



Occupational Outlook Quarterly

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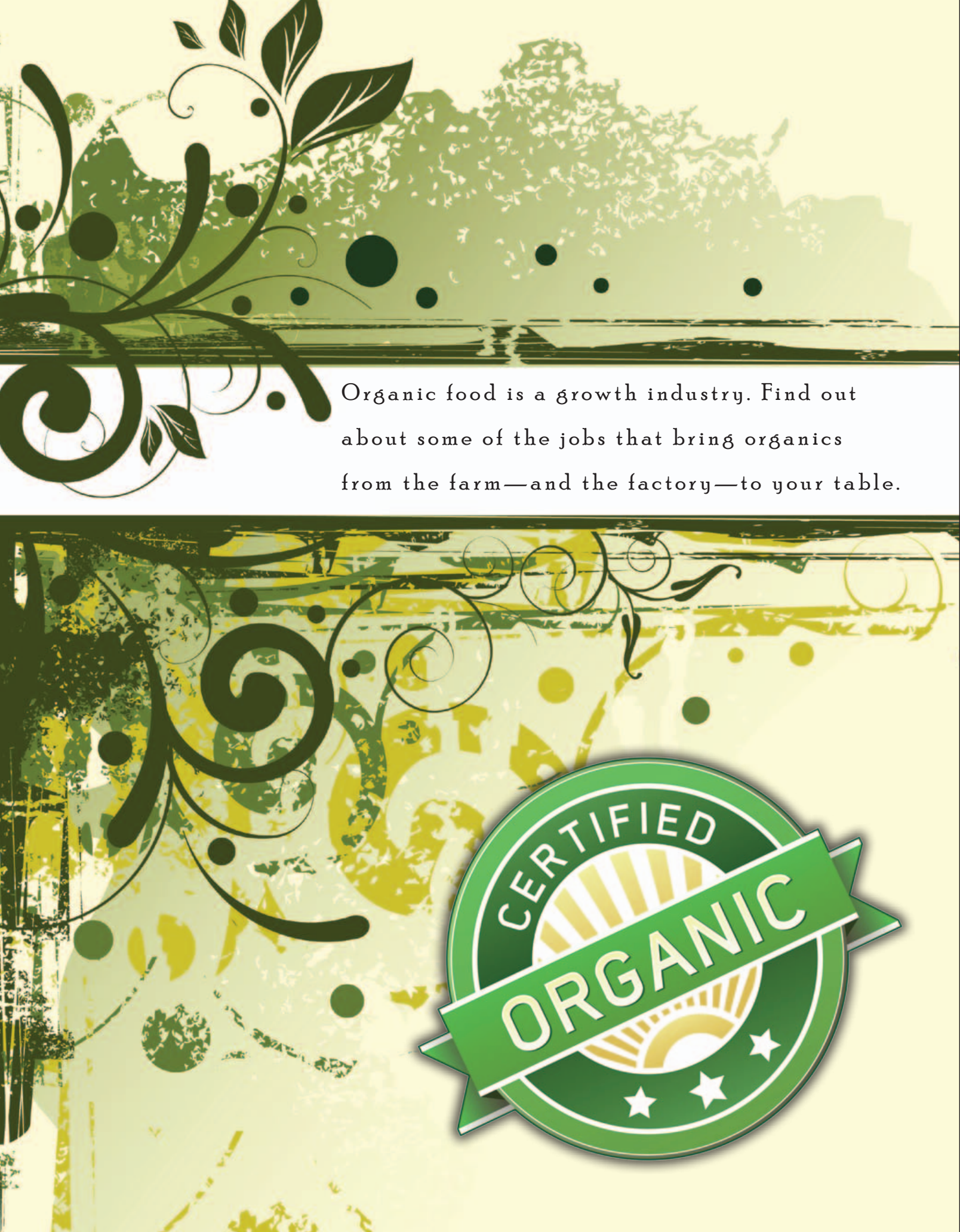
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The background features a light green and yellow color palette with abstract, painterly textures. On the left side, there are dark green, stylized leaf and vine motifs that curve upwards and outwards. The central text is enclosed in a white rectangular box with a thin black border. The text itself is in a black, serif font, arranged in three lines. The overall aesthetic is clean and natural, emphasizing organic themes.

Organic food is a growth industry. Find out
about some of the jobs that bring organics
from the farm—and the factory—to your table.



Careers in organic food production

From TVs to TV dinners, technology plays a role in nearly all aspects of modern life. But when it comes to food production, many of us are turning away from technology toward organic methods of food production—methods that combine science with traditional farming practices. Growth in the organic industry's popularity should also sprout employment in its occupations.

New technology developed over the past several decades have allowed farmers to grow more food using fewer resources. Compared with 60 years ago, today's farm can supply more than three times more corn per acre, and the average dairy cow produces almost four times more milk. Even as technology improves farm yields, however, many consumers are looking for healthier, environmentally sustainable alternatives to typical food. The result has been a rapid growth in the growing, manufacturing, regulation, and marketing of organically produced foods.

This article discusses some of the workers who are involved in producing organic food, certifying it, and bringing it to consumers. The first section explains what organic means and how this expanding specialty may offer opportunities. The next three sections describe some occupations in the organic industry, looking at ways in which the work involved might differ from that in the conventional food industry. The final section provides sources of additional information.

Opportunities in organic

Organic fruits, vegetables, and animal products—which include meat, eggs, and dairy

items—are sold directly to consumers or to food manufacturers that make organic processed foods, such as bread and frozen meals. Foods that carry a U.S. Department of Agriculture (USDA) certified organic label come from producers that have undergone a certification process guaranteeing they have met specific criteria during production. For example, fruits and vegetables must be grown without the use of chemical pesticides or synthetic fertilizers, and animal products must come from livestock that have not been given growth hormones or antibiotics.

According to the USDA, certified organic acreage—which includes cropland, pastureland, and rangeland—quadrupled between 1992 and 2008, and the number of organic operations nearly tripled. But organic farms and the organic food industry are still much smaller than their conventional counterparts. Nevertheless, organic foods are now available in nearly all retail food stores, and most consumers say they buy organic food at least occasionally. Growth in the industry seems likely to continue, and continued growth in demand may lead to career opportunities.

The U.S. Bureau of Labor Statistics (BLS) estimates that there were 1.8 million workers in the crop and animal production industries in 2008. But the organic segment is a small portion of that total. BLS does not currently collect wage or employment data for occupations that deal exclusively with organic goods—nor does it project employment for organic-specific occupations. Given the increases in organic food sales, however, opportunities are likely to continue in the occupations related to organic foods.

Adam Bibler

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Growing organic: Farmers and other farm workers

Both conventional or organic food usually originates on a farm. The difference between conventional and organic farming is in the approach each uses to raise crops and animals. Where a conventional farm might use pesticides to fight insects that damage crops or livestock, for example, an organic farm might use predatory bugs that feed on such insects.

Farmers and ranchers, agricultural managers, and farmworkers and laborers are among the workers involved in producing organic food. The following pages describe the scope of their duties—both those specific to organic farming and those that are not.

Farmers, ranchers, and agricultural managers

Farmers, ranchers, and agricultural managers direct the activities of farms and ranches. On small farms, these workers generally oversee the entire operation; on larger farms, they may oversee a single activity, such as marketing. Farmers and ranchers own and operate their farms. Agricultural managers are hired to

work on behalf of a farmer, absentee landowner, or corporation.

On a crop farm, farmers, ranchers, and agricultural managers decide what and how much to grow and when to plant, harvest, and rotate fields. They supervise tilling and weeding to ensure a good crop. After harvesting is done, they make sure that crops are properly packaged and stored. For farmers raising animals, daily activities include feeding, monitoring the animals' health, maintaining the animals' living spaces, and, for dairy operations, milking more than once a day. Livestock farmers also oversee breeding activities.

A year-round, 7-day workweek and the uncertainties of weather are among the realities of farm life. But organic farmers have additional challenges. Because synthetic fertilizers cannot be used on organic crops, these farmers instead use manure, compost, and other organic fertilizers. In place of herbicides, attention to weeding or use of cover crops is important. Controlling pests without pesticides requires use of other methods, such as sowing "trap crops," plants intended to lure pests from the main crop. And on animal farms, organically raised livestock must have

Farmers and other farm workers harvest crops and make certain that the food is properly stored.





Monitoring animal health is an important task for livestock farmers.

access to the outdoors. This requires that farmers manage their animals' activities, such as rotating pastures for grazing cattle.

Running a farm also has a business component. These tasks include marketing, sales, and bookkeeping. Farmers, ranchers, and agricultural managers may perform all or some of the required tasks. Workers on larger farms often delegate the physical tasks to farmworkers and laborers, as described below. Operators on smaller farms usually perform most of the work themselves.

Because of the need for timely distribution of fresh food, marketing and sales are especially important in both organic and conventional farming. To get their food to consumers, farmers often make arrangements with buyers or wholesalers, who then sell the products. (To learn more about these workers, see "Getting food to consumers: Buyers and sellers," beginning on page 9.)

Other farmers, particularly organic ones, sell their products directly to consumers at farmers' markets, through community-supported agriculture programs, or, at crop farms, by allowing consumers to pick their own produce. Increasingly popular farmers'

markets allow producers to gather, often at a designated time and place, to sell their goods. In community-supported agriculture programs, farmers sell "shares" of their total goods for a set price before producing the food and then make regular food deliveries throughout the season. Some farmers arrange for self-pick, or pick-your-own, products, letting consumers come directly to the farm and pick their own produce to buy. This arrangement helps the farmer eliminate the costs of labor for harvesting and of transporting.

Skills and training. There are no specific educational requirements for becoming a farmer, rancher, or agricultural manager, although postsecondary education in agriculture—including, for organic farmers, instruction on organic farming practices and techniques—is recommended. And working on an existing farm through an internship or other arrangement is a good way to learn more about the occupation.

Aspiring farmers should enjoy working outdoors, be physically fit, and must understand the commitment required to run a farm. They also need managerial ability for organizing a farm's business operations, solid

communication skills for dealing with consumers and other buyers, and knowledge of accounting and bookkeeping for the substantial recordkeeping required due to organic farming regulations. Proficiency in using a computer, including basic spreadsheet and word processing programs, is increasingly important.

Farmworkers and laborers

Agricultural farmworkers and laborers perform much of the physical labor on a farm. This includes the work of raising crops and livestock but also involves maintenance of the farm itself, such as basic repair of fences, pens, or farm equipment. Some of the alternative approaches to organic farming may make the work more labor-intensive than conventional farmwork.

On organic crop farms, farmworkers and laborers plant seeds and prune, irrigate, harvest, and pack and load crops for shipment. They also apply fertilizers to crops, use organic methods for controlling pests and weeds, and may help with produce sales, such as at a local farmers' market.

On organic ranches and animal farms, farmworkers and laborers care for livestock by supplying the animals' food and water, maintaining their living areas, and ensuring that they spend time outside. Farmworkers and laborers may need to transport cattle to grazing areas or move portable coops to pastures, which may involve driving machinery and lifting equipment or animals.

Skills and training. As with farmers, ranchers, and agricultural managers, farmworkers and laborers have no specific educational requirements for entering the occupation; most farmworkers learn their skills on the job. But workers on organic farms often benefit from knowledge of, or experience in, organic farming techniques. And knowledge of the physical requirements of farming may be as important as the ability to perform them.

Much farm work is strenuous and takes place outdoors in all kinds of weather. Work schedules are variable and revolve around crop cycles and weather. Therefore, farmworkers and laborers must be physically fit and be able to work extended hours. Communication and basic math skills are also important for

Workers on organic farms often benefit from having knowledge or experience in organic farming techniques.





As part of the organic certification process, agricultural inspectors report whether a farm's operations match its organic production plan.

farmworkers and laborers who deal with customers and sell produce.

Working with producers: Inspectors and consultants

To use the “Certified Organic” seal, a farm or a food manufacturer must pass inspection by an accredited certifying agency. Such agencies may be part of a State government, a nonprofit group, or a for-profit company.

The USDA’s National Organic Program sets the standards for organic production of foods and also oversees accreditation of the certifying agencies. Agricultural inspectors and consultants are among the workers knowledgeable about the certification process.

Agricultural inspectors

Agricultural inspectors do preliminary research and site inspections to investigate farms and food manufacturing companies. These inspectors usually work for Federal or State governments. Inspectors examine food processing operations to ensure compliance with health, safety, and quality laws. The work of inspectors for organic certification differs from that for conventional inspections.

Organic farms and companies are required to maintain organic production plans. These plans include detailed information about the farm, such as which crops are produced or which animals are raised, as well as information about the production process and the farm’s pest control or fertilization techniques. The inspector reviews this plan and other relevant information, such as the farm’s inspection history. The inspector then visits the farm, spending time in its fields and crop storage areas and examining its machinery. He or she talks to the farmer and observes farm operations to see that they match what’s in the organic production plan.

Inspectors also review food manufacturing plants using a similar process. In plants, however, the inspector looks at different things. He or she examines the cleaning, handling, and packaging techniques used by the facility, as well as reviews employee training programs. Inspectors ensure that a plant’s manufacturing procedures, like those on a farm, follow the description in the organic production plan.

After completing the inspection, the inspector prepares a report of the farm or plant to document his or her findings. The certifying agency considers the inspector’s report

in deciding whether the farm or manufacturer may obtain or retain organic certification.

Skills and training. There are no formal educational requirements for becoming an agricultural inspector. However, most employers require work experience in a related field, such as food processing, or some college coursework in biology, agricultural science, or a related subject.

Inspectors for organic certification are also usually required to have formal training in organic inspection. The largest training programs are offered by the Independent Organic Inspectors Association, which has separate trainings and accreditations for crop, livestock, and processing inspection. Employers often provide or sponsor ongoing training to keep up with the latest rules and regulations for organic production.

Potential inspectors should be comfortable working outdoors. In addition to their technical knowledge, they also need good oral communication skills for talking with producers and good written communication skills for drafting reports.

Consultants

Consultants provide technical advice and assistance to producers seeking to expand their organic operations or to transition from conventional to organic farming. The transition can be lengthy; it may require farmers or manufacturers to adopt new methods, and it can be costly. USDA regulations require a 3-year transition period for land used in organic production in most situations.

By law, inspectors may clarify rules but are not permitted to advise the facilities they examine. As a result, some certifying agencies and other establishments offer consulting services for aspiring organic producers. Consultants explain the organic certification process as fully as possible and provide suggestions, cost estimates, and more to help producers understand the complexity of an expansion or transition. Farmers and manufacturers may use the information from consultants to make a decision about whether to proceed.

In addition to working one-on-one with individual farmers, some consultants present group training. Nonprofit certifying agencies

Consultants explain the organic certification process to help farmers and food manufacturers decide whether to expand production or transition from conventional to organic farming.



Photo: U.S. Department of Agriculture



Purchasing agents and buyers of farm products help make organic foods more readily available to consumers.

and State governments often host educational events to disseminate information and answer producers' questions relating to organic production and certification. These organizations employ consultants full time who specialize in this type of work.

Skills and training. Consultants who advise or train organic farmers and manufacturers have diverse educational and professional backgrounds. Like consultants in other industries who have specialized knowledge, however, these consultants should have expertise in the organic industry—including a thorough understanding of the organic certification process as it relates to specific products.

Because consultants usually work without direct supervision, they should be self-motivated, disciplined, and have good time-management skills. They should also have analytical, problem-solving, and creative abilities, as their work often requires them to suggest solutions to obstacles encountered with the certification process. And they should have good interpersonal and communication skills for working with a wide range of people.

Getting food to consumers: Buyers and sellers

In response to the growing popularity of organic goods, retailers have increased their offerings of such products. Once sold primarily in natural and health food stores, organic goods have become mainstream: most organic food is now sold in conventional grocery stores. Purchasing agents and buyers of farm products and wholesale sales representatives are some of the workers who help make organic foods more readily available.

Purchasing agents and buyers of farm products

Purchasing agents and buyers of farm products work on behalf of grocery stores, restaurants, and other businesses. Their job is to obtain quantities of goods before they are resold to individual customers. Agents and buyers may also work on behalf of wholesalers, who serve as intermediaries in the path between producers and retailers.

To get the needed products and negotiate on prices and delivery dates for goods, agents and buyers may visit the producer or wholesaler directly. Agents and buyers keep abreast of changing consumer preferences to make sure what they buy can be profitably resold.

Purchasing agents and buyers of farm products who work with organic goods might be responsible for one category of goods, such as produce or cheese, or for many. Agents and buyers who work for a chain of grocery stores may oversee buying for one store or one region of stores.

To judge the quality of a product firsthand, agents and buyers often travel to visit farms, producers, or distributors. These workers also analyze sales data to determine what goods—and at what price—customers demand so they know what to buy and how much to pay.

Skills and training. Requirements for purchasing agents vary by the size and type of establishment. Most employers prefer to hire applicants who have a college degree and who are familiar with the merchandise they sell and with wholesaling and retailing practices. Educational background should include coursework in supply-chain management. Formal education is especially important for agents and buyers working in the organic food manufacturing industry. Continuing education is often necessary for advancement.

Professional certification is becoming increasingly important. There are many types of certification, based on specialty, but all require work-related experience and education followed by successful completion of written or oral exams. Buyers typically learn the particulars of their business through on-the-job training.

Good communication and negotiation skills are a plus, as they help when working with suppliers. Strong analytical skills are also necessary in determining which goods to buy. Prior knowledge of the particular qualities of organic foods or other goods is beneficial.

Purchasing agents and buyers must have basic computer skills and be proficient in various software. They also need an ability to

analyze technical and financial data and have good skills in communication and negotiation.

Wholesale sales representatives

Farmers and producers who do not sell their products directly to consumers, retailers, or restaurants instead sell them to wholesale businesses. Wholesale sales representatives are the workers responsible for selling these goods to other businesses.

Like any sales workers, wholesale sales representatives must find new customers to win new business. This effort sometimes requires making cold calls or traveling to businesses—and being well informed about the goods and products they sell.

Sales representatives might handle organic products exclusively or as part of a larger portfolio. For example, a sales agent might sell ingredients to an organic food manufacturer, such as organic flour to a baker. Or, a sales rep might sell finished products to retail outlets, such as packaged organic meat to grocery stores.

In each case, sales agents must know which establishments in their area are likely to buy organic products. And they must know market prices and industry trends to sell the organic goods.

Skills and training. Some wholesale sales representative positions require applicants to have a bachelor's degree, but most jobseekers are fully qualified with a high school diploma or its equivalent. For these positions, previous sales experience is a plus.

Companies often have formal training programs, which may last up to 2 years. In some of these programs, employees rotate among plants and offices to learn all phases of the employer's operation.

To create business, sales agents must be friendly and personable. The ability to communicate well is also important. General business skills, such as the ability to analyze sales data, are beneficial. A background in an aspect of organic food production or knowledge of organic regulations is helpful, too.

For more information

This article provided only snapshots of the occupations featured. For more general information about these occupations beyond their organic focus, see the *Occupational Outlook Handbook*. The *Handbook* provides detail about the work, employment, wages, outlook, training and more for farming, inspecting, buying, and other occupations related to food and food production—as well as for hundreds of other occupations. This resource is available in many career centers and public libraries and online at www.bls.gov/ooh.

To learn more about becoming an organic farmer, contact World Wide Opportunities on Organic Farms. This organization is an exchange network through which farms and volunteer workers connect. Volunteers learn more about organic farming by working on farms in exchange for living accommodations and food. For more information about

opportunities on farms in the United States, contact:

World Wide Opportunities on Organic Farms
430 Forest Ave.
Laguna Beach, CA 92651
(949) 715-9500
info@wwofusa.org
www.wwofusa.org

For general information about the organic industry, contact:

Organic Trade Association
60 Wells St.
Greenfield, MA 01301
www.ota.com

For more information about becoming an organic inspector, contact:

International Organic Inspectors Association
Box 6
Broadus, MT 59317
(406) 436-2031
ioia@ioia.net
www.ioia.net

o o o



Mapping out a career: An analysis of geographic concentration of occupations



Do you thrive on the excitement of a big city, or do you enjoy waking up to a quiet country morning? Do you anticipate relocating frequently, finding a new job each time you move? Do you really love New York—or Orlando? If these types of lifestyle considerations are important to you, then the location of jobs might affect your career choice.

Not all occupations are created equal when it comes to geographic distribution. Some occupations are concentrated in relatively few geographic areas; others are spread more evenly across the United States. Specific occupations might be clustered in particular types of geographic settings, such as large urban areas or small rural ones. And some locations are especially likely to have a specific occupation—even areas that have relatively low overall employment.

Audrey Watson



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This article examines the geographic concentration of occupations. The first section discusses occupations that are geographically concentrated, or not. The second section highlights occupations for which employment is concentrated in large, mid-sized, and small areas. The next section identifies smaller areas that are among the largest employers of specific occupations. The fourth section explains why studying geographic concentration is important in career planning. The final section suggests sources of additional information.

Understanding geographic concentration

This article measures occupations' geographic concentrations using 2009 data from the U.S. Bureau of Labor Statistics (BLS) Occupational Employment Statistics (OES) program. The geographic concentration was determined by analyzing the percentage of occupational employment in the 10 locations in which employment was highest for that occupation. These locations are known as metropolitan

statistical areas, geographic entities defined by the U.S. Office of Management and Budget for use by BLS and other Federal statistical agencies in collecting, tabulating, and publishing Federal statistics, and as OES-defined nonmetropolitan areas.

Among the occupations selected, those designated as highly concentrated had more than 65 percent of their employment in their top 10 areas. Occupations with low geographic concentration had 20 percent or less of their total employment in their top 10 areas.

Occupations with high geographic concentration

Some occupations are more likely than others to be concentrated in specific areas. For example, 89 percent of political scientists worked in just a few areas in 2009—including more than two-thirds in the Washington, D.C., metropolitan area.

The main reasons for occupational concentration are population density, location of natural resources or features, and a particular type of work that is distinct to an area. Selected occupations with high geographic

concentrations in 2009 are shown in Table 1.

Population. Occupational concentration often corresponds to population. Sometimes, this concentration results from demands that are unique to large populations.

For example, the more people who live and work in densely populated areas, the greater the need for public transportation. And because transit systems are in and around major cities, that's where occupations associated with such systems are clustered: nearly all subway and streetcar operators—96 percent—were employed in just 10 areas in 2009.

Natural resources or features. The natural resources or physical features of a locale can also determine occupational



concentration. For example, mining is an activity that is concentrated in a specific area—in this case, one where minerals are located. As a result, among the most concentrated occupations in 2009 were several mining-related ones. These occupations are limited geographically by the need to be near the natural resource deposits being mined.

Similarly, several occupations associated with water transportation are concentrated in areas near waterways and coasts, such as Seattle, Virginia Beach, and New Orleans. Some examples include marine engineers and naval architects, ship engineers, and sailors.

Type of work performed. Some occupations are highly concentrated because they are associated with industries in which related

TABLE 1

Selected occupations with high geographic concentrations, May 2009		
Occupation	Total U.S. employment	Percent of occupational employment in 10 areas with highest employment of occupation
Subway and streetcar operators ¹	6,050	95.9
Political scientists ¹	3,970	89.2
Fashion designers ¹	15,780	78.0
Shuttle car operators ²	3,520	77.0
Roof bolters, mining	5,470	75.7
Fabric and apparel patternmakers	6,640	68.8
Marine engineers and naval architects	5,270	68.7
Agents and business managers of artists, performers, and athletes ¹	11,700	68.4
Loading machine operators, underground mining ²	3,570	68.4
Ship engineers	10,850	66.3

¹ This occupation is also in Table 4 because it is concentrated in large metropolitan areas.

² This occupation is also in Table 3 because it is concentrated in nonmetropolitan areas.

businesses benefit from locating near one another. The San Francisco Bay area attracted high-tech workers, for example, and that locale eventually became known as Silicon Valley because of the large cluster of technology companies there.

Other occupations with high geographic concentrations include those related to fashion and entertainment. In 2009, New York and Los Angeles, two areas with high concentrations of apparel and entertainment-related industries, had the highest employment of fashion designers, fabric and apparel patternmakers, and agents and business managers of artists, performers, and athletes.

Occupations with low geographic concentrations

In contrast with occupations that are highly concentrated geographically, some occupations are widely dispersed. These

are primarily occupations involving workers who are needed everywhere, such as postmasters, or workers whose jobs focus on rural or sparsely populated areas, such as foresters.

Occupations with low geographic concentrations in 2009 are shown in Table 2.

But total employment also matters in determining which occupations have low geographic concentrations. Large occupations—including retail salespersons, cashiers, and general office clerks, each with 2009 total employment of at least 2.8 million—are likely to appear in significant numbers in many areas, even if their geographic concentrations are somewhat higher than those of the occupations in the table.

Services needed everywhere. Residents in all types of areas need basic services (such as mail delivery, highway maintenance, and utilities), and several occupations with



TABLE 2

Selected occupations with low geographic concentrations, May 2009		
Occupation	Total U.S. employment	Percent of occupational employment in 10 areas with highest employment of occupation
Postmasters and mail superintendents*	24,890	11.9
Agricultural inspectors	14,030	15.0
Highway maintenance workers	139,490	15.6
Foresters	10,230	15.9
Electrical power-line installers and repairers	108,980	16.1
Correctional officers and jailers	455,350	16.7
Water and liquid waste treatment plant and system operators	109,090	16.9
Farm equipment mechanics*	30,250	17.3
Cooks, institution and cafeteria	383,540	18.0
Legislators	65,750	18.3

*This occupation is also in Table 3 because it is concentrated in nonmetropolitan areas.

low geographic concentrations in 2009 are related to providing such services. These occupations include postmasters and mail superintendents, highway maintenance workers, and electrical power-line installers and repairers.

Schools, nursing homes, retirement communities, and hospitals are spread out geographically—and these facilities need workers to prepare food for their students, residents, and patients. Consequently, institution and cafeteria cooks were more widely dispersed in 2009 than other food service occupations, most of which were employed primarily in restaurants and other eating places that benefit from having numerous customers living and working nearby.

And correctional officers and their supervisors are geographically widespread. These occupations were among those with the lowest geographic concentrations in 2009.

Rural settings. Some occupations with low geographic concentrations exist, in part, because the nature of their work involves little residential population and a large area of land.

These occupations are related to agriculture or natural resource conservation, such as agricultural inspectors, farm equipment mechanics, foresters, conservation scientists, and fish and game wardens.

Does metro size matter?

Areas with the highest overall employment usually have the highest employment of most occupations. But not all metropolitan areas are alike in the types and numbers of occupations that are likely to be clustered together. Large, medium, and small metropolitan areas have different occupational concentrations.

Nonmetropolitan areas accounted for less than 14 percent of total U.S. employment in 2009 but contained the majority of employment in some occupations. (See Table 3.)

As discussed previously, occupations found primarily in nonmetropolitan areas can be highly concentrated geographically because their job tasks are associated with natural resources (such as mining), or they can have low geographic concentrations because the

TABLE 3

Selected occupations concentrated in nonmetropolitan areas		
Occupation	Total U.S. employment	Percent of employment in nonmetropolitan areas
Shuttle car operators ¹	3,520	77.2
Loading machine operators, underground mining ¹	3,570	74.3
Continuous mining machine operators	11,230	71.1
Fallers	6,480	69.6
Logging equipment operators	23,630	68.9
Log graders and scalers	2,940	60.8
Forest and conservation technicians	31,440	57.9
Postmasters and mail superintendents ²	24,890	56.2
Slaughterers and meat packers	97,530	55.5
Farm equipment mechanics ²	30,250	52.1
Percent of all employment in nonmetropolitan areas		13.5

¹ This occupation is also in Table 1 because it is highly concentrated geographically.

² This occupation is also in Table 2 because it has low geographic concentration.

services they provide are needed everywhere (such as mail delivery).

Large metro areas

The largest metropolitan areas—those with employment of 1 million or more—made up about 42 percent of total employment in 2009. However, some occupations are even more likely to be concentrated in large metropolitan areas, such as New York, Los Angeles, and Chicago. Some occupations that had two-thirds or more of their 2009 employment in the largest metropolitan areas are shown in Table 4.

Several of these occupations also appeared among the most geographically concentrated occupations in Table 1. These occupations were not only geographically concentrated, they were concentrated precisely because they're mainly in a small number of large urban areas.

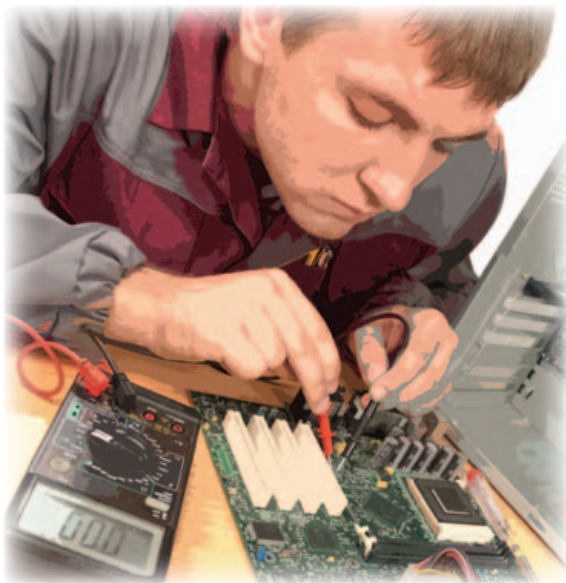
Some of the occupations found primarily in these large areas are related to arts and entertainment. These include film and video editors, multi-media artists and animators, sound engineering technicians, producers



TABLE 4

Selected occupations concentrated in large metropolitan areas (employment ≥ 1 million), May 2009		
Occupation	Total U.S. employment	Percent of employment in large metropolitan areas
Subway and streetcar operators*	6,050	86.3
Political scientists*	3,970	85.8
Flight attendants	95,810	83.7
Fashion designers*	15,780	75.8
Airline pilots, copilots, and flight engineers	74,420	73.6
Shampooers	16,170	70.9
Agents and business managers of artists, performers, and athletes*	11,700	69.9
Film and video editors	17,550	68.9
Brokerage clerks	62,470	66.8
Financial analysts	235,240	66.7
Percent of all employment in large metropolitan areas		41.6

* This occupation is also in Table 1 because it is highly concentrated geographically.



and directors, and actors. New York and Los Angeles had the highest employment of most of these occupations in 2009.

Metropolitan areas often serve as busy hubs for air transportation. As a result, nearly 74 percent of airline pilots, copilots, and flight engineers and 84 percent of flight attendants were employed in the largest of these areas in 2009. New York City is a center of financial activity, so it is not surprising that brokerage

clerks and financial analysts were particularly concentrated in that metropolitan area.

Two specialized personal care occupations, shampooers and manicurists and pedicurists, also had two-thirds or more of their 2009 employment in the largest metropolitan areas. Although these workers are employed throughout the country, their jobs are more likely to be specialized where larger populations are served; in smaller areas, these workers' tasks are often combined with duties of other personal care workers, such as hairstylists, hairdressers, and cosmetologists.

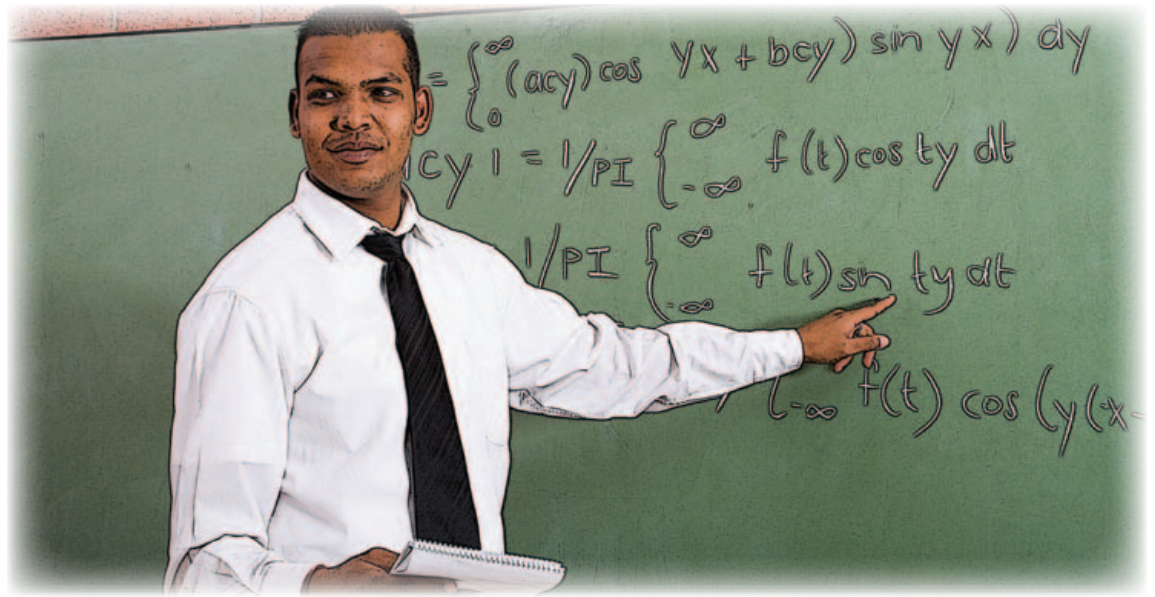
Medium-sized metro areas

Metropolitan areas with employment between 250,000 and 999,999 accounted for about 24 percent of overall U.S. employment in 2009. (See Table 5.) However, concentration patterns in medium-sized metro areas are not as pronounced as those in large metro areas.

Computer hardware engineers, nuclear engineers, and aerospace engineering and operations technicians are likely to be employed in medium-sized areas. And several occupations common in the insurance industry—insurance underwriters, correspondence

TABLE 5

Selected occupations concentrated in medium-sized metropolitan areas (250,000 ≤ employment < 1 million), May 2009		
Occupation	Total U.S. employment	Percent of employment in medium-sized metropolitan areas
Semiconductor processors	25,750	47.4
Gaming supervisors	24,760	37.4
Bookbinders	6,430	35.0
Aerospace engineering and operations technicians	7,940	34.7
Medical appliance technicians	13,760	34.4
Tax examiners, collectors, and revenue agents	69,500	33.9
Gaming dealers	86,900	33.6
Computer hardware engineers	65,410	33.4
Nuclear engineers	16,710	32.3
Insurance underwriters	98,430	31.8
Percent of all employment in medium-sized metropolitan areas		23.9



clerks, and insurance claims and policy processing clerks—had 30 percent or more of their employment in medium-sized metropolitan areas in 2009.

Small metro areas

Small metropolitan areas with employment of less than 250,000 made up about 20 percent of overall U.S. employment in 2009. (See Table

6.) As with occupations in medium-sized areas, geographic concentration patterns in small metro areas are not as pronounced as those in large metro areas.

For some of these occupations, possible reasons for geographic concentration in small metro areas may be more obvious. For example, nearly 55 percent of postsecondary forest and conservation science teachers worked

TABLE 6

Selected occupations concentrated in small metropolitan areas (employment < 250,000), May 2009		
Occupation	Total U.S. employment	Percent of employment in small metropolitan areas
Forest and conservation science teachers, postsecondary	2,380	54.6
Tire builders	17,820	48.1
Agricultural sciences teachers, postsecondary	10,230	44.3
Home economics teachers, postsecondary	4,800	36.2
Textile winding, twisting, and drawing out machine setters, operators, and tenders	30,530	35.3
Atmospheric and space scientists	8,320	35.2
Textile knitting and weaving machine setters, operators, and tenders	24,530	33.1
Animal scientists	2,190	33.0
Agricultural and food science technicians	18,490	32.1
Library science teachers, postsecondary	3,940	32.0
Percent of all employment in small metropolitan areas		20.4

in small metropolitan areas in 2009—likely because of the occupations’ need to be near rural areas. Similarly, two science occupations related to agriculture and animal production—animal scientists and agriculture and food science technicians—had 30 percent or more of their 2009 employment in small metropolitan areas.

But with other occupations, the reasons for concentration in small metro areas are not as apparent. For example, two occupations associated with textile and yarn production—textile winding, twisting, and drawing out machine setters, operators, and tenders; and textile knitting and weaving machine setters, operators, and tenders—each had one-third or more of their employment in small metro areas in 2009. Because of increased competition arising from globalization, U.S. textile manufacturers remain primarily in small metro areas in the South, which often have lower labor costs than other areas.

Small area, high employment

Some relatively small metropolitan areas were among the largest employers of individual occupations in 2009. In many cases, this employment concentration results from unique circumstances for an occupation in its geographic location.

For example, popular vacation destinations may be smaller cities but have higher-than-average employment of occupations related to tourism and traveler accommodation. Honolulu, Hawaii, had one of the highest employment levels of tour guides in 2009. And Orlando-Kissimmee, Florida, had some of the highest 2009 employment of baggage porters and bellhops; travel agents; and hotel, motel, and resort desk clerks.

State capitals are not always in large metropolitan areas, but they often have high numbers of workers in public service or government-related occupations. For example, California’s State capital,

Sacramento, had more tax examiners, tax collectors, and revenue agents in 2009 than Philadelphia and Cincinnati—two larger metropolitan areas that are not State capitals. Some other State capitals, including Albany, New York; Little Rock, Arkansas; and Harrisburg, Pennsylvania, also had relatively high 2009 employment of tax collectors.

In 2009, Nashville, Tennessee, had some of the highest employment of musicians and singers and agents and business managers of artists, performers, and athletes. As a percent of total employment, the share of sound recording industries in Nashville was 18 times as high as in the United States as a whole in 2009, and the share of musical groups and artists was 9 times as high, according to BLS. So, although the New York and Los Angeles metropolitan areas had the highest employment of these two occupations in 2009, Nashville had a larger employment share of both occupations because of its high concentration of music-related industries.



Geographic concentration and career planning

When planning a career, it's important to determine whether a desired occupation is geographically concentrated—especially for people who have strong preferences about where they want to live. An aspiring subway operator who craves country living needs to reconcile those conflicting interests, for example, just as forestry may not be the ideal career choice for an avowed urbanite.

BLS data on geographic concentration of occupations are useful for making an informed career decision. These data show which occupations are clustered in urban areas of various size; they also show the occupations most likely to be found in rural areas. And, although large metro areas may offer a wider variety of occupational options than small or nonmetro areas do, data on the previous pages have shown that a specific occupation's geographic location might depend on more than city size.

The data also show occupational size, which is sometimes a key to job mobility: large occupations spread across multiple areas may offer more opportunity for relocating than highly concentrated occupations do. Some of the most concentrated occupations also have the lowest overall employment, simply because these small occupations aren't likely to be in many areas. Such information may be helpful for people who hope to move frequently throughout their careers—or for those who prefer to stay put.


Choice of occupation only partially determines where people live, and choice of

location only partially determines the occupations that are available in an area. Occupation and location need not be mutually exclusive, of course; plenty of commuters live outside urban areas but commute into them—and vice versa. But studying geographic concentration of occupations can help jobseekers balance what they want to do with where they want to live.

For more information

Geographic location is just one thing to consider when deciding on a career. Wages, job duties, education or training requirements, and employment outlook are among other significant factors. And BLS offers more detailed information online.

This article explained some of the ways in which geographic distribution of specific occupations may differ from that of employment in general. Detailed occupational employment and wage data for States, metropolitan areas, and nonmetropolitan areas are available from the OES program at www.bls.gov/oes. In addition to overall employment levels, the OES metropolitan and nonmetropolitan area downloadable files include data on employment concentrations, expressed as employment per 1,000 area jobs.

To learn more about the job duties, education or training requirements (including certifications and licensure, which may affect geographic mobility), and employment outlook for hundreds of occupations, see the *Occupational Outlook Handbook* online at www.bls.gov/ooh. The *Handbook* is also available in hard copy in many libraries and offices of career counselors. 







Apprenticeship: Earn while you learn

Did you know that, every year, thousands of people earn money while learning new skills? They're apprentices, and their paid training helps pave the way to a career.

The usual practice in registered apprenticeship is for someone new to an occupation to receive on-the-job training along with occupation-specific technical instruction. This instruction may take place through distance learning or in a classroom. Apprentices are paid employees, so they earn wages for the time they spend working on the job, and some employers pay for all or part of the related technical instruction. Upon finishing an apprenticeship—determined by length of program, competency assessment, or a combination of the two—participants receive a nationally recognized completion certificate.

Nearly half a million people enter registered apprenticeship programs each year in the United States. There are plenty to choose from: about 29,000 programs covering roughly 1,000 career areas are registered with the U.S. Department of Labor. The list of apprenticeship-able occupations includes chefs, child care development specialists, dental assistants, law enforcement agents, and pipefitters. This list is updated periodically to reflect our changing workforce; for example, wind turbine technician was added recently as the first apprenticeship-able “green” occupation.

Registered apprenticeship programs conform to certain guidelines and industry-established training standards. The programs may be run by businesses, trade or professional associations, or partnerships with businesses and unions.

To learn more about apprenticeship processes and occupations or for links to other sources of information, visit the Department of Labor's Registered Apprenticeship Web site at www.doleta.gov/oa, email etapagemaster@dol.gov, or call toll-free, 1 (877) US-2JOBS (872-5627).

Guidance on career guidance for offender reentry

Stable employment is a key factor in the successful rehabilitation of law offenders. And now there's a resource available to those who provide job-search guidance to offenders.

The National Institute of Corrections wants to improve offenders' long-term employment prospects. The Institute's “Career Resource Centers: An Emerging Strategy for Improving Offender Employment Outcomes” is a how-to guide for establishing a career center in correctional facilities, parole and probation offices, or community organizations. The guide offers practical information in multimedia formats—all at no cost.

The print publication includes a description of the common elements of career resource centers, an explanation of how to work with inmate career clerks and build community ties, and a discussion about the role of assessment. A companion DVD provides career assessment software, videotaped interviews with practitioners, and some of the basic materials used in a center, such as the *Occupational Outlook Handbook* published by the U.S. Bureau of Labor Statistics.

To get your free guide, ask for item number 023066 when writing to the National Institute of Corrections Information Center, 791 North Chambers Road, Aurora, Colorado 80011; or when calling toll-free, 1 (800) 877-1461. Or, visit the Institute online at <http://nicic.gov/features/library/default.aspx?library=023066>.



Scholarships for minority students

Minority students with leadership skills, a good GPA, and college aspirations could be eligible for a Gates Millennium Scholars scholarship for use at the university of their choice. Recipients who progress satisfactorily toward a degree may renew the scholarship each year—all the way through graduate school for students in certain subject areas.

The Gates Millennium Scholars program, funded by a grant from the Bill & Melinda Gates Foundation, covers unmet educational costs for selected African American, American Indian/Alaska Native, Asian and Pacific Islander American, and Hispanic American students. In addition to financial assistance, scholarship recipients receive mentoring services, academic encouragement, and access to an online resource center that provides information about internship, fellowship, and scholarship opportunities.

Minority applicants for the renewable awards must be enrolling for the first time as degree-seeking undergraduates at an accredited college or university, be U.S. citizens or legal residents, meet Federal Pell Grant eligibility criteria, demonstrate leadership through community service or other activities, and have a cumulative GPA of at least 3.3 (on a 4.0 scale) or have earned a high school equivalency credential. Funding continues for

scholars who pursue graduate study in computer science, education, public health, and some other fields.

The program is administered by the United Negro College Fund, which has partnered with other scholarship programs to reach minority students who have academic and leadership potential. For more information, including access to online application forms, visit www.gmsp.org. You can also call toll-free, 1 (877) 690-4677, or write to Gates Millennium Scholars, P.O. Box 10500, Fairfax, Virginia 22031.



CLEAR WINNER

Data and other complex information are often not so reader-friendly. The *Occupational Outlook Quarterly* tries to make complicated topics comprehensible to its audience—and a recent award suggests success.

The 2010 ClearMark Awards from the Center for Plain Language recognized the best use of clear language in business, government, and nonprofit writing. *Quarterly* submissions were honored in the public-sector documents category. Judges evaluated 160 entries on criteria such as word choice, sentence structure, and organization and design details.

These were the first awards presented by the Center for Plain Language, but writing prizes are not new to the *Quarterly*. Previous honors, including those from the Society for Technical Communication and the National Association of Government Communicators, demonstrate the *Quarterly's* long-standing commitment to quality.



FIX-IT CAREERS: JOBS IN REPAIR



Are you interested in how things work—and how to fix them when they don't? Then your career world is wide open. From auto mechanic to HVAC technicians, many occupations require repair skills.

For jobseekers with the right skills, there are many advantages to a repair career. Repair work provides millions of jobs throughout the United States. Wages are often higher than average. And in many occupations, the employment outlook is bright. Plus, most repair jobs don't require a 4-year college degree.

In today's job market, however, repairers need more than mechanical ability in their skills toolbox. Mathematics and writing are useful for workers in many of the fastest growing repair occupations. And those who understand and keep up with technology usually have an advantage.

Sound good? Keep reading to learn more about repair occupations and what it takes to get started in a career. The first section of the article talks about different types of repair work, highlighting those occupations that pay the best and are expected to have the best employment prospects. The second section looks at three occupations in which employment is expected to grow through 2018: automotive service technicians and mechanics; general maintenance and repair workers; and heating, ventilation, and air conditioning mechanics and installers. You'll also learn more about what these workers do, which tools they use, and where they work. The third section discusses skills, training, and other requirements for repair careers. You can find additional sources of information at the end of the article.

Repair work

Almost any product, from motorboats to telecommunications lines, may need fixing, creating opportunities for repairers. All repairers help to restore machinery, equipment, or other products to working order. Many repairers also provide routine and general maintenance, and some install the products that they fix.

Sometimes these jobs are physically demanding and require heavy lifting or working in awkward positions. Injury rates for repair occupations are typically higher than those of other occupations.

In May 2009, more than 5 million workers were employed in installation, maintenance, and repair occupations, according to the U.S. Bureau of Labor Statistics (BLS). And the overall job outlook for repair workers is good, with more than 1.5 million job openings expected between 2008 and 2018. The table on page 28 shows selected repair occupations, ranked according to their projected job openings.

Wages

Workers in repair occupations earned a median annual wage of \$39,600 in May 2009, compared with a median annual wage of \$33,190 for workers in all occupations. (A median wage means that half of all workers made more than that amount and half made less.) All of the repair occupations shown in the table had wages that were at or above the national median for all occupations.

Among the highest paying repair occupations in May 2009 were powerhouse, substation, and relay electrical and electronics repairers (\$62,270) and electrical power line installers and repairers (\$56,670). Working with electricity is dangerous and requires special training—a factor that often leads to higher pay. Repair workers who advance to become supervisors or managers also usually earn higher wages.

Prospects

Although overall job prospects for repair occupations are good, BLS expects variability across these occupations over the 2008–18 decade. In the table, prospects are shown as total job openings, which is the number of jobs expected to become available in the 2008–2018 decade. Openings come from employment growth in an occupation or the need to replace workers who leave the occupation, or from a combination of the two. In general, more jobs usually means better opportunities. Moreover, even declining occupations

Continued on page 29

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Selected installation, maintenance, and repair workers by total job openings, projected 2008-18				
Occupation	Employment, May 2009	Total job openings due to growth and net replacement needs, projected 2008-18	Job growth, projected 2008-18	Median annual wages, May 2009
Maintenance and repair workers, general	1,268,930	357,500	About average growth	\$34,620
Automotive service technicians and mechanics	606,990	181,700	Slower than average growth	35,420
First-line supervisors/managers of mechanics, installers and repairers	427,560	136,500	Slower than average growth	58,610
Heating, air conditioning, and refrigeration mechanics and installers	244,410	136,200	Much faster than average growth	41,100
Bus and truck mechanics and diesel engine specialists	232,810	75,300	Slower than average growth	40,250
Industrial machinery mechanics	276,230	62,400	About average growth	44,470
Electrical power-line installers and repairers	108,980	45,500	Slower than average growth	56,670
Automotive body and related repairers	133,290	43,800	Little or no change	37,980
Aircraft mechanics and service technicians	112,130	31,400	Slower than average growth	52,810
Telecommunications line installers and repairers	162,400	27,900	Little or no change	49,110
Computer, automated teller, and office machine repairers	111,600	26,300	Moderate decline	37,620
Medical equipment repairers	34,550	23,200	Much faster than average growth	42,300
Electric motor, power tool, and related repairers	20,660	9,400	Slower than average growth	36,280
Home appliance repairers	34,670	8,700	Little or no change	34,200
Electrical and electronics repairers, powerhouse, substation, and relay	22,870	6,700	About average growth	62,270
Rail car repairers	20,910	5,900	About average growth	46,460
Motorboat mechanics	18,180	5,800	Slower than average growth	35,430
Camera and photographic equipment repairers	3,290	1,300	Rapid decline	35,420
Radio mechanics	5,690	1,000	Moderate decline	41,060
Watch repairers	2,350	900	Rapid decline	37,680



Repairers provide routine and general maintenance to keep equipment in working order.

Continued from page 27

can have job openings because of the need to replace workers.

What affects job prospects for those interested in repair careers? As with all occupations, many factors—such as shifting consumer tastes, demographic changes, and technological advances—can alter demand for repair workers. Demand for repair occupations is influenced by the likelihood that someone will pay to have a product fixed. Many items are increasingly being replaced rather than repaired. Watches, for example, have become relatively inexpensive and, therefore, more affordable to replace. As a result, watch repairers are not in high demand. Medical equipment, on the other hand, is more costly to replace. And with the rise in baby boomers seeking healthcare services, more medical machinery is needed, which should lead to a greater demand for medical equipment repairers.

So what's a would-be watch repairer to do? Options do exist for aspiring repairers. For one thing, there will be a need to replace workers who retire or leave the labor force. For another, just because many inexpensive watches are being replaced doesn't mean that expensive watches won't need to be repaired. Most importantly, though, many of the skills used to repair one type of item, like watches, can be applied to other repair occupations that are in greater demand.

Three occupations, more than 2 million jobs

For a career with favorable prospects, consider one of the repair careers described below. Collectively, 2.1 million people were employed in May 2009 as automotive service technicians and mechanics; general maintenance and repair workers; and heating, air conditioning, and refrigeration mechanics and installers, according to BLS. And they are expected have more than 675,000 job openings between 2008 and 2018.

Workers in these occupations have similar skills and use some of the same tools, but each occupation involves very different tasks.

Automotive service technicians and mechanics

A car owner brings the vehicle into a garage for a routine service check but mentions noticing that the antilock brake system warning light is on. The automotive service technician begins the inspection by using a computer to look up the required maintenance for that car's make and model. She uses a checklist to ensure that all the necessary work is performed for the service inspection, including changing the oil, checking the car's fluid levels, and examining major components. Using diagnostic equipment, she checks the car's antilock brake system and discovers that the warning light has been triggered by the pump motor, which might need to be replaced.

She then makes a note of this and all other possible issues so that she can inform the car's owner and recommend additional work.

This is a familiar routine for automotive service technicians, who inspect, maintain, and repair cars and light trucks. They provide safety inspections to ensure that vehicles are in good working order and don't pose a hazard on the road. They also perform regular maintenance on vehicles. To complete these tasks, workers might inspect vehicle components, including engines, steering and suspension systems, drive belts, hoses, and batteries.

Some automotive service technicians specialize. For example, front end technicians focus on steering and suspension systems; transmission technicians work on the various parts of automatic and manual transmission systems. Others specialize in vehicles that use fuels other than gasoline, such as diesel or "green" fuels such as electricity and ethanol.

For many technicians, determining the source of a problem is one of the most interesting parts of the job. When identifying a problem, workers get a description from the vehicle's owner and, using their knowledge of how a car works and what might go wrong, they start checking each possibility. A technician might test drive the vehicle to try to reproduce the problem—a noise under the hood, perhaps. Because many parts of modern automobiles are controlled by computers or electronic components, workers often use special high-tech devices to help them identify and fix problems.

Like most repairers, automotive service technicians use pliers, wrenches, and other hand and power tools.



Tools of the trade. Automotive service technicians, like most repairers, work with basic hand tools, including pliers, wrenches, and screwdrivers. They use jacks and hoists to lift up a vehicle so that they can work underneath it. They might use power tools, machine tools, or welding and flame-cutting equipment when installing or repairing parts or systems. They also use computerized diagnostic equipment, including handheld diagnostic computers and diagnostic computers that have been built into the vehicle, to help locate the source of a problem.

Places of employment. In May 2009, according to BLS, 37 percent of automotive service technicians and mechanics worked in automotive repair and maintenance shops. About 31 percent worked for automotive dealers. An additional 16 percent worked for automotive parts, accessories, and tire stores; gasoline stations; and local governments. Some workers are self-employed.

More information. For more information about automotive service technicians and mechanics, see the occupation's profile in the *Occupational Outlook Handbook (OOH)* online at www.bls.gov/ooh/ocos181.htm.

General maintenance and repair workers

It's been a busy week at the local schools. In one auditorium, an upgraded sound system must be installed to replace outdated equipment. At another school, asphalt under the outdoor basketball hoop is cracking and needs to be repaired. Several buildings have loose door hinges that should be tightened. Some of these tasks require simple adjustments; others are more complex. And it's the job of the general maintenance and repair worker to fix them all.

General maintenance and repair workers are jacks-of-all-trades. They help to fix almost any problem inside and outside of a building. For example, they might work on plumbing, electrical, or construction-related tasks. They also maintain and repair machinery and other equipment. And they perform routine preventive maintenance for a building's physical structure and systems.

When maintaining equipment, structures, or systems, workers often follow schedules or checklists to ensure that preventive

maintenance is done thoroughly and regularly. Common types of maintenance include replacing filters and checking fluid levels. Workers also inspect systems for safety. Often, they are required to document their work.

Like other repairers, these workers diagnose and correct problems using their mechanical ability and knowledge of how things work. For more extensive problems, they might plan out a repair project, order or purchase parts and supplies, and consult repair manuals. In some cases, they refer work to others who specialize in a particular type of repair.

Tools of the trade. Because these workers perform such varied tasks, they must be comfortable working with many different tools. They might use hammers, electric drills, and screwdrivers when putting up shelves, walls, or partitions. Or they might use special testing devices to diagnose electrical or electronic malfunctions.

Places of employment. General maintenance and repair workers are employed in many places. BLS data show that in May 2009, about 17 percent worked for firms that lease office buildings and apartments or perform other activities related to real estate. About 8 percent worked for local government. Five percent worked in traveler accommodation, including hotels and motels. And about 4 percent worked in elementary and secondary schools.

For more information. To learn more about general maintenance and repair workers, see the *OOH* profile at www.bls.gov/ooh/ocos194.htm.

Heating, air conditioning, and refrigeration mechanics and installers

A heating, air conditioning, and refrigeration repairer arrives at the first of his residential stops for the day. The gas furnace is having trouble starting up. He knows from his training and the description of the problem that the first thing to do is check the flame sensor. It's dirty, so he cleans it and then asks the customer to turn up the heat while he examines what happens. It looks like a new sensor is needed. But if that isn't it, the job might require something more complicated, such as a new control board. After explaining this to



the homeowner and telling her the cost of a new sensor, he goes out to his truck to get the specific part that's needed for the customer's heating unit. He then takes out the old sensor, installs the new one, and enters the details of the job and the customer's payment method into a portable computer.

A number of things can go wrong with the systems that heat or cool commercial and residential buildings. Heating, air conditioning, and refrigeration mechanics and installers troubleshoot and identify the cause of these problems and then properly maintain the systems to avoid future malfunctions. These workers—who are also called heating, ventilation, and air conditioning (HVAC) repairers—also install these systems, usually following blueprints and manuals.

When performing routine inspections, these workers might replace filters, clean ducts, or adjust burners and blowers. They might also test the heating or cooling unit to be sure that it is operating correctly. When locating the source of a problem, workers apply their knowledge of how systems work to figure out which parts need replacement or repair. They might, for example, repair or replace nonfunctioning components or wiring.

Some of these workers focus on heating units; others focus on air conditioning and refrigeration equipment. Workers can also specialize in a particular type of unit, such as oil-burning or gas-burning furnaces.

General maintenance and repair workers diagnose problems using their mechanical ability and knowledge of how things work.

Training, licensure, and certification are important for many careers in repair.



Tools of the trade. Workers use common hand tools, such as wrenches or pliers, to perform tasks such as adjusting system controls or installing thermostats. Other tools that are used when working with air ducts or refrigerant lines include pipe cutters and benders, hammers, and acetylene torches. Special testing devices verify that burners, electrical circuits, and other parts of the system are safe and working properly.

Places of employment. Plumbing, heating, and air-conditioning contractors employed 65 percent of all heating, air conditioning, and refrigeration mechanics and installers in May 2009, according to BLS. Other employers accounted for smaller percentages of total employment. For example, about 5 percent of workers were employed by direct selling establishments, such as those companies that deliver home heating fuel. And about 3 percent worked for merchant wholesalers of hardware, plumbing, and heating equipment

and supplies. Some workers are also self-employed.

For more information. See the *OOH* profile for heating, air conditioning, and refrigeration mechanics and installers online at www.bls.gov/ooh/ocos192.htm.

Getting your career up and running

Most repair jobs don't require a 4-year college degree, but they do have some specific requirements. Skills, training, and licensure and certification can be important for many repair careers.

Skills

Basic repair skills are essential for fix-it workers. These skills include good mechanical ability and being adept at working with your hands and with a variety of tools and technologies. Troubleshooting skills are also important because workers must be able to quickly and efficiently diagnose the source of a problem. Analytical skills, reasoning ability, and creativity also help in determining what needs to be fixed and how best to fix it. Moreover, repairers need excellent communication skills to be able to explain problems and possible solutions to customers and employers.

Training

Most repairers benefit from having at least a high school education or its equivalent, such as a GED. Some go on to complete other educational programs.

High school. In high school, repairers learn many subjects that they can later apply to their careers. For example, they might use basic math, such as addition or multiplication, when determining the cost of repairs. Or they might use geometry and algebra to calculate the sizes and positioning of ductwork when installing a heating or air conditioning system.

Reading and writing abilities are needed to understand repair manuals, keep current on the latest technologies and repair techniques, and document work that has been done.

Sciences, such as physics, can be helpful for understanding electrical circuits or hydraulics in automobiles, for example. And working knowledge of computers, such as being able to navigate through Web pages and locate information on a computer, is also helpful.

Other, more specialized, high school courses that are helpful for repairers include mechanical drawing, blueprint reading, electrical or electronics training, and automotive classes. High schools might also offer vocational-technical programs to help prepare students for a career in repair. For example, some high schools have programs in automotive repair that are run in conjunction with the Automotive Youth Education Service, a program linking schools with car dealers and manufacturers.

Formal training beyond high school.

After high school, many repairers earn an associate degree or complete postsecondary vocational training. And many employers prefer to hire workers with formal training. These programs, offered at junior or community colleges and trade or technical schools, usually combine classroom learning with hands-on experience.

Sometimes, product manufacturers or dealers have specialized training programs, such as those offered by automobile manufacturers. The U.S. Armed Forces may also provide training opportunities for repairers, such as in machine operator and production occupations that train personnel to operate equipment, machinery, and tools for repair.

On-the-job learning. In addition to formal training, repair workers learn much of what they do on the job. General maintenance and repair workers, for example, often start out as helpers to other more experienced workers, slowly increasing the complexity of their tasks as they learn specific repair techniques. Sometimes, this experience takes the place of education. Other times, education and experience are combined.

Apprenticeships are common in some fields. Heating, air conditioning, and refrigeration mechanics and installers, for example, often learn their jobs in this way. Registered

apprenticeship programs are frequently conducted through partnerships with unions or trade associations, such as the United Association Union of Plumbers, Fitters, Welders, and HVAC Service Technicians. Such programs can last between 3 to 5 years and involve both technical instruction and paid on-the-job training. (For more information about registered apprenticeships, see the Grab Bag item on page 24 in this issue of the *Quarterly*.)


Workers also must learn proper safety procedures to avoid injuries, especially when working around heavy equipment, power tools, or electricity.

Licensure and certification. Some repairers, such as general maintenance and repair workers who perform electrical or plumbing work, might require licensure, depending on their employer or the State or locality in which they work. Other repairers benefit from optional certification, which shows an added level of expertise. Automotive service technicians and mechanics, for example, often choose to become certified in one or more specialty areas. Certification offered through the National Automotive Technicians Education Foundation involves passing an exam and having 2 or more years of experience.

For more information

In addition to occupation-specific information cited for the three repair careers described in this article, general information is also available. For information on repair careers, visit your local library or One-Stop Career Center. Locate a career center near you by going to **www.servicelocator.org**. The *OOH*, available online at **www.bls.gov/ooh**, is also in print in many public libraries and career centers.

Detailed, up-to-date employment and wage data for installation, maintenance, and repair occupations are available on the Occupational Employment Statistics program's Web site at **www.bls.gov/oes/current/oes490000.htm**.

And for a look at the repair and maintenance industry by the numbers, visit **www.bls.gov/iag/tgs/iag811.htm**. 



You're a *what?*

WIND TURBINE SERVICE TECHNICIAN

Drew Liming

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After 4 years in the Air Force, Brandon Johnson was seeking a new job. He found what he was looking for when one possibility—a career as a wind turbine service technician—blew him away.

Wind turbine service technicians, also called wind techs, repair and maintain the complicated machinery inside wind turbines. Repairs include everything from fixing circuit boards and motors to inspecting turbine blades to replacing generator components. Maintenance involves more routine tasks, such as replacing light bulbs inside the turbine. “There’s a lot of variety in the work I do,” says Brandon. “No day is the same as the one before.”

As the lead technician on a wind farm—an area where a group of wind turbines produces electricity from wind power—Brandon

consults an internal Web site to check the status of each of the farm’s turbines. He and the site supervisor assign jobs to the other wind techs, usually at a morning meeting. With roughly 1 technician for every 10 turbines, and each turbine containing many intricate pieces, there’s a lot of work to be done on the farm.

The basic parts of a wind turbine are the tower, the blades, and the nacelle. The nacelle is a rectangular box resting atop the tower that houses the turbine’s gears, drive shaft, generator, and other mechanical and electrical components. Wind techs service the blades or nacelle by entering the turbine through the base of the tower and climbing a ladder or riding an elevator up through the tower shaft. When working outside of the nacelle—repairing the sensors that measure wind speed

and direction, for example—wind techs are suspended hundreds of feet in the air. The risks of operating at high elevation mean that they must take precautions to stay safe on the job. Standard safety procedures include ensuring that turbines have been turned off before entering them, having at least two technicians work together, and requiring that they wear gear such as safety harnesses, hardhats, and safety goggles.

Other risks may arise from one job to another, so the morning meetings at Brandon's worksite are also used for daily safety briefings. Technicians fill out job preparation sheets and receive warnings about potential hazards so they can plan additional precautions. For example, wind techs scheduled to work on high-voltage assignments wear special suits for added protection.

Safety isn't the only concern for most of these workers, however. Nacelles are compact, and working in one requires wind techs to maneuver in cramped spaces. Technicians must also be available to work at all times to keep turbines running. Brandon admits that the hours can be difficult sometimes. "You're like a doctor—a turbine doctor," he says, "and when you're on call, even if it's midnight, you have to respond."

Wind turbine service technicians are employed by many different kinds of companies, including energy providers, manufacturers, and project developers. Brandon works for a turbine manufacturer that provides turbine technicians for a wind farm while the turbines are under warranty. He speaks regularly with company engineers to troubleshoot problems or to offer design feedback based on his observations in the field. Input from experts like Brandon helps the manufacturer improve its design and keep the turbines running smoothly.

Regardless of who their employer is, most wind techs work at wind farms in the Midwest, Texas, or California. These farms are frequently in remote locations, but opportunities exist for wind techs to leave the site and travel. Some technicians are attached to a specific farm; others travel routinely from

site to site, staying stationary only for brief periods.

Brandon received his training as a wind tech through a program at Iowa Lakes Community College in Estherville, Iowa. Because of the complexity of the electrical and mechanical systems inside turbines, prospective wind techs learn about electrical theory, motors, generators, and hydraulics. Brandon also received hands-on knowledge working on school-owned turbines and blades and touring manufacturing facilities.

The wind industry is relatively new, so there are currently no standard certifications for wind turbine service technicians. Completing a training program, like the one Brandon attended, should improve jobseekers' chances of getting hired but isn't always required to find work in the occupation. Many companies seek new employees who have electrical experience, and they offer on-the-job training to instruct technicians in the particulars of wind turbines.

The U.S. Bureau of Labor Statistics does not yet collect data for wind turbine service technicians. According to anecdotal information, entry-level wind techs earn around \$15 per hour. As they gain more experience, workers can take on more management responsibilities to become lead technicians. These technicians, including Brandon, have paperwork and site-safety duties in addition to their repair and maintenance work. But experienced technicians earn significantly more: up to \$50 an hour.

According to the American Wind Energy Association, the amount of energy provided by wind turbines grew by 39 percent per year from 2004 to 2009. As new turbines are constructed, new opportunities for turbine technicians should follow.

With career opportunities come chances for personal advancement—including the occasion to interact with new people in a growing global market. "It's a very diverse group," says Brandon of the wind-energy workforce, "and we have a great opportunity to learn from each other. Everyone brings different strengths to the industry."





Temporary measures


Does good news for temporary workers today suggest better news for all nonfarm workers tomorrow? Data on temporary help services employment from the U.S. Bureau of Labor Statistics (BLS) suggests that it does. These data—often viewed as an indicator of broad future employment trends—have been climbing steadily for much of the past year.

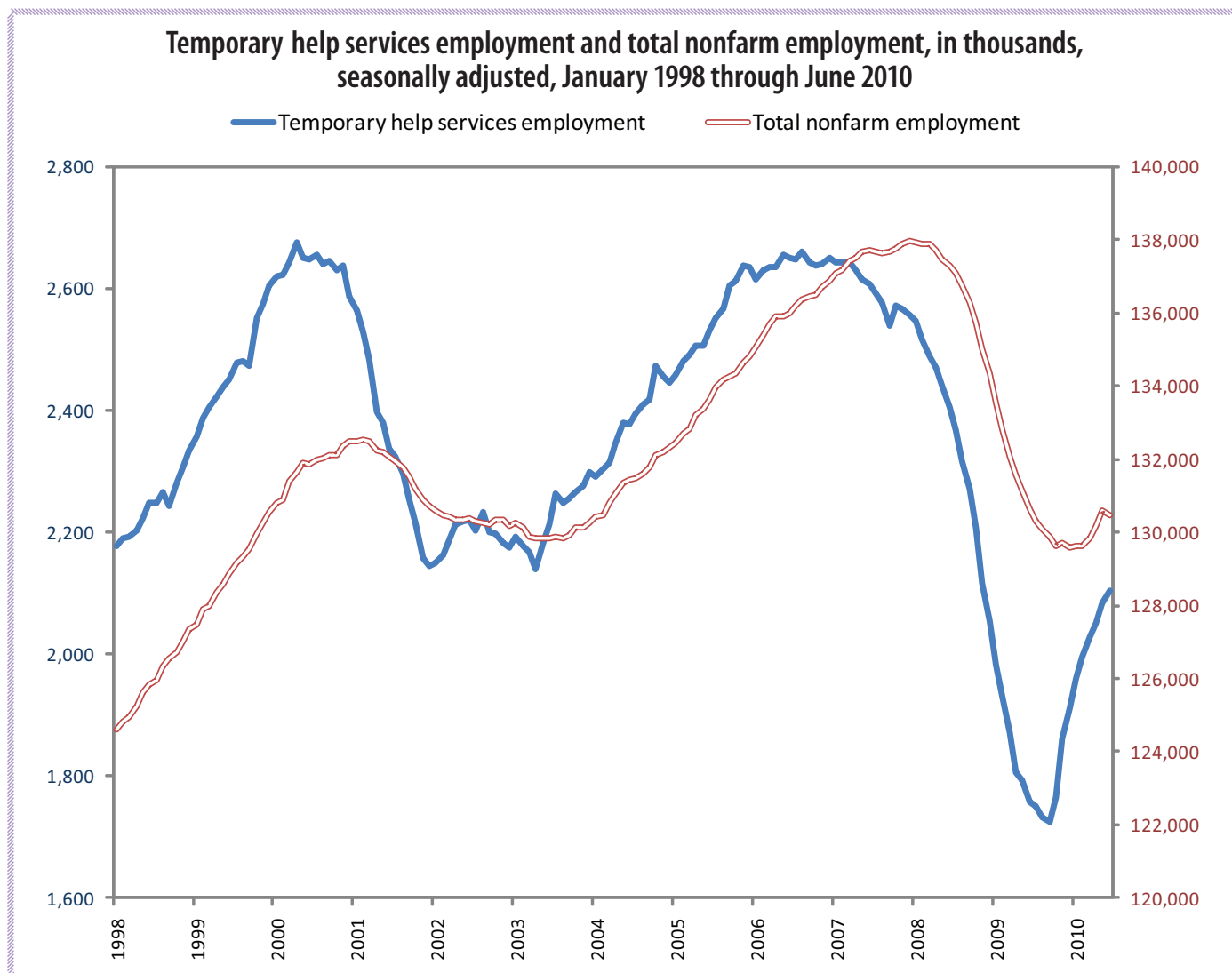
In times of economic uncertainty, firms are often hesitant to hire or fire permanent employees. Many businesses, therefore, first respond to changing demand for their goods or services in other ways. One method is to alter the length of the workweek of current employees. Another method, shown in the chart, is to increase or decrease the use of temporary workers.

Temporary help service companies provide temporary workers (also called temp workers, or temps) to their clients, usually as a supplement to the client's permanent workforce. Temp workers are employees of the temporary help supplier and have no permanent

relationship with the client. This flexible arrangement allows the client to quickly add or subtract workers in response to changing business conditions. At economic turning points, many businesses tend to increase or decrease their use of temps before they hire or terminate permanent employees. Thus, employment in the temporary help industry tends to lead total nonfarm employment, a measure used by economists to determine the economic health of a nation.

In recent cycles, as the chart shows, job losses in temporary employment began more than a year before those in total nonfarm employment. The lag during recoveries, however, has been much shorter, with gains in total nonfarm employment beginning just 3 or 4 months after those in the temp industry.

These data are from the Current Employment Statistics Survey. For more information, call (202) 691-6555 or visit online at www.bls.gov/ces. 



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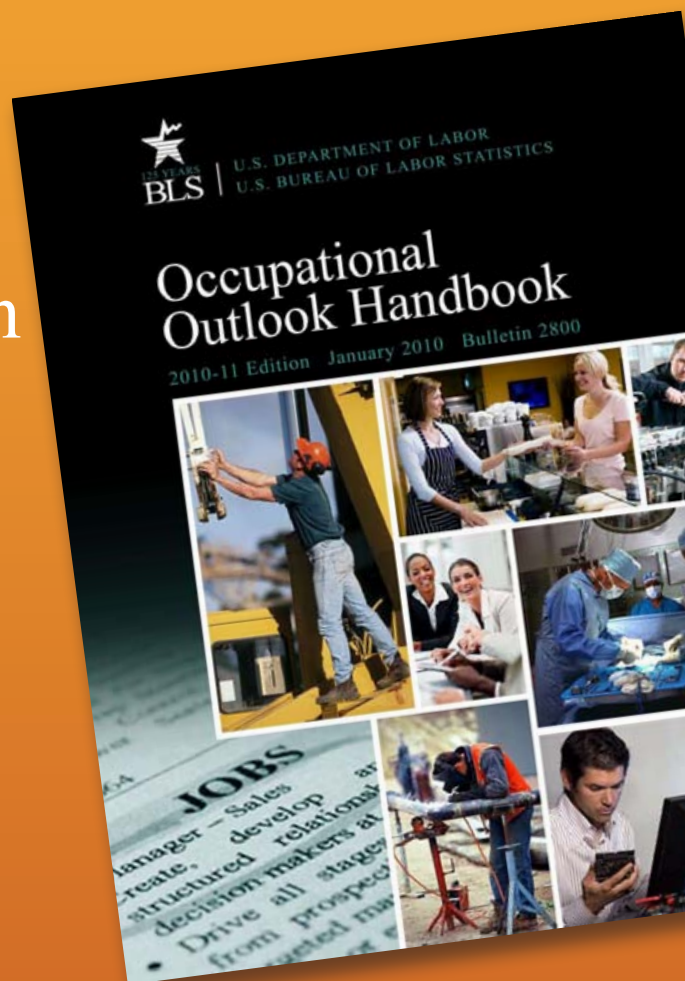
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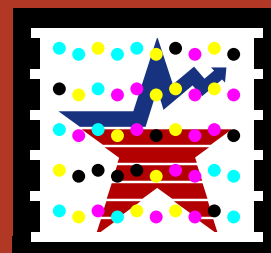
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