

Workplace safety and health profiles of occupations with green technology jobs

BLS data can measure injuries and illnesses within occupations that contain green jobs; among the 10 largest such occupations, laborers and hand movers of freight, stock, and material had both the highest count and rate of injuries and illnesses requiring days away from work

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The Bureau of Labor Statistics (BLS) has approached the challenge of identifying green jobs from two perspectives: the *output* approach (which identifies establishments that produce green goods and services and counts the associated jobs) and the *process* approach (which identifies establishments that use environmentally friendly production processes and practices and counts the associated jobs).¹ Data from these efforts provide information on “green” employment and wages by industry and occupation. Although there may be interest in the prevalence and types of workplace injuries, illnesses, and fatalities of workers with green jobs, the two BLS surveys that identify green jobs do not directly collect these details, and the BLS survey on workplace safety and health does not currently identify green jobs. However, BLS workplace safety and health data use the same industry and occupation classification systems used in the green jobs studies. Thus, we can examine industries or occupations that contain green jobs to determine the prevalence and details of workplace injuries for all jobs in those industries and occupations; the data cannot be separated, however, into green and non-green jobs.

This analysis focuses on occupations identified in the BLS Green Technologies and Practices (GTP) survey, which uses the

process approach to identifying green jobs.² In the GTP survey, BLS identified establishments that use green technologies and practices and, within those establishments, the occupations of workers who spend more than half their time involved in such technologies and practices. Workers were considered to be involved in green technologies and practices if they were doing either of the following:

- Researching, developing, maintaining, using, or installing technologies or practices to lessen the environmental impact of their establishment
- Training the establishment’s workers in these green technologies and practices

The survey identified about 854,700 workers employed in GTP jobs in 2011, approximately 0.7 percent of total U.S. wage and salary employment.³ More than one-quarter of all GTP jobs were in the building and grounds cleaning and maintenance occupational group or in the installation, maintenance, and repair occupational group. The transportation and material moving; production; and construction and extraction occupational groups made up an additional 23 percent of GTP employment. Detailed occupations with the largest number of GTP jobs included janitors and cleaners, except

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maids and housekeeping cleaners, with 56,700 GTP jobs; heating, air conditioning, and refrigeration mechanics and installers (37,300); and general maintenance and repair workers (26,000). The 10 detailed occupations with the largest number of GTP jobs are identified in chart 1 and are discussed within this article in size order.

The BLS Survey of Occupational Injuries and Illnesses (SOII) provides information on workplace injuries and illnesses involving days away from work for each of these 10 occupations, as well as for hundreds more. The information available includes worker characteristics and circumstances that describe the injury or illness. In addition, the BLS Census of Fatal Occupational Injuries (CFOI) provides information on those who are fatally injured on the job; again, data include information about the worker and about the fatal incident. What follows is an occupational safety and health profile of the 10 detailed occupations with the largest number of GTP jobs. The information presented is for private sector workers, who make up the majority of workers for each of these occupations.⁴ Some comparisons are made to data for total private industry wage and salary employees, henceforth referred to as “total workers.” No effort is made to provide a broader view of workplace safety and health for

all green jobs or to compare worker safety among green versus nongreen jobs. As noted earlier, BLS occupational safety and health data are not currently designed to provide such information.

BLS safety and health data

The BLS Occupational Safety and Health Statistics program consists of a census of fatal work injuries and a survey of nonfatal injuries and illnesses.⁵ The fatality census—CFOI—provides annual data on worker and employer characteristics and the circumstances surrounding all fatal work injuries in the nation; in 2010 there were 4,690 fatal work injuries in the United States. Table 1 shows the number and rate of fatal work injuries for the 10 occupations with the highest number of GTP jobs.

The SOII is an annual survey of about 250,000 private employers, state governments, and local governments. Sampled employers are required to maintain an Occupational Safety and Health Administration (OSHA) log of recordable workplace injuries and illnesses for the reference year and then provide that information to BLS after the year ends.⁶ Recordable workplace injury and illness cases are classified as one of three types: (1) cases with

Chart 1. Occupations with the largest number of green technologies and practices jobs, August 2011

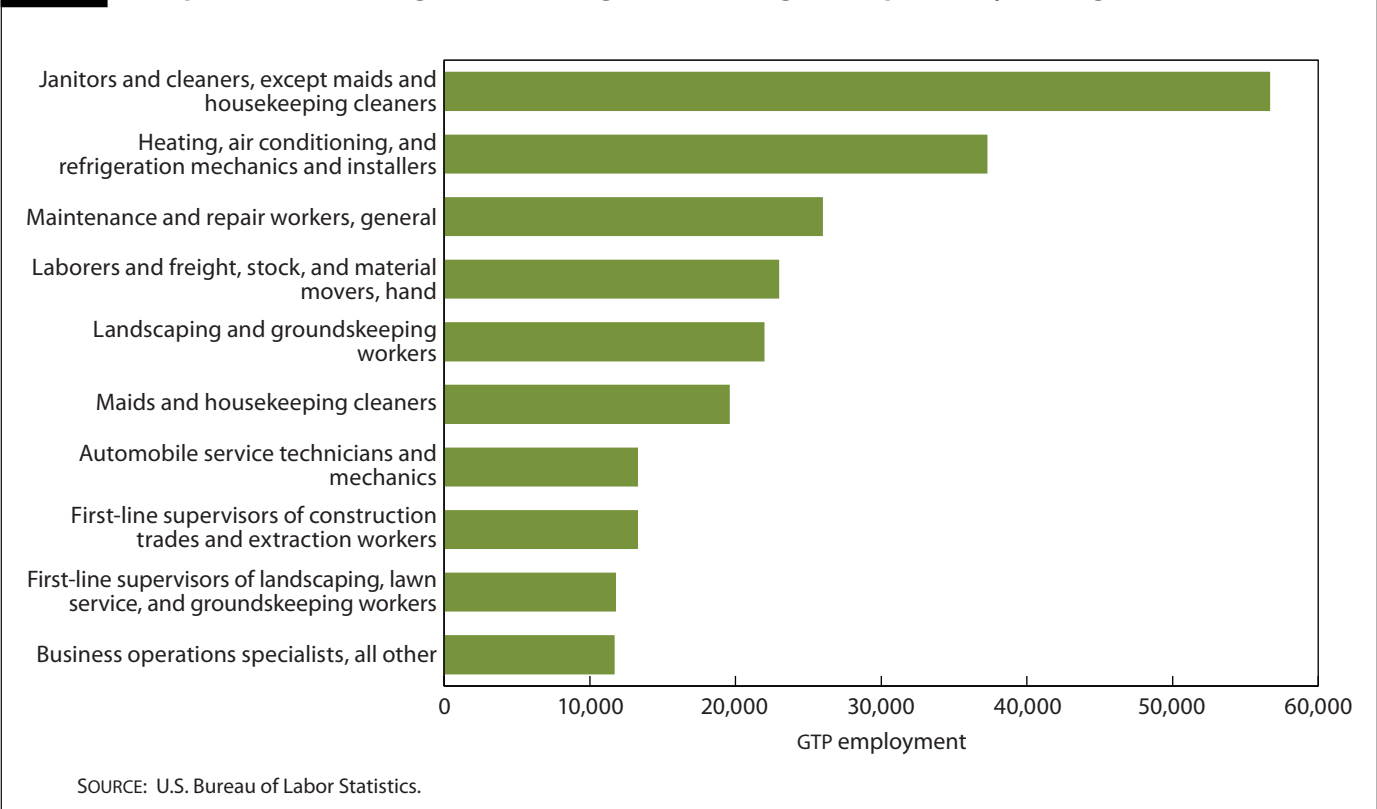


Table 1. Number and rate of fatal work injuries, selected occupations, 2010

Occupation	Number of fatal work injuries among private industry workers	Private industry and government workers	
		Number of fatal work injuries	Rate per 100,000 full-time-equivalent workers
All occupations	4,206	4,690	3.6
Janitors and cleaners, except maids and housekeeping cleaners	36	38	2.0
Heating, air conditioning, and refrigeration mechanics and installers	25	25	6.5
Maintenance and repair workers, general	56	68	19.6
Laborers and freight, stock, and material movers, hand	90	93	6.2
Landscaping and groundskeeping workers	66	80	(¹)
Maids and housekeeping cleaners	8	8	(¹)
Automobile service technicians and mechanics	38	39	4.9
First-line supervisors of construction trades and extraction workers	107	111	15.3
First-line supervisors of landscaping, lawn service, and groundskeeping workers	28	30	12.8
Business operations specialists, all other	(¹)	3	(¹)

¹ Data not available.

SOURCE: U.S. Bureau of Labor Statistics.

days away from work, (2) cases with days of job transfer or restricted work, or (3) other cases (those recordable but not resulting in days away or restricted work). BLS publishes annual data on recordable workplace injuries and illnesses by industry and case type. In addition, for cases of days away from work, BLS captures and reports on various worker characteristics and case circumstances:

- Occupation
- Age
- Race or ethnic origin
- Gender
- Length of service with employer
- Day and time of event
- Amount of time on shift when event occurred

The focus of the following occupational profiles is on case characteristics—the circumstances surrounding non-fatal injuries and illnesses. In addition to the variables listed above, the following items are captured and coded to provide greater detail about the injury or illness:

- Nature of injury or illness—the principal physical characteristics of the injury or illness
- Part of body—one or more areas of the body directly affected by the nature of the injury or illness
- Source and secondary source—the object, substance, equipment, or other factors that were responsible for or precipitated the injury or illness

- Event or exposure—the manner in which the injury or illness was produced or inflicted by the source of the injury or illness
- Number of days away from work (tabulated as median days per injury or illness)—this provides a measure of the severity of the injury or illness.⁷

Janitors and cleaners

The occupation of janitors and cleaners is one of several that had more than 20,000 occupational injuries and illnesses involving days away from work in 2011; three of these occupations are discussed in this article. (See table 2.) Like many of the 10 occupations examined here, janitors and cleaners had a rate of days-away-from-work cases that was higher than the rate for total private industry workers (227.5 per 10,000 full-time equivalent workers for janitors and cleaners compared with 105.2 for all occupations). The profile of these injuries and illnesses mirrors those of all private industry—nearly 40 percent of cases result in sprains, strains, or tears; 14 percent in soreness or pain; 8 percent in bruises or contusions; 7 percent in fractures; and 6 percent in cuts, lacerations, or punctures. The majority of injuries occur to the trunk and upper and lower extremities and are often due to overexertion (including lifting) and falls. The sources directly responsible for or precipitating the injury include floors, walkways, and ground (20 percent of cases); containers (18 percent of cases); and the person themselves (that is, the injury is

Table 2. Number and rate of nonfatal injuries and illnesses requiring days away from work for private industry workers in selected occupations, 2011

Occupation	Number	Rate per 10,000 full-time equivalent workers
All occupations	908,310	105.2
Janitors and cleaners, except maids and housekeeping cleaners	24,450	227.5
Heating, air conditioning, and refrigeration mechanics and installers	5,090	276.4
Maintenance and repair workers, general	21,230	247.1
Laborers and freight, stock, and material movers, hand	53,660	352.5
Landscaping and groundskeeping workers	10,180	185.4
Maids and housekeeping cleaners	17,760	293.1
Automobile service technicians and mechanics	12,150	239.8
First-line supervisors of construction trades and extraction workers	4,790	119.7
First-line supervisors of landscaping, lawn service, and groundskeeping workers	1,650	206.4
Business operations specialists, all other	340	(¹)

¹ Data not available.

SOURCE: U.S. Bureau of Labor Statistics.

due to worker motion or position). The median number of days away from work is 7, which is 1 less than the median for total employees. (See chart 2.)

Heating, air conditioning, and refrigeration mechanics and installers

Of the 10 GTP occupations examined here, heating mechanics had by far the highest median days away from work at 16 days, double the average for all private industry workers. The longer median days away from work may be related to where on the body the injury occurred; nearly 40 percent had injuries to the upper extremities compared with just over 30 percent for all private industry workers. Many of these injuries were to the shoulders or hands, perhaps limiting the injured workers' ability to return to work. In nearly 1 in 4 cases, the source of injury to these workers was machinery; in contrast, machinery is the source of less than 6 percent of the injuries among all private industry workers. Worker motion and position was also a prevalent source of injury. Just over 20 percent of days-away-from-work injuries to heating mechanics resulted from falls, about half of which were falls to a lower level (from a height). Among all private industry workers, 25 percent of days-away-from-work injuries resulted from falls, with 1 in 5 of those involving a fall to a lower level.

Maintenance and repair, general

Like janitors and cleaners, maintenance and repair workers experienced more than 20,000 cases resulting in days away from work, and these cases had characteristics simi-

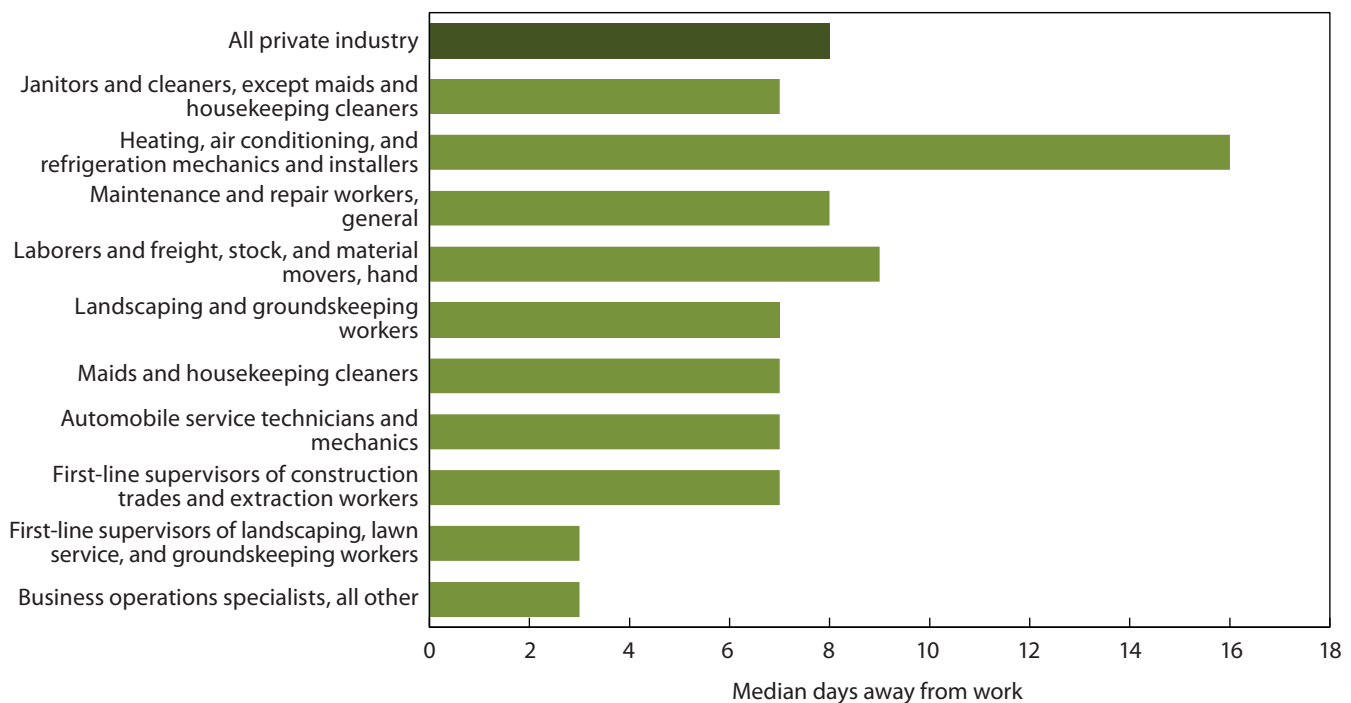
lar to cases for total workers. This occupation's median of 8 days away from work is equal to the private sector median. The most prevalent events or exposures leading to nonfatal injuries and illnesses among maintenance workers are the following:

- Struck by object—18 percent
- Fall on same level—10 percent
- Overexertion due to lifting—9 percent
- Fall to lower level—8 percent
- Exposure to harmful substances or environments—7 percent

Laborers and hand movers of freight, stock, and material

With nearly 54,000 cases, laborers in private industry were among the occupations with the most days-away-from-work injuries or illnesses in 2011 and therefore also had the most cases among the 10 largest GTP occupations. The rate of days-away-from-work cases for this occupation, 352.5 per 10,000 full-time equivalent workers, was the highest among the 10 largest GTP occupations and was more than 3 times the rate for total private industry. Many of the injuries to these workers resulted from contact with objects and equipment, such as being struck by, struck against, or caught in an object or equipment. A common source of injury was containers being moved. About 1 in 4 cases among laborers had containers as the source of the injury, twice the proportion for total workers. Injured and ill laborers stayed away from work a median of 9 days.

Chart 2. Median days away from work for occupational injuries and illnesses, selected occupations, private industry, 2011



SOURCE: U.S. Bureau of Labor Statistics.

Landscaping and groundskeeping

There were slightly more than 10,000 cases involving days away from work in 2011 for landscaping and groundskeeping workers, one of the two landscaping-related occupations among the 10 largest GTP occupations. Consistent with landscaping and groundskeeping work, one source of injury was handtools: 17 percent of injury cases involved handtools, compared with only 5 percent of cases for total workers. Landscapers also suffered a greater proportion of cuts, lacerations, and punctures than did other private industry workers, 16 percent of cases compared with 9 percent of cases, respectively. The part of body most frequently injured included

- Upper extremities (including shoulders, arms, and hands)—29 percent
- Trunk (including chest and back)—29 percent
- Lower extremities (including legs, ankles, and feet)—23 percent
- Head (including face)—11 percent

Among the 10 occupations being discussed here, landscapers are the only occupation identified as having more than a minimal percentage of cases that are animal or

insect related. As landscapers generally work outdoors, these injuries and illnesses may be due to interactions with dogs, livestock, bees, or other animals or insects. The median days away from work for landscapers—regardless of the circumstances surrounding the injury or illness—was 9 days.

Maids and housekeepers

Maids and housekeepers experienced nearly 18,000 non-fatal injuries and illnesses resulting in days away from work in 2011, a rate of 293.1 per 10,000 full-time workers. About 43 percent of these cases involved overexertion or bodily reaction, compared with 36 percent of cases for total workers. Overexertion and bodily reaction can result from such actions as lifting, lowering, pushing, pulling, and carrying, as well as from repetitive motion. Consistent with injuries due to overexertion while lifting, one of the sources of injury to these workers is furniture and fixtures, which accounted for 13 percent of cases compared with only 4 percent of cases for total workers. Injured and ill maids and housekeepers were away from work a median of 7 days, 1 day less than the median for all private industry workers.

Automobile service technicians and mechanics

Auto mechanics are classified in the same broad occupational category as heating mechanics and maintenance and repair workers (occupations previously discussed), and their injuries and illnesses follow some of the same patterns. For example, among the 12,000 auto mechanic injuries and illnesses resulting in days away from work in 2011, 16 percent resulted in cuts or lacerations. Among heating mechanics and maintenance workers, 13 percent of cases resulted in cuts or lacerations. Where these occupations differ somewhat from each other is in the source of the injury or illness. For fully one-third of auto mechanics' injuries and illnesses resulting in days away from work, parts and materials was the source of injury. Parts and materials was the source for 10 percent of injuries to heating mechanics and 13 percent of maintenance workers. Another prevalent source of injury for auto mechanics was vehicles, which accounted for 11 percent of cases. Auto service technicians and mechanics had a median of 7 days away from work.

First-line supervisors of construction trades and extraction workers

This occupation and the next one are both first-line supervisors; they supervise construction, extraction, and landscaping workers. Based on the Standard Occupational Classification system, these first-line supervisors are classified in the same broad occupational category as those being supervised because they typically are present at the worksite and may be coordinating or providing training on many of the same tasks as those they are supervising. Such first-line supervisors may also spend part of their time performing these same tasks. Thus, these supervisors may be exposed to many of the same workplace hazards as the workers they supervise.

Consistent with this classification, first-line supervisors of construction trades and extraction workers experience patterns of nonfatal injuries and illnesses that resemble those of other construction workers. Three broad categories of events or exposures account for nearly 90 percent of all cases among these supervisors—contacts with objects or equipment (33 percent), overexertion and bodily reaction (33 percent), and falls, slips, and trips (20 percent). Construction supervisors were absent from work because of injury or illness for a median of 7 days.

First-line supervisors of landscaping and grounds-keeping workers

Of particular note for this first-line supervisor occupation

is its relatively low median days away from work—3 days. It is not clear whether the differences in the nature of the injuries, compared with those of total employees, account for the shorter median absence from work. Sprains, strains, and tears were prevalent among landscape supervisors (44 percent of cases), while cuts, lacerations, and punctures (2 percent of cases) and bruises and contusions (also 2 percent of cases) were less prevalent. Also of note is the proportion of head (16 percent) and trunk (44 percent) injuries among landscape supervisors.

Business operations specialists, all other

The 10th occupation among detailed occupations with the largest number of GTP workers is business operations specialists, all other. This occupation is classified in the business and financial occupations category and includes business operations workers not identified separately in the Standard Occupational Classification system.⁸ Examples include ship purser and mystery shopper. The differences between the other nine detailed occupations and this one are evidenced by the nature of the workers' injuries and illnesses and by the relatively low incidence of days-away-from-work cases. Fully 70 percent of cases involved falls, many on the same level (not from a height). Consistent with falls on the same level, the most prevalent source of injury to business operations specialists was floors, walkways, and ground; this is typically where the falling worker landed. More so than for total workers, injuries to workers in this occupation were to the lower extremities and to multiple body parts. The share of cases resulting in fractures was higher than for total workers (15 percent compared with 9 percent), as was the share of cases resulting in soreness or pain with no other injury (26 percent compared with 12 percent). The median days away from work for the category business operations specialists, all other, was 3 days.

One more look at 10 occupations

The profiles presented here may say less about the green nature of these 10 occupations than about the extensive data available on the characteristics of workplace injuries and illnesses for all workers. Clearly some of the details examined show relationships between the type of work being performed and the characteristics of injuries, such as landscapers being injured by handtools and laborers being injured when lifting. But to have a true picture of workplace safety issues among green occupations, the injury and illness survey would need to identify which

workers employed green technologies and practices and tabulate data for these workers separately. Such detail is not planned at this time.

Often what is needed when employers, worker representatives, researchers, policymakers, and others are attempting to improve worker safety is to look across characteristics to discern patterns that might need to be addressed. The business operations specialist occupation, for example, had a high proportion of falls resulting in a high proportion of fractures. This combination of details can help de-

termine where to focus injury prevention resources. Table 3 offers one approach to looking at the 10 occupations by various injury and illness case characteristics and identifies some of the prevalent items regarding nature of injury, part of body, source of injury, and event or exposure. For example, there are patterns to certain characteristics, such as overexertion leading to strains or contacts with objects leading to cuts. The extensive BLS data available on worker safety and health can be used to construct similar views for hundreds of detailed occupations. □

Table 3. Selected characteristics of days-away-from-work injuries, selected occupations, private wage and salary workers, 2011

Occupation	Event or exposure		Nature of injury or illness		Part of body		Source of injury or illness	
	Description	Percent	Description	Percent	Description	Percent	Description	Percent
Janitors and cleaners, except maids and housekeeping cleaners	Overexertion/bodily reaction	39	Sprains, strains, tears	40	Trunk	32	Floors, walkways, ground	20
	Falls, slips, trips	30	All other natures	16	Upper extremities	30	Containers	18
	Contacts with objects	20	Soreness, pain	14	Lower extremities	21	Person—injured/ill worker	13
Heating, air conditioning, and refrigeration mechanics and installers	Overexertion/bodily reaction	40	Sprains, strains, tears	42	Upper extremities	39	Machinery	24
	Falls, slips, trips	22	All other natures	25	Trunk	22	Person—injured/ill worker	19
	Contacts with objects	23	Cuts, lacerations, punctures	13	Lower extremities	19	All other sources	12
Maintenance and repair workers, general	Overexertion/bodily reaction	33	Sprains, strains, tears	33	Upper extremities	34	All other sources	17
	Contacts with objects	31	All other natures	22	Lower extremities	23	Person—injured/ill worker	14
	Falls, slips, trips	23	Cuts, lacerations, punctures	13	Trunk	22	Parts and materials	13
Laborers and freight, stock, and material movers, hand	Overexertion/bodily reaction	40	Sprains, strains, tears	38	Upper extremities	30	Containers	25
	Contacts with objects	34	All other natures	18	Trunk	28	Parts and materials	14
	Falls, slips, trips	18	Soreness, pain	11	Lower extremities	27	Vehicles	13
Landscaping and groundskeeping	Contacts with objects	36	Sprains, strains, tears	35	Upper extremities	29	All other sources	29
	Overexertion/ bodily reaction	33	All other natures	24	Trunk	29	Handtools	17
	Falls, slips, trips	16	Cuts, lacerations, punctures	16	Lower extremities	23	Person—injured/ill worker	14
Maids and house-keeping cleaners	Overexertion/bodily reaction	43	Sprains, strains, tears	42	Upper extremities	30	Floors, walkways, ground	23
	Falls, slips, trips	32	All other natures	18	Trunk	25	Person—injured/ill worker	22
	Contacts with objects	18	Soreness, pain	17	Lower extremities	22	All other sources	16
Automobile service technicians and mechanics	Contacts with objects	45	Sprains, strains, tears	31	Upper extremities	36	Parts and materials	33
	Overexertion/bodily reaction	33	All other natures	19	Trunk	22	Person—injured/ill worker	15
	Falls, slips, trips	13	Cuts, lacerations, punctures	16	Lower extremities	18	All other sources	11
First-line supervisors of construction trades and extraction workers	Contacts with objects	33	Sprains, strains, tears	30	Upper extremities	30	All other sources	23
	Overexertion/bodily reaction	33	All other natures	19	Trunk	26	Parts and materials	21
	Falls, slips, trips	20	Soreness, pain	18	Lower extremities	24	Person—injured/ill worker	14
First-line supervisors of landscaping and groundskeeping workers	Overexertion/bodily reaction	44	Sprains, strains, tears	44	Trunk	44	All other sources	39
	Contacts with objects	28	All other natures	27	Upper extremities	19	Person—injured/ill worker	18
	Falls, slips, trips	22	Soreness, pain	9	Lower extremities	13	Floors, walkways, ground	13
Business operations specialists, all other	Falls, slips, trips	71	Sprains, strains, tears	32	Lower extremities	35	Floors, walkways, ground	44
	Overexertion/bodily reaction	15	Soreness, pain	26	Multiple body parts	29	Furniture and fixtures	24
	Transportation incidents	9	Fractures	15	Trunk	21	Person—injured/ill worker	15

NOTE: Data refer to percentage of cases for each occupation that have the identified characteristic. The "all other" categories include

a variety of differing characteristics. SOURCE: U.S. Bureau of Labor Statistics.

Notes

¹ For details on the approaches to measuring green jobs, see <http://www.bls.gov/green/#overview>.

² The GTP survey identified three broad categories of green technologies and practices: (1) energy from renewable sources and energy efficiency, (2) greenhouse gas reduction and pollution reduction and removal, and (3) recycling and reuse and natural resource conservation. Additional detailed groupings are identified within these broad categories. For more information about the GTP survey definitions and procedures, see <http://www.bls.gov/gtp/overview.htm#definition>.

³ Results from the 2011 GTP survey are available at <http://www.bls.gov/gtp/news.htm>. For information on how GTP employment for an occupation compares with existing BLS data on occupational employment, see <http://www.bls.gov/gtp/faq.htm#q12>.

⁴ Data from the BLS Occupational Employment Statistics (OES) program for 2011 show that 85 percent of workers in the 10 occupations discussed in this article worked in private industry; the remain-

der worked in federal, state, or local government. Within the individual occupations, the percentage working in private industry ranged from 65 percent for business operations specialist to 96 percent for maids and housekeepers. Information about the OES program may be found at <http://www.bls.gov/oes/home.htm>.

⁵ Details about the BLS Occupational Safety and Health Statistics program are available at <http://www.bls.gov/iif/home.htm>.

⁶ OSHA defines which injuries and illnesses are to be recorded by employers on the basis of severity and on definitions of work relatedness. Details and definitions are available from OSHA at <http://www.osha.gov/recordkeeping/index.html>.

⁷ Complete information about the BLS Occupational Injury and Illness Classification System (OIICS) may be found at <http://www.bls.gov/iif/osh/iics.htm>.

⁸ All occupations are classified using the Standard Occupational Classification (SOC) system; details about the system are available at <http://www.bls.gov/soc/home.htm>.