2011

Green-Economy Jobs Report

Washington State
Employment Security Department
Labor Market and Economic Analysis

2011 Green-Economy Jobs Report

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Executive summary

This report presents the results of the 2011 Washington State Green-Jobs Survey, which collected self-reported data from a large sample of Washington employers from industries across the state's economy. Employment Security conducted the survey in the fall of 2011.

This report is the third and most-comprehensive green-jobs report by the Employment Security Department. The initial survey in 2008 sought to determine how many "green jobs" existed in the state, but looked only within private-sector industries where researchers expected to find green jobs. The 2009 survey was expanded to include more industries presumed to be green and the public sector. In 2011, the survey was expanded again to examine all industries in the private and public sectors.

Defining the green economy

The following definitions of the green economy and green jobs are the result of extensive literature reviews, consultation with industry, labor and other experts, and contributions from members of the state Evergreen Jobs Leadership Team. The 2008 and 2009 green-jobs surveys used this same definition of green jobs, and several other states and research studies have adopted it in whole or part.

> The *green economy* is rooted in the development and use of products and services that promote environmental protection or clean energy. It is composed of industries and businesses engaged in four core areas:
>
> - Increasing energy efficiency.
> - Producing renewable energy.
> - Preventing and reducing environmental pollution.
> - Providing mitigation or cleanup up of environmental pollution.
>
> *Green jobs* are those jobs that promote environmental protection or clean energy.

The survey form provided employers the definitions of the four core areas and green jobs. Employers self-reported data about the number and nature of green jobs in their firms.

Data collection

Data in this report are from two sources. First, Employment Security conducted a survey of more than 21,000 Washington employers covered by unemployment insurance. Analysts weighted results of the survey to produce estimates of the number of green jobs in Washington. Second, occupational data from the federal Bureau of Labor Statistics (BLS) was matched to the top 25 occupations identified in the survey to provide information about the earnings and education requirements of green jobs in these occupations.

Key findings

Green jobs found in nearly all Washington industry and occupational groups

To date, green-job studies in Washington and across the nation have not identified any new industries and few new occupations that are uniquely "green," such as wind-turbine technician or solar-panel designer. For the most part, employers are adding work responsibilities and activities identified as green to existing jobs. Employers appear to be "greening" jobs through their products and services and through the work practices they require of employees.

This trend was apparent in an analysis of the raw job titles reported by employers. They named few new or unique job titles that were not already reflected in the existing national Standard Occupational Classification (SOC) system. Additionally, in the 2011 survey, employers reported that two-thirds of all green jobs have skill requirements that are identical or mostly the same as non-green jobs.

Because green practices, products and services permeate the economy, short- and long-term employment projections developed for the state's whole economy may be the best guide for projecting job growth by industry and by occupation.

2011 estimate of green jobs

The 2011 Green-Jobs Survey identified an estimated 120,305 green jobs in Washington. Of these, an estimated 104,955 were in the private sector and about 15,350 were in the public sector. Altogether, these green jobs represented about 4 percent of total employment covered by unemployment insurance in Washington (*Figure 4*).

Overall results from 2008, 2009 and 2011 cannot be directly compared to each other due to changes in the survey universe. However, a limited analysis of comparable data from the 2009 and 2011 surveys shows that the number of green jobs decreased by an estimated 18 percent from 2009 to 2011. The government; construction; and professional, scientific and technical industry sectors saw the largest declines in the number of green jobs (*Figure 3*).

Green jobs by industry

In 2011, one in every five jobs in the construction industry was a green job. The construction industry had more green jobs than any other industry, estimated at 29,865, and represented nearly one-quarter of total green jobs in the state (*Figure 1*).

The administrative-support and waste-management industry had the second-highest number of estimated green jobs, at about 12,540. Agriculture had the third-largest number of green jobs, followed by the professional, scientific and technical-services industry.

Green jobs by occupation

Twenty-five occupations accounted for nearly half of all green jobs identified in the 2011 survey (*Figure 5*).

- Farmworkers and crop, nursery, and greenhouse employees comprised the single largest occupation, with about 7 percent of all green jobs.
- Electricians comprised the second-largest occupation, with about 4 percent of all green jobs.

- The third-most-common occupation was heating, air conditioning and refrigeration mechanics and installers.
- The fourth-most-common occupation was carpenters.
- Transit and intercity bus drivers comprised the fifth-largest number of green jobs. This occupation was also the leading public-sector green job.

Earnings and education for green jobs

Employers who responded to the survey tended to use the same job titles for green jobs and non-green jobs and indicated that the skills were similar. Because of these similarities, existing wage and education data were used to calculate the contribution of green jobs to Washington's economy and the earnings and education requirements of green jobs.

Analysts estimate that the top 25 occupations by number of green jobs account for approximately $3 billion in annual earnings in Washington. Estimated annual earnings for all green jobs are approximately $6.4 billion.

Within the top 25 occupations, earnings increase as education and experience levels increase (*Figure 7*):

- Average annual earnings are highest for occupations that require the longest preparation, with at least a bachelor's degree. Average annual earnings are about $90,000.
- Mid-level occupations requiring up to four years of postsecondary education and on-the-job training have average annual earnings of more than $56,000.
- Occupations with short preparation of up to 12 months of coursework or on-the-job training have average annual earnings of slightly less than $43,000.
- Occupations that require little preparation (less than one month) have average annual earnings of less than $30,000.

Earnings data and education requirements for occupations in the report are from the federal Bureau of Labor Statistics' Occupational Employment Statistics.

Background

This report presents the findings of an employment survey of private- and public-sector employers in Washington state. The goal of the survey was to identify and describe the number and type of green-economy industries and employment in Washington.

Defining green-economy jobs

Research began in 2008 with the first iteration of the Washington State Green-Economy Jobs report, which was the first state agency-led survey of its kind in the nation. To determine the appropriate definitions and scope of the research, researchers did extensive literature review, consulted with industry, labor and other experts, and solicited information and ideas from members of the Evergreen Jobs Leadership Team.

Existing research on green economies and green jobs varies widely, depending on the operational definitions, research assumptions and the measurements used. Most definitions of the green economy express the idea that the "triple-bottom-line" goals of environmental protection, increased energy security and creating good-paying jobs are complementary and interdependent. Clean energy—which encompasses new technologies, renewable energy, energy efficiency, and the policies and practices that support them—is typically at the core of green-economy definitions.

Furthermore, the research methods used to study green economies and green jobs are not uniform, and many viable design options exist. Some studies rely on existing databases for their analyses, while others collect information directly from employers.[1] Depending on the purposes of the research, choices about the definitions and methods used are valid and appropriate. At the same time, these differences make it difficult to compare the results of different studies.

In its review, the green-jobs research team sought to match the development of definitions and the research design with the intent of the legislation and available resources. The resulting definitions, in turn, provided a basis for a rigorous scientific survey design and sampling procedure. Several other states and research studies subsequently adopted and used the definitions, in whole or in part.[2] These same foundational definitions formed the basis for the 2008, 2009 and 2011 Washington state green-jobs studies.

[1] Reviews of existing research on green-economy jobs show a wide variation in research results among different reports, often due to differences in the key definitions, assumptions and analytical models employed. For a review of research on green-economy jobs and research methods, see the *2008 Washington State Green Economy Jobs* report: https://fortress.wa.gov/esd/employmentdata/reports-publications/occupational-reports/green-economy-jobs-report. See also: Hardcastle, A., and Kester, K. Growing Washington's green economy: Progress, opportunities and challenges. Washington State University, Extension Energy Program, October 2011.

[2] The state of Oregon used Washington's four core area definitions and added a fifth core area regarding support jobs, such as education. Other states, including California, Colorado, Michigan and Tennessee, use renewable energy and energy efficiency as part of their definitions of green-economy jobs.

The green economy: Four core areas

The *green economy* is rooted in the development and use of products and services that promote environmental protection or clean energy. It is composed of industries and businesses engaged in one or more of four core areas:

- Increasing energy efficiency.
- Producing renewable energy.
- Preventing and reducing environmental pollution.
- Providing mitigation or cleanup of environmental pollution.

Green jobs

Green jobs are those jobs that promote environmental protection or clean energy.

Collecting data on Washington's green economy

Since the primary purpose of the research was to identify green jobs that exist within Washington's economy, the research team used data collected directly from Washington employers.

Researchers designed a survey that asked employers to identify the job titles and number of jobs they considered "green" based on the four core areas. The survey length and focus was limited to ensure high survey-response rates and thereby produce statistically reliable estimates of green jobs. For some analyses, such as education and earnings, existing data were used to approximate the typical earnings and education requirements for green jobs.

The overall results of the 2011 Green-Jobs Survey cannot be compared directly to the survey results from 2008 and 2009. This is because the 2011 survey used a universe of employers across all industry sectors. This design produced estimates that represent the state's entire economy. Limited analysis is possible using statistically comparable survey universes from 2009 and 2011. *Figure 3* displays these results.

The 2008 and 2009 samples included only businesses within industries presumed to be green, though the scope of industries in the 2009 sample was broader than in the 2008 sample. The 2009 survey also included estimates of green jobs in the public sector, whereas the 2008 survey did not.

A copy of the 2011 Green-Economy Jobs Survey is in *Appendix 3*.

Legislation and legislative requirements

This research fulfills a reporting requirement of the Washington State Legislature, as specified in Engrossed Second Substitute House Bill 2227 (E2SHB 2227), which passed during the 2009 legislative session.[3]

The bill established the Evergreen Jobs Act and directed the Evergreen Jobs Leadership Team to focus on specific goals and activities, including coordinating proposals for federal stimulus funding. E2SHB 2227 also called for developing 15,000 new green-economy jobs by 2020.

[3] Engrossed Second Substitute House Bill 2227, as passed in the 2009 legislative session with a partial veto, can be found online: http://apps.leg.wa.gov/documents/billdocs/2009-10/Pdf/Bills/Session%20Law%202009/2227-S2.SL.pdf

E2SHB 2227 directed the Employment Security Department, in consultation with other state agencies and the Evergreen Jobs Leadership Team, to conduct and update labor market research every two years to analyze:

- The current labor market and projected job growth in the green economy.
- The current and projected recruitment and skill requirements of green-economy employers.
- The wage and benefits ranges of jobs within green-economy industries.
- The education and training requirements of entry-level and incumbent workers in green-economy industries.

The bill also called for Employment Security to propose which industries should be considered high-demand green industries, based on current and projected job creation and their strategic importance to the development of the state's green economy. Finally, the legislation required Employment Security to identify occupations that are part of career pathways to middle- and high-wage occupations within green-economy industries.

Additionally, in response to legislation[4] requiring research on the forest-products and transportation industries, *Appendix 1* contains analyses identifying green jobs in those industries.

[4] Substitute House Hill 2420, from 2009: http://dlr.leg.wa.gov/billsummary/default.aspx?Bill=2420&year=2009

Findings of the 2011 Green-Jobs Survey

The findings in this report are self-reported survey data from a sample of Washington employers across the state's economy. Analysts used these data to generate statistical estimates of green jobs for the entire state.

The 2011 survey found an estimated 120,305 green jobs in Washington. This total includes private- and public-sector employment. A little more than 87 percent of all green jobs were in the private sector. Green jobs accounted for about 4 percent of total statewide employment covered by unemployment insurance.[5]

Green jobs by industry

The estimated distribution of green jobs by industry varies considerably. *Figure 1* shows the industries with the largest numbers of green jobs were construction; administrative and support services and waste management; agriculture; and professional, scientific and technical services.

- Construction was the leading industry, with about one-quarter of the green jobs in the state (24.8 percent). *Figure 1* shows that construction also represented the largest proportion of green jobs as a percentage of statewide total covered employment. More than one of every five jobs in construction was green (21.5 percent).
- Administrative and support services and waste management comprised about 10 percent of the green jobs. Within this industry, approximately 8 percent of the covered employment was green.
- Agriculture was the third-largest industry reporting green jobs. These green jobs represented about 10 percent of total covered employment in agriculture, meaning one in every 10 agriculture jobs was a green job.
- Professional, scientific and technical services also represented about 10 percent of the green jobs. Of the total covered employment in this industry, about 7 percent was green.

The figure also shows that employers in some industries reported very small numbers or no green jobs, most notably in management of companies and enterprises (0); mining (208); arts, entertainment and recreation (324); and information (360).

Finally, *Figure 1* shows that, although the 120,305 green jobs in Washington is substantial, this represented only about 4 percent of the total covered employment in the state.

[5] Total covered employment is all employment subject to unemployment-insurance law, as measured by the Quarterly Census of Employment and Wages (QCEW).

Figure 1. Green jobs by industry
Source: Employment Security Department, 2011 Washington State Green-Jobs Survey

Industry	Estimated green jobs	Percent of all green jobs	Covered employment in 2010 Q3[1]	Green jobs as a percent of covered employment
Construction	29,864	24.8%	138,760	21.5%
Administrative and support services and waste management	12,542	10.4%	151,041	8.3%
Agriculture, forestry, fishing and hunting	12,008	10.0%	115,132	10.4%
Professional, scientific and technical services	11,704	9.7%	157,211	7.4%
Manufacturing	11,309	9.4%	265,528	4.3%
Public administration	7,416	6.2%	192,129	3.9%
Other services (except public administration)	6,749	5.6%	78,033	8.6%
Transportation and warehousing	6,277	5.2%	102,322	6.1%
Wholesale trade	5,949	4.9%	120,935	4.9%
Retail trade	3,960	3.3%	322,177	1.2%
Healthcare and social assistance	3,626	3.0%	361,244	1.0%
Educational services	3,185	2.6%	227,854	1.4%
Utilities	1,450	1.2%	17,029	8.5%
Finance and insurance	1,405	1.2%	92,877	1.5%
Real estate and rental and leasing	1,364	1.1%	47,416	2.9%
Accommodation and food services	606	0.5%	229,079	0.3%
Information	360	0.3%	104,969	0.3%
Arts, entertainment and recreation	324	0.3%	69,382	0.5%
Mining	208	0.2%	2,406	8.6%
Management of companies and enterprises	0	0.0%	5,517	0.0%
Total*	**120,305**	**100.0%**	**2,801,043**	**4.3%**

**Totals may not add due to rounding.*

[1]Based on master accounts. See Appendix 4.

The industries with the largest numbers of green jobs were construction; administrative and support services and waste management; agriculture; and professional, scientific and technical services.

Green jobs by industry in the public sector

The 2011 survey universe grouped firms by industry based on the primary product or service the firm produced. Therefore, public-sector green jobs in *Figure 1* are dispersed through many industries, not just public administration. *Figure 2* shows the disbursement of public-sector green jobs among industries.

While green jobs accounted for about 4 percent of total employment, green jobs accounted for about 3 percent of total public-sector employment.[6]

[6] Total covered employment is all employment subject to unemployment-insurance law, as measured by the Quarterly Census of Employment and Wages (QCEW).

Figure 2. Public-sector green jobs by industry
Source: Employment Security Department, 2011 Washington State Green-Jobs Survey

Industry	Estimated public-sector green jobs
Public administration	7,416
Transportation and warehousing	3,215
Educational services	2,522
Utilities	1,138
Construction	447
Administrative and support and waste management	363
Other services (except public administration)	100
Arts, entertainment and recreation	69
Real estate and rental and leasing	56
Healthcare and social assistance	18
Information	5
Total*	**15,348**

**Totals may not add due to rounding.*

Nearly half of all public-sector green jobs were in public administration. The remaining public-sector green jobs were spread among many industries. Public-sector green jobs were found in many industries in the 2011 survey because the survey universe grouped firms by primary product or service.

Changes in green jobs, 2009 to 2011

As noted, because the 2011 survey used an employer sample that represented the entire economy, statistically reliable comparisons between the total estimates of green jobs in 2008, 2009 and 2011 are not possible. While the total estimations are not comparable, it is possible to compute statistically reliable comparisons for 2009 and a portion of the 2011 employer sample (*Figure 3*).

Due to the changes in the 2011 survey sample, the industries listed in *Figure 3* do not exactly match other tables in this report. This difference is most notable for "Government (all sectors)." In the 2009 survey, all public-sector jobs were in the "Government (all sectors)" category. In the 2011 survey sample, public-sector green jobs were dispersed through many industries (*Figure 2*). Though the two surveys treated public-sector jobs differently, analysts were able to extract data from the survey results to provide the comparison in *Figure 3*.

Overall, firms in these industries reported that the number of green jobs declined by more than 18,300, or about 18 percent, from 2009 to 2011.

The most notable shift was for government, which reported a drop of more than 11,000 green jobs – a nearly 48 percent decrease since 2009. Other large declines were shown for construction, which lost 3,248 green jobs, and professional, scientific and technical services, which dropped by an estimated 2,315 green jobs. There also were declines in green jobs in the manufacturing, agriculture, and wholesale trade sectors. Increases in reported green jobs in service-oriented industries and administrative and support services and waste management somewhat offset these declines.

The construction industry accounted for 45 percent of private-sector job losses from 2009 to 2011. Statewide employment in the construction industry dropped following the national recession, and recovery in the construction industry continued to lag even as the state's economy showed signs of improvement. Thus, it seems reasonable to find employment declines in green jobs for this industry.

The public sector accounted for a disproportionate percentage of the decline in green jobs from 2009 to 2011, about 60 percent of the 18,300 green-job decline. This steep decline is not consistent with modest statewide declines in government employment during that period. The exact reason for this decline is unknown. It could be due to the overall "greening" of products and services – that is, employers may not be identifying as many jobs as uniquely "green."

Figure 3. Comparable change in green jobs by industry, 2009 to 2011
Source: Employment Security Department, 2011 Washington State Green-Jobs Survey

Industry	Estimated green jobs 2009	Comparable estimated green jobs 2011[1]	Change from 2009 to 2011	Percent change from 2009 to 2011
Government (all sectors)	23,182	12,122	-11,059	-47.7%
Construction	29,410	26,162	-3,248	-11.0%
Professional, scientific and technical services	10,914	8,598	-2,315	-21.2%
Manufacturing	5,739	4,011	-1,728	-30.1%
Agriculture, forestry, fishing and hunting	12,027	10,414	-1,612	-13.4%
Wholesale trade	4,494	3,316	-1,177	-26.2%
Utilities	461	69	-391	-85.0%
Transportation and warehousing	1,708	1,342	-366	-21.4%
Information	363	52	-311	-85.7%
Retail trade	125	25	-100	-80.3%
Real estate and rental and leasing	46	247	201	435.5%
Finance and insurance	19	738	719	3778.5%
Other services (except public administration)	1,419	2,946	1,527	107.6%
Administrative and support services and waste management	9,414	10,968	1,554	16.5%
Total*	**99,319**	**81,011**	**-18,308**	**-18.4%**

**Totals may not add due to rounding.*

[1]The presumed green jobs strata in the 2011 survey are comparable with the total green jobs in the 2009 survey.

Comparable data from 2009 and 2011 show that the number of estimated green jobs decreased by more than 18,300 from 2009 to 2011. The most notable shifts were for government; construction; and professional, scientific and technical services. Because this table uses comparable data, the industries listed will not exactly match other tables in this report.

Green jobs by core area

Figure 4 shows the distribution of green jobs by core area in the public and private sectors. On a percentage basis, the private sector accounts for about 87 percent of all green jobs.

Preventing and reducing environmental pollution accounted for the largest number of green jobs (59,288) among the four core areas, and represented about 49 percent of all green jobs. The public sector accounted for about 17 percent of all jobs in this core area, and almost two-thirds of all public-sector green jobs identified in the survey were in this core area.

Increasing energy efficiency had the second-largest number of green jobs by core area, and represented nearly one-third of all green jobs. The private sector accounted for approximately 96 percent of total green jobs in this core area. The large number of green jobs in the energy-efficiency core area was likely related to the fact that energy-efficiency products and services support employment in a range of occupational groups.[7]

Green-job counts in *providing mitigation or cleanup of environmental pollution* were the third-largest of all core areas. This core area accounted for nearly 17,000 green jobs and 14 percent of total green jobs. The public sector accounted for more than one of every five jobs in this core area.

Producing renewable energy represented the smallest of the four core areas in terms of total green jobs – only about 4 percent of all positions (5,210). Private-sector employment accounted for about 93 percent of all renewable-energy green jobs (*Figure 4*).[8]

Figure 4. Green jobs by core area, private and public sectors
Source: Employment Security Department, 2011 Washington State Green-Jobs Survey

Industry core area	Private sector		Public sector		Total	
	Estimated green jobs	Percent of core area	Estimated green jobs	Percent of core area	Estimated green jobs	Percent of total green jobs
Preventing and reducing pollution	49,329	83.2%	9,958	16.8%	59,288	49.3%
Increasing energy efficiency	37,449	96.2%	1,471	3.8%	38,920	32.4%
Providing mitigation or cleanup of environmental pollution	13,339	79.0%	3,548	21.0%	16,887	14.0%
Producing renewable energy	4,839	92.9%	371	7.1%	5,210	4.3%
Total*	**104,956**	**87.2%**	**15,348**	**12.8%**	**120,305**	**100.0%**

**Totals may not add due to rounding.*

The largest number of green jobs was in the core area of preventing and reducing environmental pollution. This core area accounted for almost half of green jobs. On a percentage basis, the private sector accounted for about 87 percent of all green jobs.

Occupations by core area

The survey asked employers to provide job titles for employees who have primary responsibility for any of the four core areas shown in *Figure 4*. The intent was to document the number and range of occupations and to identify any new job titles that employers may have created that are related specifically to the four core areas.

Green-jobs titles

With very few exceptions, employers did not identify new job titles that could be explicitly linked to a new class of green occupations. Similar to the findings from earlier surveys, employers who reported that they produce goods or provide services that support any of the core areas appear to be relying primarily on traditional occupational titles to categorize or describe green jobs.

[7] See: The Size of the U.S. Energy Efficiency Market: Generating a More Complete Picture, Karen Ehrhardt-Martinez and John A. "Skip" Laitner, for the American Council for an Energy Efficient Economy (ACEEE), May 2008. See also: Hardcastle, A. and Waterman-Hoey, S. (2009). Energy Efficiency Industry Trends and Workforce Development in Washington State: Phase I. Olympia, Wash: Washington State University, Extension Energy Program.

[8] While private- and public-sector utilities are large sponsors and supporters of renewable energy projects, many of these sites and components are designed, constructed and maintained by private contractors.

Some employers did list specific job titles (e.g., environmental engineer or conservation scientist) that could be directly associated with some of the core areas, while the jobs named by other employers were more generic (i.e., computer support specialist). These results suggest that the majority of employers use traditional occupation titles for green jobs.

Top 25 occupations

Figure 5 shows the top 25 occupations (based on Standard Occupational Classification (SOC) codes), with the largest number of green jobs and the percentage of all green jobs that each occupation represented. Within each occupation, the figure also shows the distribution of jobs across the four core areas.

These top 25 green occupations accounted for just under half (48.1 percent) of all green jobs. Although these jobs represent many different types of occupations, the largest employment counts were concentrated in a small number of occupations:

- Farmworkers, laborers and others working with crops, nurseries and greenhouses comprised the single-largest occupation, with about 7 percent of all green jobs. This occupation also represented the largest total number of jobs (7,362) within any core area (these jobs were in the core area of preventing and reducing environmental pollution).
- Electricians were the second-largest occupation, with about 4 percent of all green jobs, and represented the second largest number of jobs (3,618) within any core area (these jobs are in the core area of increasing energy efficiency).
- The third-most-common occupation was heating, air conditioning and refrigeration mechanics and installers. The fourth-most-common occupation was carpenters. Each comprised about 3 percent of all green jobs. The majority of employment in both of these occupations was in energy efficiency.
- Transit and intercity bus drivers comprised the fifth-largest occupational group, with about 2 percent of all green jobs (2,471). The vast majority of these jobs were in preventing and reducing environmental pollution.

Electricians; heating, air conditioning and refrigeration mechanics and installers; and carpenters were among a number of leading occupations that directly support the construction industry. Combined, the 10 largest occupations named in *Figure 7* directly related to construction accounted for 20 percent of all green jobs.[9]

[9] These are: electricians; heating, air conditioning and refrigeration mechanics and installers; carpenters; construction laborers; architects, except landscape and naval; hazardous materials removal workers; construction managers; roofers; plumbers, pipefitters and steamfitters; and painters, construction and maintenance.

Figure 5. Top 25 occupations by number of green jobs, by core area
Source: Employment Security Department, 2011 Washington State Green-Jobs Survey

Occupation[1]	Core area				Estimated total green jobs	Percent of total green jobs
	Increasing energy efficiency	Producing renewable energy	Preventing and reducing pollution	Providing mitigation or cleanup of environmental pollution		
Farmworkers and laborers, crop, nursery and greenhouse	287	34	7,362	152	7,835	6.5%
Electricians	3,618	392	304	45	4,359	3.6%
Heating, air conditioning and refrigeration mechanics and installers	2,787	-	538	47	3,371	2.8%
Carpenters	2,509	54	532	188	3,284	2.7%
Bus drivers, transit and intercity	65	31	2,375	-	2,471	2.1%
Construction laborers	1,101	63	891	236	2,292	1.9%
Graders and sorters, agricultural products	-	-	2,272	-	2,272	1.9%
Bus drivers, school or special client	193	-	1,952	63	2,208	1.8%
Architects, except landscape and naval	1,760	40	191	120	2,111	1.8%
Hazardous materials removal workers	-	6	414	1,603	2,023	1.7%
Retail salespersons	541	61	1,340	76	2,018	1.7%
Refuse and recyclable material collectors	34	68	1,555	342	2,000	1.7%
Engineers, all other	1,107	22	250	606	1,985	1.6%
Managers, all other	369	172	611	764	1,916	1.6%
Heavy and tractor-trailer truck drivers	392	24	1,194	292	1,902	1.6%
Construction managers	1,112	97	434	203	1,844	1.5%
Roofers	1,608	11	108	31	1,757	1.5%
Maintenance and repair workers, general	616	71	692	307	1,686	1.4%
Plumbers, pipefitters and steamfitters	1,212	93	301	32	1,638	1.4%
Painters, construction and maintenance	51	-	1,470	99	1,620	1.3%
Automotive service technicians and mechanics	484	-	1,087	29	1,599	1.3%
Water and wastewater treatment plant and system operators	19	12	1,152	311	1,494	1.2%
Sales representatives, wholesale and manufacturing, except technical and scientific products	544	59	733	82	1,418	1.2%
Firefighters	-	-	268	1,136	1,405	1.2%
Mechanical engineers	660	225	378	80	1,343	1.1%
Green jobs for the top 25 occupations	**21,067**	**1,536**	**28,405**	**6,845**	**57,852**	**48.1%**
Percent of green jobs within core area	**54.1%**	**29.5%**	**47.9%**	**40.5%**		
Total green jobs by core area*	**38,920**	**5,210**	**59,288**	**16,887**	**120,305**	

**Totals may not add due to rounding.*

[1]Refer to Appendix 6 for SOC codes for these occupations.

Although green jobs represent many different types of occupations, the largest counts of green jobs were concentrated in a small number of occupations. The top 25 green occupations represented just under half (48.1 percent) of all green jobs.

Analysis of the top 25 occupations by core area

Preventing and reducing environmental pollution

Agriculture- and transportation-related occupations (dominated by bus drivers) comprised the largest number of green jobs in this core area.

By identifying agriculture-related employment in the context of preventing and reducing environmental pollution, it may be that employers were relating the work of employees – which include farmworkers, laborers and others working with crops or in nurseries and greenhouses – with organic farming, sustainable practices or environmentally friendly harvesting methods.

Increasing energy efficiency

Construction-related occupations accounted for the majority of the jobs in the "increasing energy efficiency" core area, followed by jobs in professional and technical services-related occupations, such as architecture and engineering.

Energy-efficiency products and services have strong markets and historical connections within residential, commercial and industrial construction. Thus, it seems reasonable to expect that the majority of construction firms would identify employees engaged in green construction activities primarily within the context of energy efficiency.

Providing mitigation or cleanup of environmental pollution

In this core area, workers who remove hazardous materials and firefighters represented the two occupations with the largest numbers of green jobs (1,603 and 1,136 jobs, respectively). Managers and engineers also accounted for a considerable number of green jobs in mitigation or cleanup.

Including these occupations seems consistent with this core area. In general, both private-sector and public-sector employers in this core can be expected to identify employees who are responsible for designing, managing or implementing policies, programs or activities intended to clean up pollution or to compensate (mitigate) for pollution that has occurred by providing substitute resources.

Producing renewable energy

Electricians, mechanical engineers and managers accounted for the majority of all positions in this core area. These occupations would likely be associated with planning, designing and constructing renewable-energy equipment and facilities.

These results seem logical, since the bulk of employment associated with most renewable projects relates to designing and constructing renewable-energy facilities. Once erected, most renewable-energy facilities operate with a relatively small number of operations and maintenance employees, who often work for outside contractors.

Public-sector occupations

As noted in *Figure 4*, the public sector accounted for only about 13 percent of green jobs. Thus, very few public-sector green occupations appear in *Figure 5*, which covers both the public and private sectors. *Figure 6* provides information about the top 25 occupations in the public sector only.

Many of these occupations related to providing professional and technical services that are associated with supporting clean energy, energy efficiency and environmental protection. Others were associated with services, such as public transportation, that reduce overall energy use and pollution.

Within the public sector, the top 25 occupations accounted for over three-quarters of green jobs. The top three occupations, transit and intercity bus drivers, school or special client bus drivers and firefighters, accounted for 37 percent of all public-sector green jobs.

Figure 6. Top 25 occupations for public-sector green jobs
Source: Employment Security Department, 2011 Washington State Green-Jobs Survey

Occupation	Estimated public-sector green jobs	Percent of public-sector green jobs
Bus drivers, transit and intercity	2,471	16.1%
Bus drivers, school or special client	2,048	13.3%
Firefighters	1,176	7.7%
Water and wastewater treatment plant and system operators	925	6.0%
Environmental engineering technicians	794	5.2%
Hazardous materials removal workers	501	3.3%
Managers, all other	409	2.7%
Environmental engineers	386	2.5%
Civil engineers	368	2.4%
Business operations specialists, all other	348	2.3%
Refuse and recyclable material collectors	333	2.2%
Maintenance and repair workers, general	325	2.1%
Environmental scientists and specialists, including health	288	1.9%
Conservation scientists	220	1.4%
Highway maintenance workers	151	1.0%
Natural sciences managers	151	1.0%
Operating engineers and other construction equipment operators	149	1.0%
Engineers, all other	142	0.9%
Maintenance workers, machinery	141	0.9%
Nuclear power reactor operators	137	0.9%
Transportation workers, all other	125	0.8%
Heavy and tractor-trailer truck drivers	124	0.8%
Janitors and cleaners, except maids and housekeeping cleaners	109	0.7%
General and operations managers	109	0.7%
Septic tank servicers and sewer pipe cleaners	108	0.7%
Total top 25 public-sector green jobs*	**12,034**	**78.4%**
Total public-sector green jobs	**15,348**	

**Totals may not add due to rounding.*

Within the public sector, the top 25 occupations account for over three-quarters of green jobs. The top three occupations were transit and intercity bus drivers, school or special client bus drivers, and firefighters.

Earnings and education

To learn more about the earnings, education and experience requirements for the leading occupations identified in the survey, researchers conducted secondary analyses using existing data. Since these data were not collected directly from employers who participated in the survey, these findings should be viewed as approximations of the actual earnings, education and experience requirements of green jobs.[10]

As shown in *Figure 5*, the top 25 occupations accounted for nearly half of total green jobs (48.1 percent). The large employment numbers and associated earnings for these occupations suggest that green jobs provide considerable economic benefits to individual workers and the state economy as a whole.

Analysts estimate the top 25 occupations by number of green jobs account for approximately $3 billion in annual earnings in Washington. Estimated annual earnings for all green jobs are approximately $6.4 billion.[11]

Figure 7 shows the top 25 occupations with the most green jobs, grouped by the level of education and experience required. The data show that average annual earnings generally increase as the required level of preparation and experience increase:

- Average annual earnings are highest for occupations that require the longest preparation, with at least a bachelor's degree. This category includes architects, engineers (all other), construction managers and mechanical engineers. Average earnings for these occupations are about $90,000 annually.
- The next tier of preparation (mid-level) includes a variety of skilled-trades occupations (e.g., electricians; heating, air conditioning and refrigeration mechanics and installers; and carpenters), as well as sales representatives and firefighters. Many of these occupations require up to four years of classroom and on-the-job training. These mid-level occupations have average annual earnings of more than $56,000.
- Short preparation of up to 12 months is required for a range of other transportation- and construction-related jobs. Preparation for these jobs typically combines limited coursework with on-the-job training. Average annual earnings in short-preparation occupations are a little less than $43,000.
- Finally, the occupations that require little preparation (less than one month) consist of farmworkers, retail salespeople, and refuse and recyclable materials collectors. Average annual earnings for these occupations are less than $30,000.

[10] *Figure 7* shows the average annual earnings for the top 25 occupations in which green jobs were reported. These are the average wages for all workers in these occupations, not for just the green jobs. These earnings data are from the federal Bureau of Labor Statistics' Occupational Employment Statistics. *Figure 8* suggests the skill requirements for green jobs are, in most cases, either identical or mostly the same as other jobs in the same occupation.

[11] Total annual earnings for the top 25 occupations and for all green jobs were calculated by multiplying the estimated number of jobs in each occupation by the average annual earnings for each occupation.

Figure 7. Education, work experience level, and statewide average annual earnings for the top 25 occupations
Source: Employment Security Department, 2011 Washington State Green-Jobs Survey; U.S. Bureau of Labor Statistics, Occupational Employment Statistics

Education and experience requirements	Percent of green jobs by education level	Estimated green jobs	Average annual earnings[1]
Long preparation – Bachelor's degree or higher			
Architects, except landscape and naval		2,111	$72,049
Engineers, all other		1,985	$91,950
Construction managers		1,844	$109,676
Mechanical engineers		1,343	$88,844
Subtotal/average annual earnings*	*6.1%*	*7,283*	*$90,098*
Mid-level preparation – More than 1 year and less than 4 years, includes on-the-job training, classes or combination			
Electricians		4,359	$62,575
Heating, air conditioning and refrigeration mechanics and installers		3,371	$52,383
Carpenters		3,284	$50,024
Graders and sorters, agricultural products		2,272	$22,229
Managers, all other		1,916	$103,189
Plumbers, pipefitters and steamfitters		1,638	$60,052
Automotive service technicians and mechanics		1,599	$39,851
Water and wastewater treatment plant and system operators		1,492	$53,366
Sales reps., wholesale and manuf., exc. tech. and scientific products		1,418	$64,010
Firefighters		1,405	$62,748
Subtotal/average annual earnings*	*18.9%*	*22,756*	*$56,363*
Short preparation – 1 to 12 months, on-the-job training, classes or combination			
Bus drivers, transit and intercity		2,471	$46,201
Construction laborers		2,292	$39,961
Bus drivers, school or special client		2,208	$36,187
Hazardous materials removal workers		2,023	$52,084
Heavy and tractor-trailer truck drivers		1,902	$43,174
Roofers		1,757	$43,028
Maintenance and repair workers, general		1,686	$41,375
Painters, construction and maintenance		1,620	$39,449
Subtotal/average annual earnings*	*13.3%*	*15,959*	*$42,760*
Little preparation – Less than 1 month, usually on-the-job training			
Farmworkers and laborers, crop, nursery and greenhouse		7,835	$25,548
Retail salespersons		2,018	$27,505
Refuse and recyclable material collectors		2,000	$46,220
Subtotal/average annual earnings*	*9.9%*	*11,853*	*$29,369*
Total top 25 green jobs	**48.1%**	**57,851**	
All other green jobs	**51.9%**	**62,454**	
Total all green jobs*	**100.0%**	**120,305**	

**Totals may not add due to rounding.*

[1]*These earnings data are by occupation, not for green jobs in these occupations.*

Green jobs skills

To better understand the nature of the skills required for green jobs, the survey asked employers to rate whether the skills of employees in green jobs were identical, mostly the same, mostly different or entirely different from the skills of employees who do not work in green jobs. Employers did not provide separate ratings of the skills for each green job. Rather, employer responses were distributed across all jobs reported by the employer.

Figure 8 presents the results for each response category by industry. In general, these results suggest that most employers find relatively few differences in the skill sets required of employees in green jobs compared to those who are not.

For two-thirds of green jobs, the skills required of employees in green and non-green jobs with the same job title were identical (21.5 percent) or mostly the same (45.1 percent). For another 20 percent of green jobs, the skills were either mostly different (15.4 percent) or entirely different (5 percent) than workers who did not hold green jobs.

Employer responses by industry yielded these notable results:

- The industries with the largest proportion of green jobs with identical skills requirements as non-green jobs were information (91.3 percent) and retail trade (50.2 percent).
- The industries that had the most differentiation in skills (either mostly different or entirely different) between green and non-green jobs were mining; accommodation and food services; other services (except public administration); and utilities.

Figure 8. Skills requirements for the top 25 occupations
Source: Employment Security Department, 2011 Washington State Green-Jobs Survey

Industry	Skills are identical	Percent of green jobs	Skills are mostly the same	Percent of green jobs	Skills are mostly different	Percent of green jobs	Skills are entirely different	Percent of green jobs	Skill level not identified	Percent of green jobs	Total estimated green jobs
Construction	8,522	28.5%	11,571	38.7%	5,677	19.0%	1,199	4.0%	2,895	9.7%	29,864
Administrative and support and waste management	1,708	13.6%	5,432	43.3%	1,874	14.9%	517	4.1%	3,011	24.0%	12,542
Agriculture, forestry, fishing and hunting	1,726	14.4%	9,057	75.4%	655	5.5%	67	0.6%	502	4.2%	12,008
Professional, scientific and technical services	1,188	10.1%	6,612	56.5%	2,413	20.6%	527	4.5%	964	8.2%	11,704
Manufacturing	1,100	9.7%	5,873	51.9%	2,541	22.5%	787	7.0%	1,008	8.9%	11,309
Public administration	1,639	22.1%	1,816	24.5%	1,009	13.6%	142	1.9%	2,811	37.9%	7,416
Other services (except public administration)	1,737	25.7%	2,212	32.8%	969	14.4%	1,523	22.6%	308	4.6%	6,749
Transportation and warehousing	842	13.4%	3,884	61.9%	459	7.3%	284	4.5%	808	12.9%	6,277
Wholesale trade	1,951	32.8%	2,124	35.7%	704	11.8%	308	5.2%	861	14.5%	5,949
Retail trade	1,988	50.2%	1,315	33.2%	334	8.4%	305	7.7%	18	0.5%	3,960
Healthcare and social assistance	1,314	36.2%	689	19.0%	376	10.4%	72	2.0%	1,175	32.4%	3,626
Educational services	775	24.3%	1,432	45.0%	388	12.2%	42	1.3%	548	17.2%	3,185
Utilities	352	24.3%	433	29.9%	320	22.1%	196	13.5%	148	10.2%	1,450
Finance and insurance	404	28.8%	583	41.5%	294	20.9%	51	3.7%	72	5.1%	1,405
Real estate and rental and leasing	132	9.7%	624	45.7%	169	12.4%	31	2.3%	408	29.9%	1,364
Accommodation and food services	103	17.1%	273	45.0%	175	28.8%	0	0.0%	56	9.2%	606
Information	328	91.3%	28	7.8%	0	0.0%	0	0.0%	3	0.8%	360
Arts, entertainment and recreation	58	17.9%	258	79.6%	0	0.0%	0	0.0%	8	2.6%	324
Mining	0	0.0%	0	0.0%	208	100.0%	0	0.0%	0	0.0%	208
Total*	**25,866**	**21.5%**	**54,215**	**45.1%**	**18,567**	**15.4%**	**6,052**	**5.0%**	**15,605**	**13.0%**	**120,305**

*Totals may not add due to rounding.

For two-thirds of green jobs, the skills required were identical or mostly the same as non-green jobs.

Industry certifications

The survey asked employers whether they held any special industry certifications that relate to the four core areas, such as LEED (Leadership in Energy and Environmental Design) or Certified Organics. The survey did not ask employers to list the names of specific certifications held by their organizations or by individual employees, and a number of firms reported holding certifications in more than one core area.

Figure 9 shows that for the 2,411 firms reporting green jobs in the 2011 survey, more than 40 percent reported having one or more certifications. Among the industries in which a substantial number of green jobs were reported, agriculture had the highest percentage of firms with certifications (66.9 percent), and wholesale trade had the lowest (19.6 percent).

Data in *Figure 9* are raw counts of firms that reported at least one green job, not weighted estimates. It would be inaccurate to draw conclusions or generalize about certifications by industry from these data.

Figure 9. Skills requirements for the top 25 occupations
Source: Employment Security Department, 2011 Washington State Green-Jobs Survey

Industry	Count of firms reporting green jobs	Count of firms reporting certifications	Percent of firms reporting certifications
Construction	801	326	40.7%
Professional, scientific and technical services	269	143	53.2%
Administrative and support services and waste management	200	80	40.0%
Public administration	168	79	47.0%
Manufacturing	168	50	29.8%
Wholesale trade	153	30	19.6%
Other services (except public administration)	136	57	41.9%
Agriculture, forestry, fishing and hunting	118	79	66.9%
Educational services	100	22	22.0%
Transportation and warehousing	63	20	31.7%
Retail trade	51	11	21.6%
Utilities	45	27	60.0%
Finance and insurance	42	24	57.1%
Healthcare and social assistance	42	9	21.4%
Real estate and rental and leasing	24	6	25.0%
Accommodation and food services	14	5	35.7%
Information	8	2	25.0%
Arts, entertainment and recreation	7	5	71.4%
Mining	2	1	50.0%
Total	**2,411**	**976**	**40.5%**

Among the 2,411 firms reporting green jobs, more than 40 percent reported having one or more special industry certification.

Employer-reported new hires

In the 2011 survey, employers were asked how many of their employees in each core area were new hires. Employers made an estimated 7,629 new hires for green jobs in the three-month period (June to August 2011) prior to the survey. *Figure 10* shows new hiring accounted for about 6 percent of all green jobs identified in the survey.

Whether these were "newly created" jobs could not be determined from employer responses. The responses likely include a combination of several different types of hiring: filling existing green-job vacancies, hiring for entirely new green jobs, and the transition of existing traditional jobs to a new green focus, which may require hiring new employees with different skill sets.

The largest number of new hires reported by employers was in the core area of reducing pollution (3,956), followed by energy efficiency (2,674). When averaged across all 2,411 employers who reported green jobs in the survey, new hiring comprised between 6 and 7 percent of the total green employment in all of the core areas except for mitigation or pollution cleanup, where about 4 percent of green jobs were new.

As shown in *Figure 10*, when the analysis was limited to only the 423 companies actually reporting new hires, close to one-quarter of their green jobs were new hires (24.5 percent).

Figure 10. New hires reported by employers, by core area
Source: Employment Security Department, 2011 Washington State Green-Jobs Survey

Core area	Estimated new hires	Percent of green jobs at companies that reported new hires	Percent of all green jobs
Increasing energy efficiency	2,674	23.4%	6.9%
Producing renewable energy	333	31.3%	6.4%
Preventing and reducing pollution	3,956	27.5%	6.7%
Providing mitigation or cleanup of environmental pollution	666	15.5%	3.9%
Total new hires*	**7,629**	**24.5%**	**6.3%**

**Totals may not add due to rounding.*

Among employers who reported hiring new employees, an estimated 7,629 new hires were made in the three-month period prior to the survey. New hiring accounted for about 6 percent of all green jobs identified in the survey.

Regional distribution of green jobs

Figure 11 shows green jobs as a percentage of total covered employment in each of Washington's 12 regional workforce development areas (WDA).[12] The category of "other" denotes green jobs for which it was not possible to identify a single workforce area.

As shown in *Figure 11*, a number of differences exist regionally in the proportion of green jobs compared to total covered employment:

- The Benton-Franklin WDA had the highest proportion of green jobs, at about 13 percent of total covered employment (10,649).
- The Eastern Washington WDA (10.1 percent) and Olympic Consortium WDA (7.6 percent) had the next-highest proportions, with 4,685 and 4,956 green jobs, respectively.
- Among WDAs with the largest numbers of green jobs, Seattle-King County led with 32,024 jobs. Seattle-King County also accounted for more than one-quarter (26.6 percent) of all green jobs in the state; however, these jobs were only about 4 percent of total covered employment in the county.
- The second-largest number of green jobs was in the Benton-Franklin WDA (10,649), followed by the Pierce County WDA (10,305).

Figure 11. Employment and green jobs by workforce development area
Source: Employment Security Department, 2011 Washington State Green-Jobs Survey

Workforce development area	Estimated green jobs	Covered employment in 2010 Q3[1]	Green jobs as a percent of covered employment
Benton-Franklin	10,649	79,341	13.4%
Eastern Washington	4,685	46,238	10.1%
Olympic Consortium	4,956	65,124	7.6%
Northwestern Washington	7,755	105,070	7.4%
Southwest Washington	7,888	114,710	6.9%
Pierce County	10,305	161,683	6.4%
Pacific Mountain	6,247	100,517	6.2%
North Central Washington/Columbia Basin	6,092	103,235	5.9%
Spokane	6,788	121,552	5.6%
Snohomish County	6,537	133,809	4.9%
South Central	4,312	96,778	4.5%
Seattle-King County	32,024	745,287	4.3%
Other*	12,066	927,699	1.3%
Totals*	**120,305**	**2,801,043**	**4.3%**

**Totals may not add due to rounding. "Other" includes firms that report employment in more than one workforce development area.*

[1]Based on master accounts. See Appendix 4.

The regional distribution of green jobs and their contribution to regional employment varies. The Benton-Franklin WDA had the highest proportion of green jobs to covered employment and the second-highest estimated number of green jobs for any WDA.

[12] *A map of Washington's workforce development areas is provided in Appendix 5.*

Green jobs by firm size

As shown in *Figure 12*, the number of green jobs reported by employers varies considerably when comparing small firms with large firms.

Small firms – those with fewer than 10 employees – reported the largest proportion of green jobs as a percentage of all employment (11.4 percent). By comparison, firms with 100 to 499 employees reported that a relatively small proportion of all employment was in green jobs (3.2 percent), and companies with 500 or more employees reported the smallest proportion of green jobs, at only about 2 percent.

Figure 12. Green jobs by firm size and percent of total covered statewide employment
Source: Employment Security Department, 2011 Washington State Green-Jobs Survey

Firm size by number of employees	Estimated green jobs	Percent of total covered employment
Fewer than 10	37,956	11.4%
10-24	13,040	4.6%
25-49	15,494	6.5%
50-99	13,519	5.7%
100-499	19,302	3.2%
500 or more	20,993	1.9%
Total*	**120,305**	**4.3%**

**Totals may not add due to rounding.*

Green jobs accounted for a greater proportion of total employment in smaller firms than in larger firms.

Limitations

The research and analysis in this report has limitations relating to the legislative requirements. These limitations include:

- While the legislation requires Employment Security to highlight family-sustaining wages and benefits ranges within the green economy, "family-sustaining wages and benefits" are not defined. Because the results of the survey indicate that the majority of green jobs are similar to non-green jobs, this report presents the average annual earnings for the occupations in which green jobs were reported using data from the federal Bureau of Labor Statistics. These are the average wages for all workers in these occupations, not for just the green jobs.
- This report does not specify the number of "newly created" jobs because of the difficulty in establishing data on this concept. Rather, the survey collected data about new hires in the three-month period prior to the survey. It is unknown if these new hires were for "newly created" jobs. Employers may "create" green jobs by combining two or more non-green jobs into jobs that are partly or wholly green, shift jobs into green or otherwise change their production methods to accommodate having more green jobs. Whether these jobs are "newly created" or not is ambiguous.
- Green jobs are not limited to one or even a few sectors of the economy; they are throughout the economy, in every industry. Consequently, the way employers recruit for green jobs is very similar to how they recruit for other jobs, so this survey does not report recruitment methods for green jobs, although that, too, is required by the legislation.
- The distinction between entry-level and incumbent-worker wage rates is difficult to make because a new hire can arrive on the job with a high skill level. These data were not collected for this report.
- Green jobs are in every industry sector, occupational group and region of the state. As this trend continues, the term "green" is becoming a less coherent analytical term for projecting industry-employment growth. Looking for "high-demand green industries" can be translated into simply "high-demand industries." Therefore, short- and long-term employment projections may be the best guide to job growth by industry and by occupation.

Appendices

This report presents the findings of an employment survey of private- and public-sector employers in Washington state. The goal of the survey was to identify and describe the number and type of green-economy industries and employment in Washington.

Appendix 1. Green jobs in transportation and forest products

Additional analyses were conducted to identify green jobs in the forest products and transportation industries. These analyses were in response to legislation requiring additional research for these industries.

Green jobs in the transportation industry

The transportation industry supports a large number of green jobs across the state, especially in the public sector. The transportation industry in Washington is also significant because of its large size and its importance to the state's economy.

Figure A1-1 shows the distribution of transportation green jobs in each core area. The transportation sector included a total of 6,137 green jobs, which represented about 8 percent of the total covered employment in transportation. Most of the green jobs were in the industries of transit and ground passenger transportation (4,216 green jobs or one-quarter of the covered employment), followed by truck transportation (1,171) and support activities for transportation (739). The core area of providing mitigation or cleanup of environmental pollution accounted for 83 percent of the green jobs in transportation. *Figure A1-2* shows that the most common green jobs were transit and intercity bus drivers (2,471) and heavy and tractor-trailer truck drivers (802).

Figure A1-1. Green jobs in transportation by core area
Source: Employment Security Department, 2011 Washington State Green-Jobs Survey

Industry	Increasing energy efficiency	Producing renewable energy	Preventing and reducing pollution	Providing mitigation or cleanup of environmental pollution	Estimated green jobs	Covered employment 2010 Q3[1]	Percent of green jobs
Transit and ground passenger transportation	76	37	3,937	166	4,216	16,809	25.1%
Truck transportation	159	52	660	300	1,171	21,830	5.4%
Support activities for transportation	59	44	487	149	739	20,154	3.7%
Water transportation	0	0	11	0	11	5,076	0.2%
Total*	**293**	**133**	**5,095**	**615**	**6,137**	**75,199**	**8.2%**

**Totals may not add due to rounding. Total covered employment in the transportation sector was 75,199. However, not all transportation subsectors had green jobs. Only the four subsectors with green jobs are listed in the table. Total covered employment in these four subsectors was 63,869.*

[1]Based on master accounts. See Appendix 4.

Figure A1-2. Green jobs in transportation by occupation
Source: Employment Security Department, 2011 Washington State Green-Jobs Survey

SOC code	Occupation	Estimated green jobs
53-3021	Bus drivers, transit and intercity	2,471
53-3032	Heavy and tractor-trailer truck drivers	802
53-3041	Taxi drivers and chauffeurs	269
53-7051	Industrial truck and tractor operators	266
47-4041	Hazardous materials removal workers	253
53-7081	Refuse and recyclable material collectors	244
53-4099	Rail transportation workers, all other	216
53-3022	Bus drivers, school or special client	196
43-5061	Production, planning and expediting clerks	169
49-9071	Maintenance and repair workers, general	129
49-3031	Bus and truck mechanics and diesel engine specialists	100
49-9099	Installation, maintenance and repair workers, all other	96
49-3011	Aircraft mechanics and service technicians	77
37-2012	Maids and housekeeping cleaners	62
13-1199	Business operations specialists, all other	58
39-6011	Baggage porters and bellhops	45
11-3071	Transportation, storage and distribution managers	36
43-6014	Secretaries and administrative assistants, except legal, medical and executive	34
17-2081	Environmental engineers	33
11-9121	Natural sciences managers	32
15-1151	Computer user support specialists	31
49-9043	Maintenance workers, machinery	31
19-3031	Clinical, counseling and school psychologists	31
37-3011	Landscaping and groundskeeping workers	31
43-4181	Reservation and transportation ticket agents and travel clerks	30
11-9199	Managers, all other	26
43-5032	Dispatchers, except police, fire and ambulance	23
43-5071	Shipping, receiving and traffic clerks	22
43-4051	Customer service representatives	21
11-9021	Construction managers	21
11-9151	Social and community service managers	21
45-4022	Logging equipment operators	17
17-2051	Civil engineers	17
17-2199	Engineers, all other	16
11-9041	Architectural and engineering managers	14
43-3031	Bookkeeping, accounting and auditing clerks	13
49-9041	Industrial machinery mechanics	12
11-3031	Financial managers	12
11-1011	Chief executives	12
43-9061	Office clerks, general	11
17-2121	Marine engineers and naval architects	11

SOC code	Occupation	Estimated green jobs
53-6099	Transportation workers, all other	10
17-1011	Architects, except landscape and naval	9
17-2112	Industrial engineers	9
19-4091	Environmental science and protection technicians, including health	9
51-1011	First-line supervisors of production and operating workers	8
53-7121	Tank car, truck and ship loaders	8
53-1031	First-line supervisors of transportation and material-moving machine and vehicle operators	8
43-4161	Human resources assistants, except payroll and timekeeping	8
53-1011	Aircraft cargo handling supervisors	6
53-7061	Cleaners of vehicles and equipment	5
11-3011	Administrative services managers	5
51-4199	Metal workers and plastic workers, all other	5
49-1011	First-line supervisors of mechanics, installers and repairers	5
47-4051	Highway maintenance workers	3
47-2061	Construction laborers	3
15-1152	Computer network support specialists	3
19-2041	Environmental scientists and specialists, including health	3
13-1041	Compliance officers	3
47-1011	First-line supervisors of construction trades and extraction workers	2
43-3051	Payroll and timekeeping clerks	2
43-3061	Procurement clerks	2
43-4061	Eligibility interviewers, government programs	2
47-2073	Operating engineers and other construction equipment operators	2
11-3061	Purchasing managers	2
51-8031	Water and wastewater treatment plant and system operators	2
11-2021	Marketing managers	2
11-3131	Training and development managers	2
19-3051	Urban and regional planners	2
11-1021	General and operations managers	2
	Total*	**6,137**

**Totals may not add due to rounding.*

Green jobs in the forest-products industry

In 2010, the Legislature passed Substitute House Hill 2420 (SHB 2420), which expanded recognition of the forestry industry under the state's renewable portfolio standard. SHB 2420 recognizes the importance of sustainable forestry and the role of biomass and bioenergy as a contributor to the state's economic, environmental and renewable energy goals. SHB 2420 also directed the Employment Security Department to analyze forest-products industry occupations.

Figure A1-3 shows the distribution of green jobs among the four core areas within each industry related to forestry. There are an estimated 1,650 green jobs in forestry, which equates to about 9 percent of total covered employment in this industry. The sectors with the largest proportion of green jobs as a percentage of total covered employment were support activities for forestry (368 green jobs or one-third of covered employment) and wood container and pallet manufacturing (188), followed by all other miscellaneous wood product manufacturing (37) and logging (284).

Figure A1-3. Green jobs in forestry by core area
Source: Employment Security Department, 2011 Washington State Green-Jobs Survey

Industry	Increasing energy efficiency	Producing renewable energy	Preventing and reducing pollution	Providing mitigation or cleanup of environmental pollution	Estimated green jobs	Covered employment 2010 Q3[1]	Percent of green jobs
Sawmills	0	2	432	49	482	8,071	6.0%
Support activities for forestry	0	0	121	247	368	1,078	34.1%
Paper mills (except newsprint)	18	18	101	150	288	4,077	7.1%
Logging	10	0	154	121	284	2,976	9.6%
Wood container and pallet manufacturing	16	0	0	173	188	999	18.8%
All other miscellaneous wood product manufacturing	0	0	0	37	37	377	9.9%
Total*	**43**	**20**	**807**	**777**	**1,648**	**17,578**	**9.4%**

**Totals may not add due to rounding.*

[1]Based on master accounts. See Appendix 4.

Figure A1-4 shows that the occupations within forestry with the greatest numbers of green jobs are milling and planing machine setters (269), sales representatives (138), logging equipment operators (130), and forestry and conservation workers (121).

Figure A1-4. Green jobs in forestry by occupation
Source: Employment Security Department, 2011 Washington State Green-Jobs Survey

SOC code	Occupation	Estimated green jobs
51-4035	Milling and planing machine setters, operators and tenders, metal and plastic	269
41-4012	Sales representatives, wholesale and manufacturing, except technical and scientific products	138
45-4022	Logging equipment operators	130
45-4011	Forest and conservation workers	121
33-2011	Firefighters	90
45-4021	Fallers	80
43-3061	Procurement clerks	74
49-9099	Installation, maintenance and repair workers, all other	73
47-2073	Operating engineers and other construction equipment operators	70
51-9198	Helpers-production workers	68
19-1032	Foresters	67
37-3011	Landscaping and groundskeeping workers	56
51-9199	Production workers, all other	37
49-9044	Millwrights	34
47-2111	Electricians	32
45-4029	Logging workers, all other	29
53-7081	Refuse and recyclable material collectors	28
49-9071	Maintenance and repair workers, general	23

SOC code	Occupation	Estimated green jobs
53-7032	Excavating and loading machine and dragline operators	22
51-2099	Assemblers and fabricators, all other	20
43-9061	Office clerks, general	17
43-5081	Stock clerks and order fillers	14
17-2199	Engineers, all other	12
49-9081	Wind turbine service technicians	12
33-2022	Forest fire inspectors and prevention specialists	11
53-3032	Heavy and tractor-trailer truck drivers	10
45-2092	Farmworkers and laborers, crop, nursery and greenhouse	9
17-2081	Environmental engineers	8
37-2011	Janitors and cleaners, except maids and housekeeping cleaners	8
51-8021	Stationary engineers and boiler operators	8
49-9043	Maintenance workers, machinery	8
51-8012	Power distributors and dispatchers	8
51-9061	Inspectors, testers, sorters, samplers and weighers	8
43-4051	Customer service representatives	8
43-5061	Production, planning and expediting clerks	6
47-4041	Hazardous materials removal workers	6
43-6014	Secretaries and administrative assistants, except legal, medical and executive	4
47-1011	First-line supervisors of construction trades and extraction workers	4
45-1011	First-line supervisors of farming, fishing and forestry workers	3
53-7064	Packers and packagers, hand	3
53-7121	Tank car, truck and ship loaders	3
11-3051	Industrial production managers	3
11-9013	Farmers, ranchers and other agricultural managers	2
11-9199	Managers, all other	2
11-3011	Administrative services managers	2
19-2041	Environmental scientists and specialists, including health	2
53-7051	Industrial truck and tractor operators	2
11-9121	Natural sciences managers	2
53-7062	Laborers and freight, stock and material movers, hand	2
29-9011	Occupational health and safety specialists	2
51-7041	Sawing machine setters, operators and tenders, wood	2
17-2071	Electrical engineers	2
	Total*	**1,648**

**Totals may not add due to rounding.*

Appendix 2. Research and sample design

Introduction

The purpose of the Green-Jobs Survey is to identify employers that produce goods or provide services that support any of the following four core areas: increasing energy efficiency, producing renewable energy, preventing and reducing environmental pollution, and providing mitigation or cleanup of environmental pollution, and the jobs associated with those core areas. The study establishes baseline measures that provide valid and reliable estimates of the number of green-economy jobs in Washington state.

This study measured only those jobs directly related to the core areas as identified by employers and did not include secondary or indirect jobs, such as secretaries. By using the conservative approach of including only direct jobs, the total effect of green industries and green jobs in the economy are understated.

The same study definitions and survey research design developed for the 2009 Green-Jobs Survey were used for the 2011 study. However, the 2011 survey universe was improved by sampling all industries, not just those presumed to be green. While this design produced estimates that represent the state's entire economy, the sampling changes make it impossible to compare directly the total results from the 2008, 2009 and 2011 surveys. However, limited analysis using statistically comparable survey universes from 2009 and 2011 can be made.

Survey sample

The sample universe was selected from the third quarter 2010 Quarterly Census of Employment and Wages (QCEW) file. Private- and public-sector employers (except private households) with at least one employee in the third quarter of 2010 were included. Only master accounts were included; estimates do not include individual parts of a company with multiple locations
.
The universe was stratified into just two strata: presumed green and all others. Presumed green strata included all detailed industries identified in the 2009 Green-Jobs Survey. *Figure A2-1* shows the sample population and response rates.

Figure A2-1. 2011 Green-Jobs Survey employer sample and response rates
Source: Employment Security Department, 2011 Washington State Green-Jobs Survey

Strata	Population of establishments in universe	Included in sample	Valid responses	Response rate
Industries presumed green	49,292	12,681	8,121	64.0%
All other industries	91,626	8,693	6,177	71.1%
Total	**140,918**	**21,374**	**14,298**	**66.9%**

Conducting the survey

Each firm in the survey sample received a one-page questionnaire via U.S. mail. Respondents had the choice of replying to the survey on the form mailed to them with the provided postage-paid return envelope or by phone, fax or email. A toll-free number was provided for telephone responses and questions. Non-response prompting was conducted by phone interview following the first mailing. Data were collected in the fall of 2011.

Following completion of the survey process, the survey results were reviewed for data-entry error and to ensure that they followed logic (the number of reported "green" job titles must be equal to or less than the total employees at the company). Then, job titles were coded to their Standard Occupational Classification (SOC) code.

A copy of the survey is in *Appendix 3*. Of the 14,298 valid responses, 2,411 firms reported green jobs.

Appendix 3. Survey form

WASHINGTON STATE GREEN JOBS SURVEY

Washington State
Employment Security Department

Labor Market and Economic Analysis

ABOUT THE SURVEY

Washington has long been a leader in environmental stewardship, climate protection, the development of renewable energy, and energy efficiency. Washington state has established goals to grow business sectors and jobs that support environmental protection and clean energy.

The Employment Security Department is conducting this survey to determine the number of jobs that directly support environmental protection and clean energy goals. We are surveying firms that produce any goods or provide services that support any of the following four core areas and goals:

1. Increasing energy efficiency
2. Producing renewable energy
3. Preventing and reducing environmental pollution
4. Providing mitigation or cleanup of environmental pollution

Please direct this survey to your Operations Manager or Human Resources Department. Include information about all your locations in Washington state. All information collected is confidential and will not be provided to any other entity; it is used for statistical research purposes only. Survey results are presented in aggregate form so that no individual response can be identified.

If you or any of your staff have worked in any of these four core areas as their primary job function within the ***past three months***, fill out both sections below and continue to page two. If not, please fill out both sections below and return using the following options.

OPTIONS FOR RESPONDING TO THE SURVEY

- Enclosed postage-paid envelope
- Fax both sides to 360-407-4510
- Contact us at 888-346-3807

In order to use your information, please respond within 15 days. Your prompt response is appreciated and reduces follow-up costs.

PLEASE REPORT FOR ALL WASHINGTON STATE BUSINESS LOCATIONS

How many employees do you currently have in Washington state? _____

Number of employees who are full time: _____

Number of employees who are part time: _____

Do you provide goods or services in any of the four core areas? Yes ___ No ___

If 'Yes,' please complete page one and two and return survey.

If 'No,' complete page one and return survey.

CONTACT PERSON

Name: _____

Title: _____

Telephone: _____

Date: _____

Thank you for your participation.

The Employment Security Department is an equal-opportunity employer and provider of programs and services. Auxiliary aids and services are available upon request to people with disabilities. Washington Relay Service: 800-833-6384

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WASHINGTON STATE GREEN JOBS SURVEY

Please enter information for the past three months' business activities only.

SECTION 1: **Total Number of Workers in Washington state and Job Titles Related to the Four Core Areas**		**Core Areas for Green Jobs**			
• Enter total number of workers for each job title and the core area they work in. • Please estimate how many employees have the following four core areas as their primary focus. (Choose only one core area per employee. For employees responsible for more than one core area, choose the one that accounts for the most time on the job). • Exclude consultants, outside contractors, vendors, and others not considered employees.		**1** Increasing Energy Efficiency	**2** Producing Renewable Energy	**3** Preventing and Reducing Environmental Pollution	**4** Providing Mitigation or Cleanup of Environmental Pollution
Job Title Related to Core Area	Total Number of Current Employees in position	Number of Current Employees	Number of Current Employees	Number of Current Employees	Number of Current Employees
Example: *Civil Engineer*	3	2			1
How many of these were new hires? (Please list total for all jobs in each core area.)					

SECTION 2: **Industry Certifications**				
Does your organization have any special industry certifications that relate to **any of the four core areas** (i.e., LEED, Certified Organic, etc.)? Yes ● or No ○	Yes or No ○ ○	Yes or No ○ ○	Yes or No ○ ○	Yes or No ○ ○

SECTION 3: **Skill Comparison**				
Overall, how different are the skills of employees in the jobs you listed compared to other employees with the same job titles that do not work in any of the four core areas? Please select only one response:	**Skills are Identical** ❑	**Skills are Mostly the Same** ❑	**Skills are Mostly Different** ❑	**Skills are Entirely Different** ❑

Thank you for your participation.

If more space is needed, please contact us for another copy or make a photocopy of this page.

Washington State Employment Security Department, Labor Market and Economic Analysis; PO Box 9046 Olympia, WA 98507-9046
Phone: 888-346-3807; Fax: 360-407-4510; Email: ihoczek@esd.wa.gov

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Appendix 4. Counts of total covered employment and North American Industry Classification System (NAICS) industry definitions

Industries in this report are categorized using the North American Industry Classification System (NAICS). The matrix below describes the types of firms in each industry.

Master accounts and total employment by industry

The survey universe for the 2011 Green-Economy Jobs Survey used master accounts. A master account tracks all of a firm's business activity under one account, in one industry.

Employment data by industry is commonly reported using establishment accounts. In addition to a master account, a firm with more than one location will have establishment accounts for each unique location. An establishment account may be in a different industry than the master account. For instance, a large manufacturer may have locations that specialize in administration, warehousing and engineering. In this case, the industry classification for the master account would be different from the industries of the establishment accounts.

Total covered employment by industry will vary depending on whether the data are based on master accounts or establishment accounts. In either case, the employment counts are correct and the sum of total covered employment remains the same.

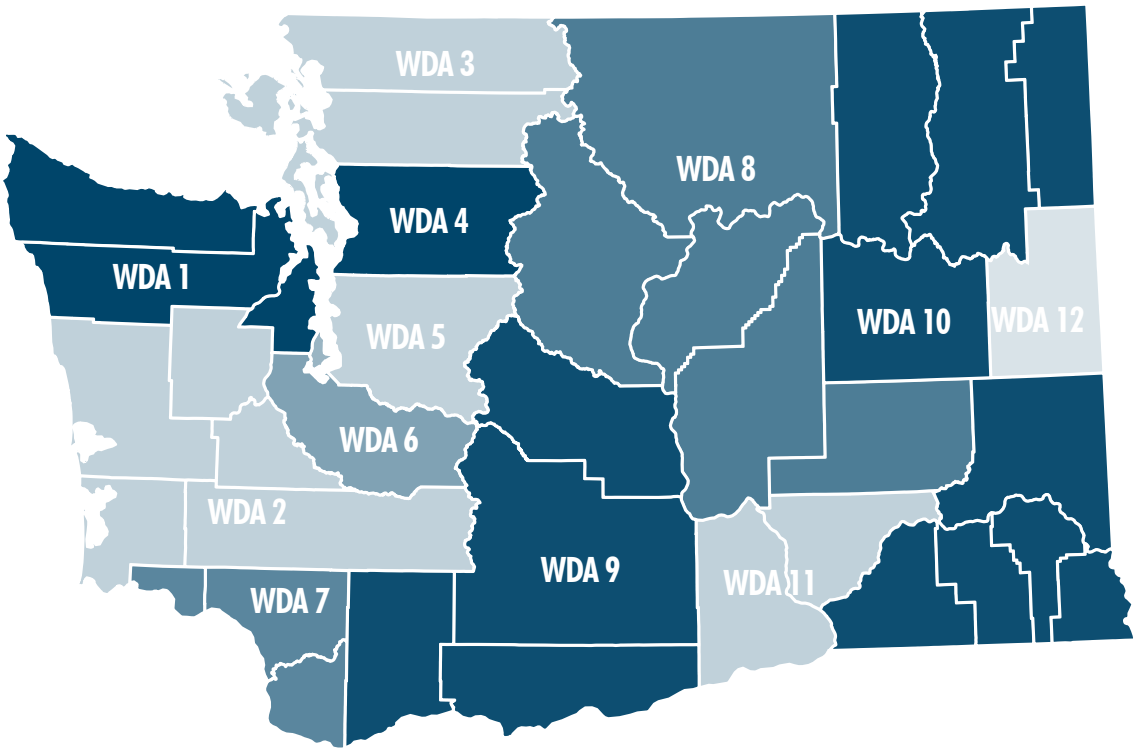
NAICS	Industry	Industry description
11	Agriculture, forestry, fishing and hunting	Firms engaged in growing crops, raising animals, harvesting timber, harvesting fish and other animals from farms, ranches or the animals' natural habitat.
21	Mining	Firms that extract naturally occurring mineral solids, liquid minerals and gases.
22	Utilities	Firms engaged in generating, transmitting, and/or distributing electricity, gas, steam and water, and removing sewage through a permanent infrastructure.
23	Construction	Firms engaged in erecting buildings and other structures; heavy construction other than buildings; and alterations, reconstruction, installation, and maintenance and repairs.
31-33	Manufacturing	Firms engaged in the mechanical, physical or chemical transformation of material, substances or components into new products.
41-43	Wholesale trade	Firms engaged in selling or arranging for the purchase or sale of goods for resale; capital or durable nonconsumer goods; and raw and intermediate materials and supplies used in productions, and providing services incidental to the sale of the merchandise.
44-46	Retail trade	Firms engaged in retailing merchandise generally in small quantities to the general public and providing services incidental to the sale of the merchandise.
48-49	Transportation and warehousing	Firms that provide transportation of passengers and cargo, warehousing and storing goods, scenic and sightseeing transportation, and supporting these activities.
51	Information	Firms engaged in distributing information and cultural products, providing the means to transmit or distribute these products as data or communications, and processing data.
52	Finance and insurance	Firms engaged in the creation, liquidation or change in ownership of financial assets (financial transactions) and/or facilitating financial transactions.
53	Real estate and rental and leasing	Firms engaging in renting, leasing or otherwise allowing the use of tangible or intangible assets (except copyrighted works), and providing related services.
54	Professional, scientific and technical services	Firms specializing in performing professional, scientific and technical services for the operations of other organizations.
55	Management of companies and enterprises	Firms who hold securities of companies and enterprises, for the purpose of owning controlling interest or influencing their management decision, or administering, overseeing and managing other establishments of the same company or enterprise and normally undertaking the strategic or organizational planning and decision making of the company or enterprise.
56	Administrative and support and waste management and remediation services	Firms performing routine support activities for the day-to-day operation of other organizations.

NAICS	Industry	Industry description
61	Educational services	Firms providing instruction and training in a wide variety of subjects.
62	Healthcare and social assistance	Firms providing healthcare and social assistance for individuals.
71	Arts, entertainment and recreation	Firms engaged in operating or providing services to meet varied cultural, entertainment and recreational interests of their patrons.
72	Accommodation and food services	Firms providing customers with lodging and/or preparing meals, snacks and beverages for immediate consumption.
81	Other services (except public administration)	Firms providing services not elsewhere specified, including repairs, religious activities, grant making, advocacy, laundry, personal care, death care and other personal services.
91-93	Public administration	Federal, state and/or local agencies that administer, oversee and manage public programs and have executive, legislative or judicial authority over other institutions in a given area.

The North American Industry Classification System (NAICS) is used to sort and define industries. The standardized system allows comparable research and reporting by individual states and the federal government.

Source: U.S. Bureau of Labor Statistics

Appendix 5. Map of Washington's workforce development areas



WDA 1 – Olympic Consortium: Clallam, Jefferson and Kitsap counties
WDA 2 – Pacific Mountain: Grays Harbor, Lewis, Mason, Pacific and Thurston counties
WDA 3 – Northwest Washington: Island, San Juan, Skagit and Whatcom counties
WDA 4 – Snohomish County
WDA 5 – Seattle-King County
WDA 6 – Pierce County
WDA 7 – Southwest Washington: Clark, Cowlitz and Wahkiakum counties
WDA 8 – North Central Washington/Columbia Basis: Adams, Chelan, Douglas, Grant and Okanogan counties
WDA 9 – South Central: Klickitat, Kittitas, Skamania and Yakima counties
WDA 10 – Eastern Washington: Asotin, Columbia, Ferry, Garfield, Lincoln, Pend Orielle, Stevens, Walla Walla and Whitman counties
WDA 11 – Benton-Franklin
WDA 12 – Spokane County

Appendix 6. Occupations with green jobs identified in the 2011 Green-Jobs Survey

SOC code	Occupation	Estimated green jobs
45-2092	Farmworkers and laborers, crop, nursery and greenhouse	7,835
47-2111	Electricians	4,359
49-9021	Heating, air conditioning, and refrigeration mechanics and installers	3,371
47-2031	Carpenters	3,284
53-3021	Bus drivers, transit and intercity	2,471
47-2061	Construction laborers	2,292
45-2041	Graders and sorters, agricultural products	2,272
53-3022	Bus drivers, school or special client	2,208
17-1011	Architects, except landscape and naval	2,111
47-4041	Hazardous materials removal workers	2,023
41-2031	Retail salespersons	2,018
53-7081	Refuse and recyclable material collectors	2,000
17-2199	Engineers, all other	1,985
11-9199	Managers, all other	1,916
53-3032	Heavy and tractor-trailer truck drivers	1,902
11-9021	Construction managers	1,844
47-2181	Roofers	1,757
49-9071	Maintenance and repair workers, general	1,686
47-2152	Plumbers, pipefitters and steamfitters	1,638
47-2141	Painters, construction and maintenance	1,620
49-3023	Automotive service technicians and mechanics	1,599
51-8031	Water and wastewater treatment plant and system operators	1,492
41-4012	Sales representatives, wholesale and manufacturing, except technical and scientific products	1,418
33-2011	Firefighters	1,405
17-2141	Mechanical engineers	1,343
47-2131	Insulation workers, floor, ceiling and wall	1,332
37-2011	Janitors and cleaners, except maids and housekeeping cleaners	1,318
37-3011	Landscaping and groundskeeping workers	1,303
17-2051	Civil engineers	1,282
51-9198	Helpers-production workers	1,204
13-1199	Business operations specialists, all other	1,001
17-2081	Environmental engineers	990
43-9061	Office clerks, general	978
51-8011	Nuclear power reactor operators	953
11-1021	General and operations managers	932
17-3025	Environmental engineering technicians	928
47-2073	Operating engineers and other construction equipment operators	906
41-3021	Insurance sales agents	899
51-9199	Production workers, all other	899
17-2071	Electrical engineers	881
21-1093	Social and human service assistants	836

SOC code	Occupation	Estimated green jobs
47-2121	Glaziers	809
49-9099	Installation, maintenance and repair workers, all other	784
53-7062	Laborers and freight, stock and material movers, hand	774
49-9052	Telecommunications line installers and repairers	742
39-9011	Childcare workers	735
51-2099	Assemblers and fabricators, all other	712
17-2112	Industrial engineers	711
13-2061	Financial examiners	606
43-9199	Office and administrative support workers, all other	587
47-2041	Carpet installers	559
19-2041	Environmental scientists and specialists, including health	549
43-4051	Customer service representatives	531
47-4071	Septic tank servicers and sewer pipe cleaners	530
15-1132	Software developers, applications	527
45-2099	Agricultural workers, all other	498
47-1011	First-line supervisors of construction trades and extraction workers	481
41-4011	Sales representatives, wholesale and manufacturing, technical and scientific products	469
45-2093	Farmworkers, farm, ranch and aquacultural animals	464
53-7061	Cleaners of vehicles and equipment	463
49-3011	Aircraft mechanics and service technicians	462
31-9091	Dental assistants	452
37-2019	Building cleaning workers, all other	449
41-2022	Parts salespersons	444
53-7051	Industrial truck and tractor operators	442
53-7032	Excavating and loading machine and dragline operators	433
51-4121	Welders, cutters, solderers and brazers	430
51-4199	Metal workers and plastic workers, all other	427
43-5061	Production, planning and expediting clerks	420
11-1011	Chief executives	400
37-2012	Maids and housekeeping cleaners	380
25-3099	Teachers and instructors, all other	372
21-1011	Substance abuse and behavioral disorder counselors	366
53-6031	Automotive and watercraft service attendants	362
51-8091	Chemical plant and system operators	354
51-5112	Printing press operators	347
53-6099	Transportation workers, all other	345
13-1051	Cost estimators	339
45-2091	Agricultural equipment operators	328
17-2151	Mining and geological engineers, including mining safety engineers	327
51-3092	Food batchmakers	323
51-1011	First-line supervisors of production and operating workers	310
11-9041	Architectural and engineering managers	307
43-6014	Secretaries and administrative assistants, except legal, medical and executive	306

SOC code	Occupation	Estimated green jobs
19-4091	Environmental science and protection technicians, including health	305
53-6051	Transportation inspectors	302
19-1031	Conservation scientists	300
19-1023	Zoologists and wildlife biologists	298
39-5012	Hairdressers, hairstylists and cosmetologists	298
51-9061	Inspectors, testers, sorters, samplers and weighers	293
49-9069	Precision instrument and equipment repairers, all other	291
45-4011	Forest and conservation workers	282
17-3023	Electrical and electronics engineering technicians	273
47-2051	Cement masons and concrete finishers	273
49-9011	Mechanical door repairers	269
51-4035	Milling and planing machine setters, operators and tenders, metal and plastic	269
53-3041	Taxi drivers and chauffeurs	269
19-2042	Geoscientists, except hydrologists and geographers	260
49-1011	First-line supervisors of mechanics, installers and repairers	258
19-2099	Physical scientists, all other	257
19-4093	Forest and conservation technicians	255
45-1011	First-line supervisors of farming, fishing and forestry workers	252
53-4099	Rail transportation workers, all other	251
49-3021	Automotive body and related repairers	244
13-1151	Training and development specialists	242
47-4011	Construction and building inspectors	236
51-9051	Furnace, kiln, oven, drier and kettle operators and tenders	235
17-3011	Architectural and civil drafters	234
39-7012	Travel guides	233
47-5021	Earth drillers, except oil and gas	232
21-1012	Educational, guidance, school and vocational counselors	231
49-9043	Maintenance workers, machinery	226
43-5081	Stock clerks and order fillers	225
29-2034	Radiologic technologists	222
17-3029	Engineering technicians, except drafters, all other	216
21-1099	Community and social service specialists, all other	213
47-4051	Highway maintenance workers	212
49-3031	Bus and truck mechanics and diesel engine specialists	211
51-2091	Fiberglass laminators and fabricators	210
17-2061	Computer hardware engineers	205
51-2041	Structural metal fabricators and fitters	199
51-6011	Laundry and dry-cleaning workers	199
41-3099	Sales representatives, services, all other	197
27-1025	Interior designers	195
19-2031	Chemists	193
51-4041	Machinists	193
11-9121	Natural sciences managers	192

SOC code	Occupation	Estimated green jobs
37-2021	Pest control workers	192
11-9141	Property, real estate and community association managers	191
11-3011	Administrative services managers	185
47-2132	Insulation workers, mechanical	181
17-2161	Nuclear engineers	175
13-1161	Market research analysts and marketing specialists	171
17-2041	Chemical engineers	171
13-2053	Insurance underwriters	166
31-9095	Pharmacy aides	166
13-2011	Accountants and auditors	162
53-1031	First-line supervisors of transportation and material-moving machine and vehicle operators	162
11-3021	Computer and information systems managers	159
25-9041	Teacher assistants	159
53-5021	Captains, mates, and pilots of water vessels	158
19-1032	Foresters	157
17-3012	Electrical and electronics drafters	156
17-3019	Drafters, all other	156
43-5071	Shipping, receiving and traffic clerks	154
47-2081	Drywall and ceiling tile installers	153
17-1012	Landscape architects	152
45-4022	Logging equipment operators	150
51-7011	Cabinetmakers and bench carpenters	150
47-2211	Sheet metal workers	148
43-1011	First-line supervisors of office and administrative support workers	146
25-2011	Preschool teachers, except special education	145
51-6099	Textile, apparel and furnishings workers, all other	145
51-9041	Extruding, forming, pressing and compacting machine setters, operators and tenders	144
51-9122	Painters, transportation equipment	142
49-9081	Wind turbine service technicians	140
53-5022	Motorboat operators	137
41-9031	Sales engineers	135
11-9013	Farmers, ranchers and other agricultural managers	134
19-1029	Biological scientists, all other	134
49-3022	Automotive glass installers and repairers	134
29-2021	Dental hygienists	133
37-1012	First-line supervisors of landscaping, lawn service and groundskeeping workers	132
49-3051	Motorboat mechanics and service technicians	132
13-1081	Logisticians	131
37-3013	Tree trimmers and pruners	118
19-3051	Urban and regional planners	112
11-3031	Financial managers	110
11-3071	Transportation, storage and distribution managers	109
17-1022	Surveyors	109

SOC code	Occupation	Estimated green jobs
11-9151	Social and community service managers	107
13-1022	Wholesale and retail buyers, except farm products	107
13-1041	Compliance officers	107
23-1011	Lawyers	107
13-1111	Management analysts	106
51-2022	Electrical and electronic equipment assemblers	106
29-1051	Pharmacists	104
41-9022	Real estate sales agents	103
11-3051	Industrial production managers	101
15-1199	Computer occupations, all other	101
51-3093	Food cooking machine operators and tenders	101
51-4051	Metal-refining furnace operators and tenders	101
29-1011	Chiropractors	100
17-3013	Mechanical drafters	98
19-4099	Life, physical and social science technicians, all other	98
47-2044	Tile and marble setters	98
27-3031	Public relations specialists	97
49-3041	Farm equipment mechanics and service technicians	97
51-9022	Grinding and polishing workers, hand	95
17-3022	Civil engineering technicians	94
53-3033	Light truck or delivery services drivers	94
19-4031	Chemical technicians	93
43-3061	Procurement clerks	91
11-9161	Emergency management directors	90
27-3042	Technical writers	90
49-9031	Home appliance repairers	88
51-6093	Upholsterers	88
17-3024	Electro-mechanical technicians	86
35-2014	Cooks, restaurant	84
51-9197	Tire builders	81
29-9011	Occupational health and safety specialists	80
45-4021	Fallers	80
49-2011	Computer, automated teller and office machine repairers	76
49-9041	Industrial machinery mechanics	76
53-7199	Material moving workers, all other	76
17-2111	Health and safety engineers, except mining safety engineers and inspectors	75
39-4031	Morticians, undertakers and funeral directors	75
53-5011	Sailors and marine oilers	75
47-2071	Paving, surfacing and tamping equipment operators	74
49-9044	Millwrights	74
39-9099	Personal care and service workers, all other	73
17-2072	Electronics engineers, except computer	72
11-9039	Education administrators, all other	71

SOC code	Occupation	Estimated green jobs
35-3031	Waiters and waitresses	70
49-9012	Control and valve installers and repairers, except mechanical door	69
17-2121	Marine engineers and naval architects	68
25-2031	Secondary school teachers, except special and career/technical education	67
45-4029	Logging workers, all other	67
51-4193	Plating and coating machine setters, operators and tenders, metal and plastic	66
17-3026	Industrial engineering technicians	65
47-3014	Helpers-painters, paperhangers, plasterers, and stucco masons	64
11-2021	Marketing managers	63
41-1011	First-line supervisors of retail sales workers	63
43-3031	Bookkeeping, accounting and auditing clerks	62
53-1021	First-line supervisors of helpers, laborers and material movers, hand	62
47-2011	Boilermakers	59
53-7064	Packers and packagers, hand	57
49-9051	Electrical power-line installers and repairers	55
11-2031	Public relations and fundraising managers	54
51-4122	Welding, soldering and brazing machine setters, operators and tenders	54
51-8013	Power plant operators	54
11-2022	Sales managers	53
43-4171	Receptionists and information clerks	53
47-2151	Pipelayers	52
51-9021	Crushing, grinding and polishing machine setters, operators and tenders	52
25-9021	Farm and home management advisors	50
35-1011	Chefs and head cooks	50
37-1011	First-line supervisors of housekeeping and janitorial workers	50
43-5032	Dispatchers, except police, fire and ambulance	50
13-1071	Human resources specialists	46
39-6011	Baggage porters and bellhops	45
51-7099	Woodworkers, all other	45
25-1194	Vocational education teachers, postsecondary	44
15-1151	Computer user support specialists	43
49-2094	Electrical and electronics repairers, commercial and industrial equipment	43
43-6011	Executive secretaries and executive administrative assistants	42
19-4041	Geological and petroleum technicians	41
29-9099	Healthcare practitioners and technical workers, all other	41
15-1152	Computer network support specialists	40
27-1021	Commercial and industrial designers	40
25-9099	Education, training and library workers, all other	39
51-9023	Mixing and blending machine setters, operators and tenders	39
11-3061	Purchasing managers	38
33-1021	First-line supervisors of fire fighting and prevention workers	38
17-3021	Aerospace engineering and operations technicians	37
45-3011	Fishers and related fishing workers	37

SOC code	Occupation	Estimated green jobs
47-3019	Helpers, construction trades, all other	37
51-4071	Foundry mold and coremakers	37
43-6013	Medical secretaries	35
35-2019	Cooks, all other	34
41-1012	First-line supervisors of non-retail sales workers	34
49-3093	Tire repairers and changers	34
49-9062	Medical equipment repairers	34
13-1031	Claims adjusters, examiners and investigators	33
13-1121	Meeting, convention, and event planners	33
13-2021	Appraisers and assessors of real estate	33
27-2012	Producers and directors	33
43-4011	Brokerage clerks	33
47-2042	Floor layers, except carpet, wood and hard tiles	33
51-4033	Grinding, lapping, polishing and buffing machine tool setters, operators and tenders, metal and plastic	33
51-9081	Dental laboratory technicians	33
47-3012	Helpers-carpenters	32
51-7021	Furniture finishers	32
53-7121	Tank car, truck and ship loaders	32
13-2072	Loan officers	31
17-2011	Aerospace engineers	31
19-3031	Clinical, counseling and school psychologists	31
37-3012	Pesticide handlers, sprayers and applicators, vegetation	31
41-9021	Real estate brokers	31
43-4181	Reservation and transportation ticket agents and travel clerks	30
43-4161	Human resources assistants, except payroll and timekeeping	29
47-2231	Solar photovoltaic installers	28
51-8021	Stationary engineers and boiler operators	28
51-9012	Separating, filtering, clarifying, precipitating and still machine setters, operators and tenders	28
19-1042	Medical scientists, except epidemiologists	27
19-2043	Hydrologists	27
41-9091	Door-to-door sales workers, news and street vendors and related workers	27
51-4072	Molding, coremaking and casting machine setters, operators and tenders, metal and plastic	27
51-9111	Packaging and filling machine operators and tenders	27
11-1031	Legislators	26
51-8092	Gas plant operators	26
43-4121	Library assistants, clerical	25
47-4099	Construction and related workers, all other	25
15-1131	Computer programmers	24
25-1032	Engineering teachers, postsecondary	24
51-8099	Plant and system operators, all other	24
17-1021	Cartographers and photogrammetrists	23
19-1022	Microbiologists	23
35-2021	Food preparation workers	23

SOC code	Occupation	Estimated green jobs
35-9021	Dishwashers	23
43-3021	Billing and posting clerks	23
47-2171	Reinforcing iron and rebar workers	23
49-2093	Electrical and electronics installers and repairers, transportation equipment	22
19-2012	Physicists	21
39-5094	Skincare specialists	21
51-3091	Food and tobacco roasting, baking and drying machine operators and tenders	21
15-2041	Statisticians	20
25-1042	Biological science teachers, postsecondary	20
25-1199	Postsecondary teachers, all other	20
35-9011	Dining room and cafeteria attendants and bartender helpers	19
41-2011	Cashiers	19
19-4051	Nuclear technicians	18
25-1052	Chemistry teachers, postsecondary	18
51-2031	Engine and other machine assemblers	18
17-2171	Petroleum engineers	17
29-1021	Dentists, general	17
21-1094	Community health workers	16
13-1023	Purchasing agents, except wholesale, retail and farm products	15
17-3027	Mechanical engineering technicians	15
29-1141	Registered nurses	14
29-2099	Health technologists and technicians, all other	14
11-9051	Food service managers	13
17-2131	Materials engineers	13
21-1015	Rehabilitation counselors	13
25-9031	Instructional coordinators	13
19-3022	Survey researchers	12
25-1053	Environmental science teachers, postsecondary	12
43-3051	Payroll and timekeeping clerks	12
43-4071	File clerks	12
33-2022	Forest fire inspectors and prevention specialists	11
39-9041	Residential advisors	11
43-9111	Statistical assistants	11
53-7021	Crane and tower operators	11
43-9021	Data entry keyers	10
47-2161	Plasterers and stucco masons	10
51-6091	Extruding and forming machine setters, operators and tenders, synthetic and glass fibers	10
11-2011	Advertising and promotions managers	9
13-2031	Budget analysts	9
19-3093	Historians	9
33-9099	Protective service workers, all other	9
49-2096	Electronic equipment installers and repairers, motor vehicles	9
53-2012	Commercial pilots	9

SOC code	Occupation	Estimated green jobs
53-7073	Wellhead pumpers	9
11-3121	Human resources managers	8
25-2022	Middle school teachers, except special and career/technical education	8
29-1131	Veterinarians	8
51-3099	Food processing workers, all other	8
51-7042	Woodworking machine setters, operators and tenders, except sawing	8
51-8012	Power distributors and dispatchers	8
11-9032	Education administrators, elementary and secondary school	7
17-2021	Agricultural engineers	7
11-3131	Training and development managers	6
13-2051	Financial analysts	6
19-1021	Biochemists and biophysicists	6
27-4099	Media and communication equipment workers, all other	6
29-1071	Physician assistants	6
33-1011	First-line supervisors of correctional officers	6
37-3019	Grounds maintenance workers, all other	6
51-4081	Multiple machine tool setters, operators and tenders, metal and plastic	6
53-1011	Aircraft cargo handling supervisors	6
53-7041	Hoist and winch operators	6
15-1121	Computer systems analysts	5
17-2031	Biomedical engineers	5
19-1013	Soil and plant scientists	5
23-2011	Paralegals and legal assistants	5
25-4031	Library technicians	5
29-1069	Physicians and surgeons, all other	5
43-4151	Order clerks	5
47-2221	Structural iron and steel workers	5
49-9094	Locksmiths and safe repairers	5
51-4031	Cutting, punching and press machine setters, operators and tenders, metal and plastic	5
13-2099	Financial specialists, all other	3
15-1141	Database administrators	3
15-2031	Operations research analysts	3
19-3099	Social scientists and related workers, all other	3
19-4011	Agricultural and food science technicians	3
25-1051	Atmospheric, earth, marine and space sciences teachers, postsecondary	3
27-3099	Media and communication workers, all other	3
35-1012	First-line supervisors of food preparation and serving workers	3
35-2011	Cooks, fast food	3
39-1021	First-line supervisors of personal service workers	3
41-3011	Advertising sales agents	3
43-4131	Loan interviewers and clerks	3
43-4199	Information and record clerks, all other	3
43-5111	Weighers, measurers, checkers and samplers, recordkeeping	3

SOC code	Occupation	Estimated green jobs
47-3013	Helpers-electricians	3
47-5099	Extraction workers, all other	3
49-3053	Outdoor power equipment and other small engine mechanics	3
51-9121	Coating, painting and spraying machine setters, operators and tenders	3
11-9111	Medical and health services managers	2
13-1075	Labor relations specialists	2
15-1142	Network and computer systems administrators	2
15-2099	Mathematical science occupations, all other	2
21-1091	Health educators	2
25-1043	Forestry and conservation science teachers, postsecondary	2
25-1054	Physics teachers, postsecondary	2
25-2032	Career/technical education teachers, secondary school	2
25-4021	Librarians	2
27-1024	Graphic designers	2
27-1026	Merchandise displayers and window trimmers	2
27-4012	Broadcast technicians	2
27-4031	Camera operators, television, video and motion picture	2
33-1012	First-line supervisors of police and detectives	2
33-9032	Security guards	2
41-9011	Demonstrators and product promoters	2
43-4061	Eligibility interviewers, government programs	2
51-7041	Sawing machine setters, operators and tenders, wood	2
29-1199	Health diagnosing and treating practitioners, all other	1
	Total	**120,305**