2004l. Annual benchmark report for retail trade and food services: January 1992 through February 2004. Current Business Reports BR/03-A. U.S. Dept. of Commerce, Washington, D.C.
- U.S. Census Bureau. 2004m. Annual benchmark report for wholesale trade: January 1992 through December 2003. Current business reports BW/03-A. U.S. Dept. of Commerce, Washington, D.C.
- U.S. Census Bureau. 2004n. Annual estimates of the population for the U.S. and states and Puerto Rico: April 1, 2000 to July 1, 2004. (NST-EST2004-01). U.S. Census Bur., Population Div., Washington, D.C.
- U.S. Department of Agriculture 2004a. 2002 Census of agriculture, U.S. summary and state geographic area series. U.S. Dept. Agr., Natl. Agr. Stat. Serv., Washington, D.C.
- U.S. Department of Agriculture National Agricultural Statistics Service. 2004b. Floriculture crops 2003 summary. U.S. Dept. Agr., Washington, D.C.
- U.S. Department of Agriculture National Agricultural Statistics Service, 2004c. Nursery crops 2003 summary. U.S. Dept. Agr., Natl. Agr. Stat. Serv., Washington, D.C.
- U.S. Department of Commerce. 2005. Gross domestic product implicit price deflator, 1970–2004, annual. U.S. Dept. of Commerce, Bur. Econ. Anal., Washington, D.C.