the missouri green jobs report

Missouri Economic Research & Information Center

MISSOURI

Department of Economic Development

A REPORT BY:

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Foreword

Much has been written and said about the emerging "Green Economy" and about the growing number of "green job" opportunities that are becoming available. But what exactly are these opportunities, particularly for the future prosperity of the state of Missouri and for the immediate and long-term job prospects of Missourians?

Although there are many definitions that exist for what might be included as part of a green economy, the key unifying ideas behind them are (1) we are living in a time of increasing resource scarcity; (2) we need to adjust the way we live our lives, especially with the energy & commerce it takes to support our current lifestyles; because (3) we are:

- Doing great harm to the environment;
- Ensuring future generations will have a worse standard of living;
- Driving the prices we pay for goods and services sky high (like we saw with gas prices not too long ago);
- Creating more insecurity in the world as we battle for limited resources; or
- A combination of all of the above.

So (4) we need to marshal and conserve our planet's precious resources while also (5) looking to develop new forms of energy and new types of products that will allow us to maintain economic growth and our desired standard of living.

The idea of "Green" then touches on all of the major sectors of our existing economy, especially Renewable Energy Generation; Energy Efficiency; Agriculture and Forestry; Transportation; Manufacturing; Research, Design, and Consulting; Recycling and Waste Reduction; Green Construction; Energy and Carbon Capture; Energy Trading; Environmental Protection; and Government and Regulatory Entities.

This vastness makes building the Green Economy a very promising economic development strategy. Missouri is already on the cutting edge of the new Green Economy in many places around the state, with primary and supporting green jobs accounting for a sizeable 4.8 percent of total employment.

Moving forward, green jobs are expected to grow at a far faster rate than other types of jobs within our state. These added career prospects for Missourians will come in three forms: (1) as an increased demand for existing occupations; (2) those requiring changes to the types of skills needed to be successful in current occupations; and (3) entirely new jobs that are, or will be, needed to meet the unique labor force needs of a greening economy.

A recent study prepared for the U.S. Department of Labor found that 64 current occupations qualified as "green increased demand" occupations. Included among these are agricultural inspectors, chemists, electricians, welders, material scientists, carpenters, and industrial engineers.

Another 60 occupations were found to be "green enhanced skills" occupations, where the purpose of the occupation remains the same but the tasks, skills, knowledge, and need for new credentials will change. Landscape architects, building inspectors, plumbers, roofers, transportation managers, and farmers are included in this grouping.

Finally, a full 91 occupations were identified as "green new and emerging occupations," having been 'born' from the activities and technologies being generated by the green economy and having significantly different work and worker requirements from any occupation that currently exists. These new occupations and career choices include: Bio-fuels production managers, energy auditors, carbon capture & sequestration system installers, industrial ecologists, precision agriculture technicians, sustainability specialists, and wind turbine service technicians.

Given where we are today and in light of mounting trends, embracing our "greenness" offers tremendous opportunities, not just to protect our planet, but to promote the economic prosperity of the state of Missouri and to secure the high-quality standard of living we desire for this and future generations of Missourians.

Marty Romitti

Marty Romitti, Ph.D.
Director of MERIC

Executive Summary

What is the green economy and how do you define green jobs? How many green jobs are located in Missouri and what skills do they require? This report constitutes Missouri's first survey of green-identified industry sectors and quantifies the number of green jobs in the state. In addition, the report focuses on the number and characteristics of green occupations in Missouri including the in-demand skill sets required for maintaining a just-in-time talent pipeline for green industry sectors.

Missouri defines green jobs as those directly involved in generating or supporting a firm's green-related products or services. The state's green economy is defined as being comprised of industries that provide green products or services in six areas: Energy, Manufacturing, Building, Farming, Salvage/Remediation, and Government.

Survey Findings

- Missouri boasts 131,103 total green jobs—both primary and support positions—among employers. There are 28,720 primary green jobs and 102,383 green supporting jobs.

- A majority (71%) of employers surveyed stated that current economic conditions were the largest barrier toward hiring additional green workers. This finding highlights the potential for growth in Missouri's green economy as national recovery efforts help to mitigate the downward spiral of employment in the next few years.

- Almost 80% of employers in the survey stated that they utilize in-house classrooms or on-the-job training to train workers in green jobs. Surveyed employers also indicated that the top three skill sets needed for future green workers are waste minimization, pollution reduction control, and principles of energy conservation.

- The survey estimated green employment for 160 detailed occupations. Occupations that represented the largest share of primary green employment include: refuse and recyclable material collectors, chemical technicians, plumbers, refrigeration mechanics and installers, and architects.

- Primary green occupations with the most opportunity for growth through 2016 include construction managers, environmental engineering technicians, operating engineers, electricians, environmental engineers, and pipe layers. The occupations cited span a variety of education and skill levels.

Introduction

Missouri's Green Economy

The passing of the 2009 American Recovery and Reinvestment Act ignited a national conversation about the green economy that includes industry sectors such as renewable energy and weatherization. Transitioning to this new economy with an increased number of green jobs will be essential for Missouri's economy as policy shifts, technology advances, and economic conditions change in the next few years. This new economic landscape will alter the way businesses and homes are constructed and powered, workers are educated and trained, and how industries adapt.

The green economy in Missouri will consist of new jobs, transition jobs, and displacing some existing jobs.

Not all the green jobs of the future will be new jobs. Many will be transition jobs and some will displace workers currently employed. Transition jobs will consist of those traditional occupations that may require an additional layer of green skills or knowledge. For example, welders may need to learn new skills for manufacturing a wind turbine or construction workers may need to use renewable materials for building homes and businesses. Workers such as these will experience the most seamless transition from traditional occupations to the new green economy.

An example of how policy shifts can displace existing jobs can be seen in the altering landscape of energy generation in Missouri with the voter-approved Missouri Clean Energy Initiative. The Initiative mandates that the state's investor-owned utilities get 15 percent of their electricity from clean, renewable energy sources. Job displacement may occur in industries like mining or extraction of natural resources as more energy is generated or purchased for renewable sources. Likewise, a percentage of workers, either through lack of current skill or the desire or ability to learn new skills and knowledge, will not transition to jobs in the new green economy either. Rather, these workers will be displaced by the workers who learn new skills and knowledge presented by the technological advancements occurring in green energy, manufacturing, building, and farming.

All of these changes underscore the need to develop timely baseline information about green industries in Missouri and the mix of occupations and skill sets within each sector. Traditional information sources and databases do not currently capture detailed information about the number of green jobs in Missouri. Additionally, the current lack of nationally standardized definitions of green industries and occupations has allowed different studies to produce different estimates of the present green economy.

This analysis focuses on the industries and occupations that constitute Missouri's green economy. Specifically, this report highlights findings from the first survey of Missouri employers that quantifies the number of green jobs in the state.

The report also focuses on the number and characteristics of green occupations in Missouri including the in-demand skill sets and education and training required for maintaining a just-in-time talent pipeline for green industry sectors. Such information will hopefully provide policy makers and other stakeholders at a statewide and regional level with a better understanding of the breadth and impact of the green economy on all Missourians.

Defining Green Jobs: What Does "Green" Mean?

As government and businesses alike continue to search for ways to spur economic growth, a lot of the focus has been on the creation of green jobs. While no official definition for green jobs exists, a green job can be generally thought of as one in which the ultimate outcome directly or indirectly creates a positive impact on the environment.

In this study, the following definitions are used:

Green Economy – Includes industries that contribute to at least one of the following:

- The conservation of energy (energy efficiency). Examples include jobs that are related to the manufacturing of hybrid vehicles, energy-efficient appliances and jobs involved in green-building projects.
- The creation of renewable energy. Examples include jobs related to wind energy, solar energy, and biomass energy.
- Organic food production. Jobs involved in the production of food that adheres to the USDA definition of organic foods production.
- The reduction (or elimination) of the direct negative impacts a product, company, or individual may have on the environment. This includes jobs related to the reduction of industrial emissions (and on a larger scale, the elimination of global warming), jobs involved in recycling, and jobs related to wastewater treatment.
- The reduction (or elimination) of the direct negative impacts the environment may have on an individual. This includes jobs related to the remediation of hazardous sites.
- Research and development devoted to supporting any of the aforementioned functions of a green job.

Green Jobs – Primary and support occupations engaged in generating a firm's green-related products or services.

Green Industries – An industry sector that is likely to contain firms that produce parts, components, products, or services related to the green economy. Industries and firms were classified as green-related based on their primary product or service; not based on whether they were taking internal steps to use less energy or be more environmentally responsible.

Existing Research on Missouri Green Jobs

A literature review of existing studies on green jobs was conducted by MERIC staff during the development of this study. The final survey instrument used in this study was developed in part from survey designs developed by the State of Washington as well as a draft instrument developed by the State of California. Methodological design was developed in part from studies by the States of Washington and Michigan. Efforts were made to create a methodology that could be easily replicated by other state labor market information offices for comparability across regional and state geographies.

Several prior research studies have been conducted to attempt to measure green employment in Missouri. Three examples of such studies are highlighted below:

The Pew Charitable Trusts released a study in June 2009 entitled *The Clean Energy Economy – Repowering Jobs, Businesses and Investments Across America.* This study estimated the number of green jobs in Missouri to be 11,714 out of an estimated 770,385 jobs nationwide in 2007. The study also estimated that green jobs in Missouri constitute only .37% of the total economy and have grown at an average annual rate of .71% since 1998. These jobs estimates were based on data from the National Establishment Time Series (NETS) Database as well as data gathered from an internet search for green establishments.

Another study that attempted to measure green jobs in Missouri was a report in 2008 for The United States Conference of Mayors entitled *U.S. Metro Economies – Current and Potential Green Jobs in the U.S. Economy* conducted by Global Insight. The report estimated the number of current green jobs among Missouri metro areas to be 9,317 out of an estimated 751,051 jobs nationwide. The study also forecasted green employment by state and estimated a potential job creation of 73,721 paritions in Missouri by the year 2038. The estimates of existing and potential green jobs were based on a set of assumptions of market forces and new state and federal policies. The job estimates in this study also include both direct and indirect green jobs.

A third study by the Center for American Progress and the Political Economy Research Institute was released in June 2008 entitled *Green Economic Recovery Program – Impact on Missouri.* The estimates in this study were based on an assumed impact of $1.8 billion in national green recovery program investments in energy efficient building retro-fitting, mass transit and freight rail, smart grid, wind/solar power, and advanced bio-fuels. The study estimated Missouri's net job creation at 43,047 throughout private and public sectors. No estimate of current Missouri green jobs was presented.

Research Approach

This study estimates the number of green jobs in the Missouri economy via an employer survey. The survey was conducted in the third quarter of 2009 by the Missouri Economic Research and Information Center, the research arm of the Missouri Department of Economic Development. This survey constitutes the first effort in the state to survey employers to measure the number of Missouri green jobs.

The ability to collect primary data from Missouri employers was crucial toward understanding the green economy due to the extreme difficulty of producing accurate employment estimates with existing information sources. Specifically, it was important to analyze the share of employment within green industries that was directly tied to the green economy. The survey was also critical toward understanding employer expectations for future employment, green-specific skill sets, wages offered, and methods utilized for employee training. Most importantly, the survey allowed employers to classify their workers by primary and support green employment to distinguish between those jobs whose primary functions are tied to the new green economy.

For primary green occupations detailed employment estimates and trends about education and training as well as wages offered were collected and estimated for the state. Such information is critically important for informing policy makers for workforce development efforts and alignment of education and training offerings in order to meet the demands of Missouri's growing green industry sectors.

Defining Green Industry Sectors in the Missouri Economy

The green economy in Missouri is comprised of the following six sectors:

Energy Production
New renewable energy initiatives are expected to drive green energy production and purchasing well beyond existing capacity. As population and industry demand for megawatts increase, so too will Missouri's need to create jobs in Wind, Solar, Hydro-Electric, Bio-Mass, and Bio-fuel energy production.

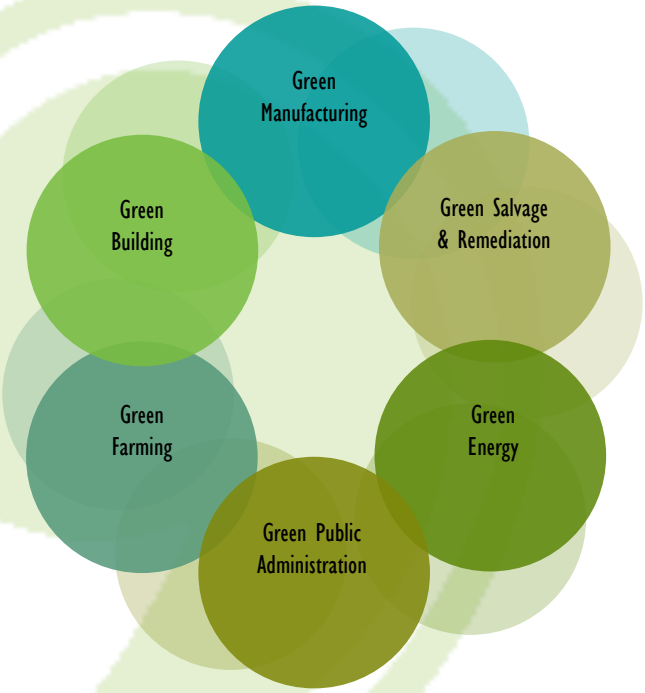
Building
Energy Efficiency and the long term cost savings provided by green building products will continue to appeal to consumers and industry alike. Missouri has the opportunity now to transition its construction related workforce over to a profitable industry which may one day completely replace traditional building practices.

Manufacturing
Research, Development, and Production of advanced green technology products are the most fundamental drivers of green job creation in Missouri. Potential global demand for this sector's exports is staggering. Growing and keeping entrepreneurship within these technology categories will reap only positive benefits for the state.

Salvage/Remediation
The supply chain of green energy, building, and manufacturing products relies on efficient processing of waste materials. The conversion, distribution, and sale of recycled raw materials create jobs integral to the green economy. The removal of hazardous materials and remediation of building sites is also important to sustaining our existing communities and improving the quality of life for Missourians.

Public Administration
The administration of federal, state, and local green initiatives will create jobs at all levels of government. Conservation, regulation, certification, incentives, and economic development are major areas of interest in the public governing and utilities sector.

Farming
The production of bio-fuel inputs will help to reduce our reliance on fossil fuels in the future. More efficient cellulosic bio-fuel crop sources will expand the available production acreage in Missouri and fuel new farming jobs. In addition, the number of organic farms is on the rise in Missouri. Smaller lots can support niche organic heirloom crops and also add to production acreage in the state resulting in new income to Missourians. Green forestry certification is another opportunity to brand the state as green friendly and be included in the LEED approved wood products supply chain.



Green Energy

Important industries currently developing greener processes in energy production include clean coal and nuclear energy. These industry jobs have not been included in this section because they do not currently fall under the renewable energy definition within the Missouri Clean Energy Initiative mandate.

Missouri's Energy Generation with Green Resources

Green Energy is the conversion from conventional sources of energy to the technology and development of renewable, clean energy resources. In Missouri, the greatest potential to supplant conventional sources of energy with clean, renewable energy sources comes in the following forms: Biomass, Hydroelectric, Solar, and Wind

Energy Cluster

The Green Energy industry includes jobs found in energy production and generation activities, power distribution and plant operations, turbine power generation, installation, repair and electronics for windmills, and bio-fuel manufacturing.

Mandate Creates New Job Demand

The Missouri Clean Energy Initiative, passed in November 2008, mandates that Missouri investor-owned utilities get 15 percent of their electricity from clean energy sources, such as wind, solar, and biomass by 2021. Currently, less than 2 percent of Missouri's electricity is generated from renewable sources, and the majority of that is from conventional hydroelectricity generation. The state currently relies heavily on coal (82%) to power its electric grid, followed by nuclear (10%) and natural gas (5%). Requirements in this initiative will be a gradual phase-in beginning with a 2 percent renewable requirement in 2011, 5 percent in 2014, 10 percent in 2018, and no less than 15 percent in 2021 and thereafter.

The renewable sources defined in the initiative requirements are wind power, solar thermal power, solar photovoltaic power, small hydropower, a variety of biomass energy sources, and fuel cells powered by hydrogen from renewable energy sources, but it also allows the Missouri Department of Natural Resources to designate new renewable energy sources as technology develops. With these requirements comes great opportunity to expand and grow new green jobs of the future for Missourians. Many of the green jobs in the energy sector, along with all sectors will not be so much new occupations but rather traditional occupations that may require additional training in green skills and knowledge. For example, with some additional training, workers could transition from an electronics engineering technician or industrial machine mechanic to a wind turbine service technician or from a roofer or installer to a solar photovoltaic installer.

The voter-approved mandate for moving to clean, renewable sources of energy in Missouri will drive employment in green energy in the state. For example, the requirement in the Missouri Clean Energy Initiative which states that at least 2 percent of the required 15 percent of electricity must come from solar has the potential to grow this sector rapidly. Additionally, energy customers can take advantage of rebates in this initiative and incentives in other legislation. In the Missouri Clean Energy Initiative, utilities are required to offer their customers a rebate of $2 per watt of customer-owned solar power systems, up to a limit of $50,000.

Top Missouri LEED Certified Occupations

Architect	419
Mechanical Engineer	104
Project Manager	85
Civil Engineer	30
Electrical Engineer	29
Consultant	29
Structural Engineer	27
Builder	26
Landscape Architect	26
Construction Manager	23

Compliance with the mandate can be achieved through the generation of renewable energy or renewable energy credits (RECs). So, Missouri's investor-owned utilities will have the option of either producing more renewable energy or purchasing it through neighboring states. One viable option to account for much of the 15 percent mandate appears to be wind energy.

The potential in Missouri to generate its own renewable energy from wind exists, but the state currently lags behind its neighbors. The current wind generation capacity in Missouri is 162 Megawatts (MW), while neighbors such as Iowa (1,294 MW), Illinois (735 MW), Oklahoma (689 MW), and Kansas (465 MW) have five to ten times the generating capacity.

Green Building

Meeting Future Housing Demand and Renovation with Green Building Practices

Definition

Building Green

- Uses environmentally friendly materials and methods for residential and non-residential infrastructure
- Converts existing property to lessen negative impacts on the environment
- Provides healthy living spaces
- Converts sustainable or renewable resources into energy
- Replenishes resources such as water and oxygen

Building Cluster

The Green Building industry includes jobs typically found in construction related activities, house shell manufacturing, household appliance manufacturing, design and remodeling services, and remediation services.

New Versus Transition Jobs

Green jobs found in this sector are primarily transitional jobs from existing construction demand. Some companies specialize in green building and use specific skills related to working with green technology. However, many of those employed in the building cluster use green skills and materials interchangeably with materials and skills considered outside of the green standard.

New construction skills and design methods have brought about actual new jobs within this industry in the areas of energy efficiency and renewable energy production involving both retrofitting existing buildings and adding optional components in new buildings.
Alternatively, some industries have traditionally been green. Contractors involved in glazing and insulation, manufacturers of reconstituted wood, building inspectors, and remediation specialists are green by job description. These businesses are already an entrenched part of the existing building cluster. However, future incentives, regulation, and certification may have a substantial effect on demand for these occupations.

Green Building Job Certifications and Trainings

Green building jobs usually require an additional certification for higher level occupations. Those involved directly with construction and design would benefit from the LEED accreditation.

U.S. Green Building Council - Leadership in Energy and Environmental Design (LEED)
LEED is a third-party certification program and the nationally accepted benchmark for the design, construction and operation of high performance green buildings. Missouri currently has over 1,300 certified LEED professionals equal to 2% of all certified LEED professionals in the U.S.
http://www.gbci.org/

DNR Home Energy Auditor Certification
- http://www.dnr.mo.gov/pubs/pub2292.pdf

Green Manufacturing

Missouri's Strengths Going Forward

Green Manufacturing is the research, development, and production of materials, parts, and final products within the following categories: Energy Efficiency, Health, Renewable Energy, and Safety.

Manufacturing Cluster

The Green Manufacturing industry includes jobs found in engineering, research and development firms, and across nearly all manufacturing sectors.

New Versus Transition Jobs

Green jobs found in the engineering and production sectors of traditional products, such as household appliances, are primarily transitional jobs. Jobs within these industries design modifications or exchange the use of material inputs to a product but do not typically add new jobs. In some cases, the design, assembly and installation of the green product requires additional training and certification.

In Missouri, new jobs are being created in the fields of solar photo-voltaic technology, battery development and production, vehicle efficiency, health and energy nanotechnologies, wind energy components, and recyclable material products. The new jobs generated in these fields typically require degrees in engineering, math, and science related occupations. More established technologies within these fields demand skilled assembly workers and knowledgeable management occupations.

Green Public Administration

Managing the Conservation Effort

Green Public Administration is the execution, oversight, and operational management of public policy in the areas of: Environmental Conservation, Green Building, Resource Management, and Energy.

Green Public Administration Industry

The Green Public Administration industry includes jobs typically found in local, state, and federal government or in contracts related to government policy.

New Versus Transition Jobs

These jobs are typically a function of public policy and result in very little displacement; as they are primarily added on top of existing industry growth. Existing jobs can be transitioned as different political emphasis, technology, and legal requirements are put in place. Job growth in this sector is considered primarily new. Jobs generated in these fields require a mix of degrees in engineering, science related occupations, conservation, water and waste management, and law. Other positions within this sector can include post-secondary degrees and/or trade applications with specialized emphasis in green policies and skills.

Green Salvage/Remediation

Recycling Our Resources

Green Salvage/Remediation is the process of renewing resources through: Material Extraction, Environmental Cleanup, Re-use, and Product Conversion.

Green Salvage/Remediation Industry

The Green Salvage/Remediation industry includes jobs found in waste management, environmental engineering, chemistry, salvage, and maintenance occupations.

New Versus Transition Jobs

Currently, this cluster displaces very few Missouri jobs in other sectors. However, the demand for recycled material could potentially replace a small number of mining jobs as salvage extraction processes improve and manufacturing begins to incorporate more recycled supply within products. Jobs are expected to be transitioned somewhat within the salvage sector from landfill dumping to separation and extraction recycling facilities.

For the most part, Green Salvage will only create new jobs. Waste and scrap are hot commodities exported internationally and industry demand is expected to increase in the United States as well. Remediation services and hazardous waste disposal are also important growing sectors in the state. Missouri's Brownfield Tax Credit program creates jobs in remediation and allows the opportunity for land to be re-used in a productive manner and reduces the level of blight in a community.

The new jobs generated in these fields require a mix of degrees in engineering, science related occupations, and waste management. Other skilled and unskilled material extraction occupations are also important in this industry.

Green Certification and Trainings

Environmental Security Technology Certification Program (ESTCP) – www.estcp.org

Missouri DNR Resource Recovery Certification – www.dnr.mo.gov/env/hwp/permits/types.htm

International Organization for Standardization Environmental Management Systems Standards (ISO 14001) – www.iso.org

Green Farming

Missouri Fields of Dreams

Green Farming falls into the following classifications: Organic/Free Range Food Production, Forest Preservation, Renewable Energy Resource Production.

Green Farming Industry

The Green Farming industry includes jobs found in agriculture and forestry. Green farming represents jobs in crop production for bio-fuels as well as Organic farms and Forest Stewardship Council certified foresters.

New Versus Transition Jobs

Jobs found in renewable energy resource production mainly displace other crop farming occupations. With a limited number of acreage available to farm, crop producers essentially trade food customers for bio-fuel customers. As cellulosic ethanol technology becomes more efficient, the possibility to expand the number of farming acres in Missouri would exist. Cellulosic plants such as switch grass can grow in places where other crops cannot. Jobs created from farming this added acreage would not displace other farming occupations.

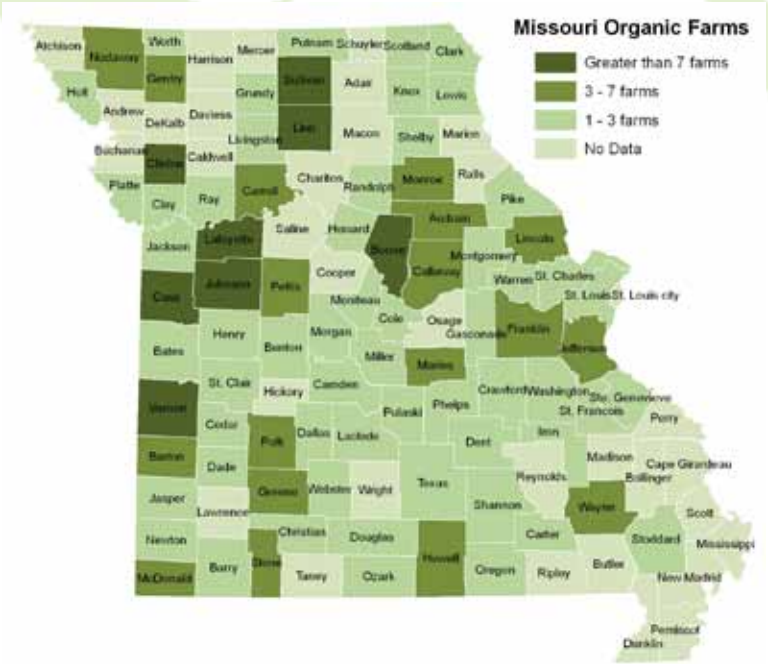
With the popularity of farmer's markets, organic farms have been increasing in number over the past few years. Many of these farms are smaller than the average non-organic farm and in many cases can add to the total acreage in the state by taking advantage of lots previously seen as too small to farm. Of course, the volume of output is lower as well; indicating that jobs in this sector may often be part-time or supplementary positions.

Job growth in this sector is considered primarily transitional. Jobs generated in these fields require a skilled knowledge of agriculture and forestry methods.

Missouri Organic Farm Locations

In Missouri, organic farms tend to cluster around metropolitan areas. Here the industry benefits from farmer's market and food manufacturing plants often situated within the nearby urban areas.

In addition, these farms are also located close to distribution modes for faster shipping of perishable products.



Missouri Green Jobs Survey Results

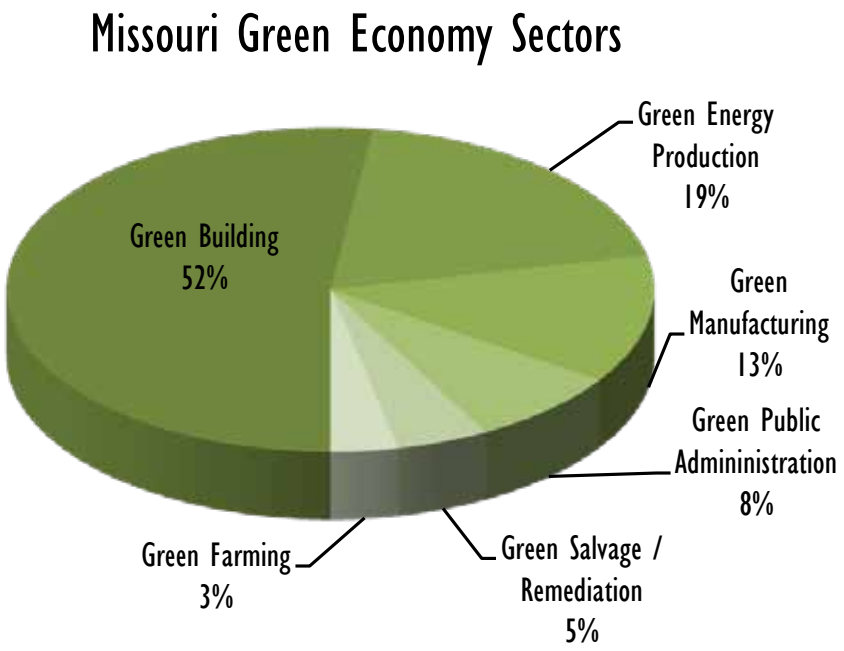
Green Jobs by Industry Sector

There are an estimated 131,103 total green jobs currently in Missouri. Green jobs account for 4.8 percent of total employment in the state, a sizeable cluster driving economic development in the state.

Green Industry Sector	Total Green Jobs 2008	Percent Share of Total Green Jobs
Total Green Jobs	**131,103**	**100.0%**
Green Building	68,293	52.1%
Green Energy Production	25,608	19.5%
Green Manufacturing	16,777	12.8%
Green Public Admininistration	10,010	7.6%
Green Salvage / Remediation	5,995	4.6%
Green Farming	4,419	3.4%

Source: Missouri Economic Research and Information Center

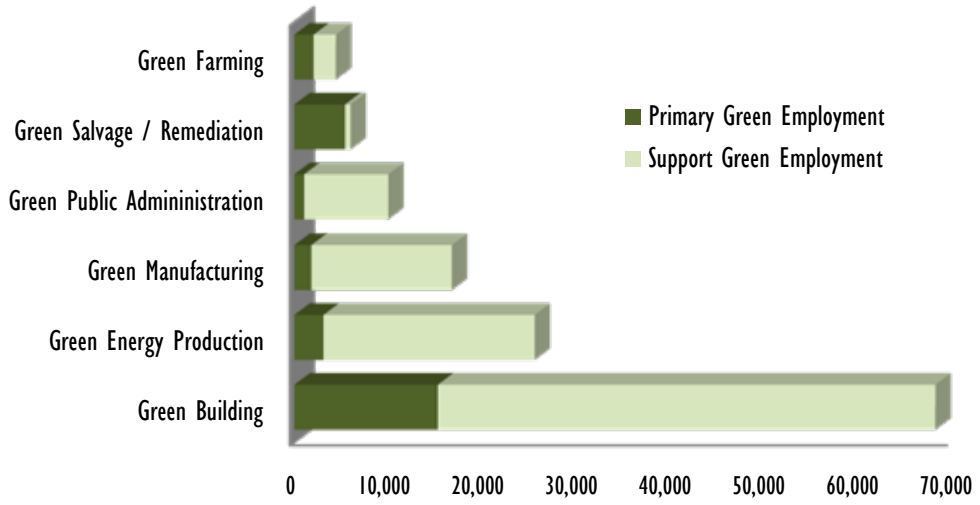
The green building sector comprises the largest share of total green employment in Missouri, constituting a little over half of the total green employment in the state. Green Farming, although just 3 percent of Missouri's present green economy, is seeing increasing growth as interest rises in bio-fuels, sustainable forestry, and organic foods.



Source: Missouri Economic Research and Information Center

Total green employment can be broken down into primary and supporting green jobs depending on the level of activity for each job that is devoted to generating a firm's green-related products or services. The share of primary versus support green employment by green sector is largest in Missouri for Green Salvage/Remediation (90%), Green Farming (46.6%), and Green Building (22.4%).

Share of Primary vs. Support Green Employment by Sector

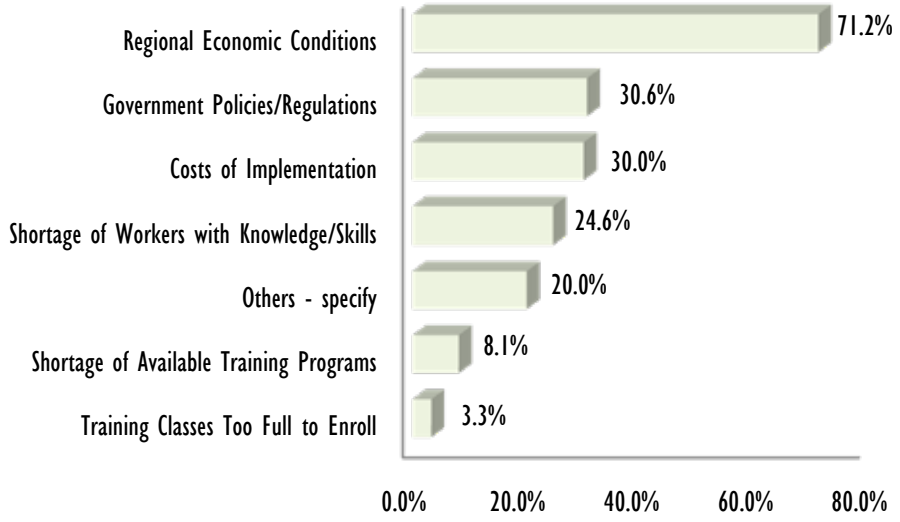


Source: Missouri Economic Research and Information Center

Hiring Expectations

Most green employers in Missouri, 71 percent, reported that the current economic slowdown has been their biggest barrier to hiring additional green workers.

Barriers for Hiring More Workers



Source: Missouri Economic Research and Information Center

Primary Green Occupations

Of the primary green employment reported by employers, 160 detailed occupational titles were identified. Analysis of the raw job titles provided indicate that employers did not report new job titles that could be identified as new green occupations and instead rely on traditional job titles to describe their primary green employment.

Occupations That Generate the Largest Number of Missouri Primary Green Jobs

SOC	Occupation	Total Primary Green Jobs	% of Total Primary Green Jobs
	Total, All Green Occupations	**23,337**	**100.0%**
53-7081	Refuse and Recyclable Material Collectors	1,849	7.9%
19-4031	Chemical Technicians	1,265	5.4%
47-2152	Plumbers	1,263	5.4%
49-9021	Refrigeration Mechanics and Installers	1,226	5.3%
17-1011	Architects, Except Landscape and Naval	1,145	4.9%
11-9021	Construction Managers	975	4.2%
11-1011	Chief Executives	867	3.7%
45-2092	Farmworkers and Laborers, Crop	740	3.2%
47-2061	Construction Laborers	736	3.2%
19-2041	Environmental Scientists and Specialists, Including Health	594	2.5%
47-2073	Operating Engineers and Other Construction Equipment Operators	538	2.3%
47-2031	Rough Carpenters	528	2.3%
27-1025	Interior Designers	500	2.1%
51-2092	Team Assemblers	476	2.0%
47-2081	Drywall and Ceiling Tile Installers	435	1.9%
49-2095	Electrical and Electronics Repairers, Powerhouse, Substation, and Relay	395	1.7%
53-7061	Cleaners of Vehicles and Equipment	361	1.5%
17-2081	Environmental Engineers	360	1.5%
17-2051	Civil Engineers	337	1.4%
51-9061	Inspectors, Testers, Sorters, Samplers, and Weighers	318	1.4%
11-1021	General and Operations Managers	316	1.4%
47-2111	Electricians	311	1.3%
47-1011	First-Line Supervisors/Managers of Construction Trades and Extraction Workers	305	1.3%
19-4091	Environmental Science and Protection Technicians, Including Health	276	1.2%
47-2021	Brickmasons and Blockmasons	266	1.1%
17-3025	Environmental Engineering Technicians	238	1.0%

Source: Missouri Economic Research and Information Center

Five Largest Occupations by Green Industry Sector

SOC	Occupations Within Green Sector	Primary Green Jobs in Sector	% of Total Sector Primary Green Jobs
	Green Energy Production	**3,111**	
49-2095	Electrical and Electronics Repairers, Powerhouse, and Relay	395	12.7%
17-2051	Civil Engineers	227	7.3%
17-2081	Environmental Engineers	209	6.7%
17-3011	Architectural and Civil Drafters	99	3.2%
47-2151	Pipelayers	93	3.0%
	Green Building	**15,286**	
49-9021	Heating, Air Conditioning, and Refrigeration Mechanics and Installers	1,226	8.0%
19-4031	Chemical Technicians	1,200	7.9%
47-2152	Plumbers, Pipefitters, and Steamfitters	1,135	7.4%
17-1011	Architects, Except Landscape and Naval	1,116	7.3%
11-9021	Construction Managers	934	6.1%
	Green Farming	**2,060**	
45-2092	Farmworkers and Laborers, Crop, Nursery, and Greenhouse	740	35.9%
45-2093	Farmworkers, Farm and Ranch Animals	219	10.6%
11-9011	Farm, Ranch, and Other Agricultural Managers	212	10.3%
11-9012	Farmers and Ranchers	97	4.7%
45-2091	Agricultural Equipment Operators	97	4.7%
	Green Manufacturing	**1,815**	
19-1020	Biologists	206	11.3%
51-2092	Team Assemblers	106	5.8%
51-2031	Engine and Other Machine Assemblers	82	4.5%
19-4031	Chemical Technicians	59	3.2%
53-6051	Transportation Vehicle, Equipment and Systems Inspectors	59	3.2%
	Green Public Adminstration	**1,051**	
13-1041	Enviromental Compliance Inspectors	188	17.9%
19-4091	Environmental Science and Protection Technicians, Including Health	146	13.8%
19-2041	Environmental Scientists and Specialists, Including Health	141	13.4%
51-8031	Water and Liquid Waste Treatment Plant and System Operators	84	8.0%
13-2011	Accountants	80	7.6%
	Green Salvage/Remediation	**5,396**	
53-7081	Refuse and Recyclable Material Collectors	1,772	32.8%
53-7061	Cleaners of Vehicles and Equipment	361	6.7%
51-9061	Inspectors, Testers, Sorters, Samplers, and Weighers	288	5.3%
19-2041	Environmental Scientists and Specialists, Including Health	271	5.0%
53-3033	Truck Drivers, Light or Delivery Services	209	3.9%

Source: Missouri Economic Research and Information Center

Wages

Additional analysis of primary green jobs was conducted by integrating available data on wages, education and training, and employment projections for the primary green jobs. Matching primary green jobs estimates to existing wage, education, and employment projections improved survey rates by reducing the burden on employers to provide specific, more detailed information in the survey.

Workers in primary green occupations can earn a wide range of wages which is to be expected with the broad array of skill sets and educational attainment required by these jobs. The following table provides a distribution of average annual wages for occupations statewide and across all industries.

Select High, Moderate, and Low Wage Primary Green Occupations

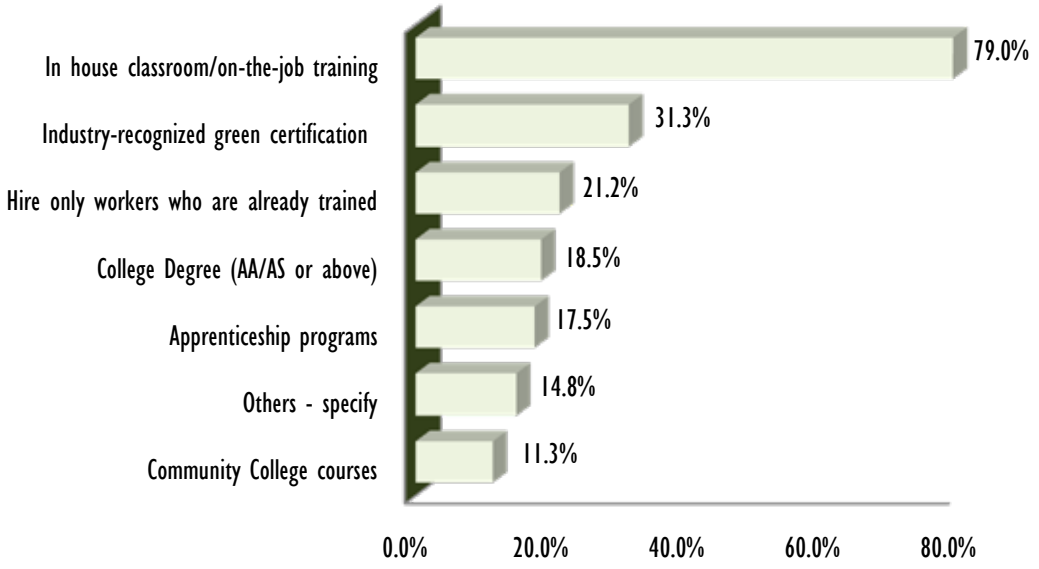
Wage	Occupation	Green Jobs 2008	Average Annual Wages	Average Hourly Wages
Higher	Construction Managers	975	$82,580	$39.70
	Sales Representatives, Technical and Scientific Products	215	$76,060	$36.57
	Civil Engineers	337	$75,810	$36.45
	Environmental Engineers	360	$71,920	$34.58
	Architects, Except Landscape and Naval	1,145	$65,800	$31.64
Moderate	Plumbers, Pipefitters, and Steamfitters	1,263	$54,240	$26.08
	Environmental Scientists and Specialists, Including Health	594	$48,820	$23.47
	Carpenters	528	$45,750	$21.99
	Chemical Technicians	1,265	$43,670	$20.99
	Heating, Air Conditioning, and Refrigeration Mechanics and Installers	1,226	$40,880	$19.65
Lower	Environmental Science and Protection Technicians, Including Health	276	$39,830	$19.15
	Construction Laborers	736	$38,620	$18.57
	Inspectors, Testers, Sorters, Samplers, and Weighers	318	$35,580	$17.11
	Refuse and Recyclable Material Collectors	1,849	$27,580	$13.26
	Farmworkers and Laborers, Crop, Nursery, and Greenhouse	740	$21,110	$10.15

Source: Missouri Economic Research and Information Center

Training & Skills

The majority of Missouri's green employers currently utilize in-house classrooms or some type of on-the-job training as the most common way of preparing workers for green jobs.

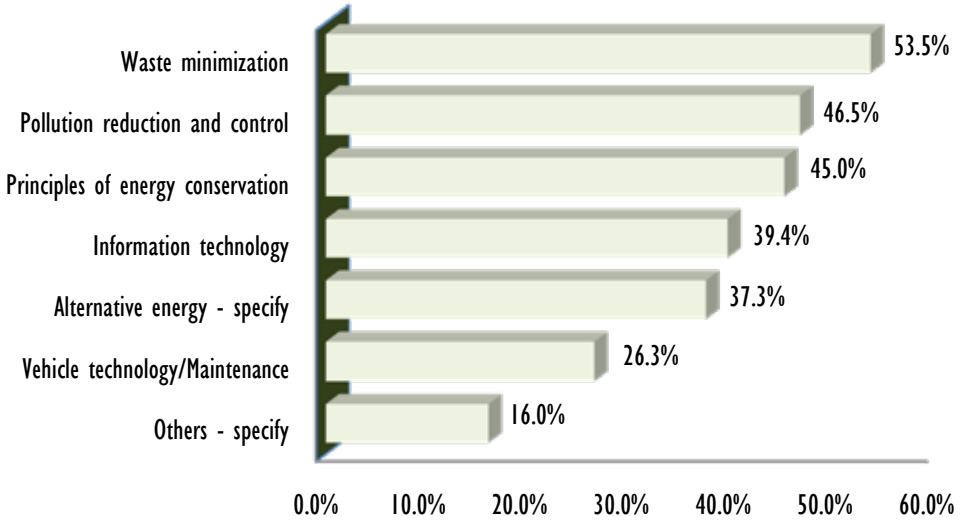
Methods Used to Prepare Green Workers



Source: Missouri Economic Research and Information Center

Of the new knowledge and skill sets needed for Missouri's green economy, the most in-demand skill reported by green employers was waste minimization.

New Skills/Knowledge Needed for Future Green Workers



Source: Missouri Economic Research and Information Center

Forecasts for Primary Green Occupations

Every two years the Missouri Department of Economic Development produces occupational employment projections. These projections use employment in a base year and project employment forward ten years; currently the projections are based in 2006 and project employment to 2016. Inputs used in creating these employment projections include: population trends, industry and occupational trends, labor force trends, and other macroeconomic variables. These employment projections were applied to the green job survey results to generate one possible estimate of future annual growth rates and job openings in green occupations through 2016.

Primary Green Occupations with High Openings

	Green Jobs	Employment (All Industries)		Annual Openings (All Industries)		
Occupation	2008	2006	2016	Total	Growth	Replacement
Carpenters	528	35,693	37,998	714	231	483
Electricians	311	12,736	14,265	481	153	328
Plumbers, Pipefitters, and Steamfitters	1,263	10,110	11,568	355	146	209
Sales Representatives, Technical and Scientific Products	215	9,014	9,637	261	62	199
Operating Engineers and Other Construction Equipment Operators	538	9,143	9,852	248	71	177
Heating, Air Conditioning, and Refrigeration Mechanics and Installers	1,226	6,263	7,196	203	93	110

Source: Missouri Economic Research and Information Center

Of Missouri's primary green jobs, three occupations associated with the green building industry sector have both the potential for the most number of openings and the fastest growth through 2016.

Primary Green Occupations with High Growth

	Green Jobs	Employment (All Industries)		Change (All Industries)	
Occupation	2008	2006	2016	#	%
Farm, Ranch, and Other Agricultural Managers	212	1,918	2,220	302	15.7%
Cost Estimators	91	5,183	5,983	800	15.4%
Heating, Air Conditioning, and Refrigeration Mechanics and Installers	1,226	6,263	7,196	933	14.9%
Plumbers, Pipefitters, and Steamfitters	1,263	10,110	11,568	1,458	14.4%
Construction Managers	975	5,532	6,235	703	12.7%
Electricians	311	12,736	14,265	1,529	12.0%

Source: Missouri Economic Research and Information Center

Educational Attainment

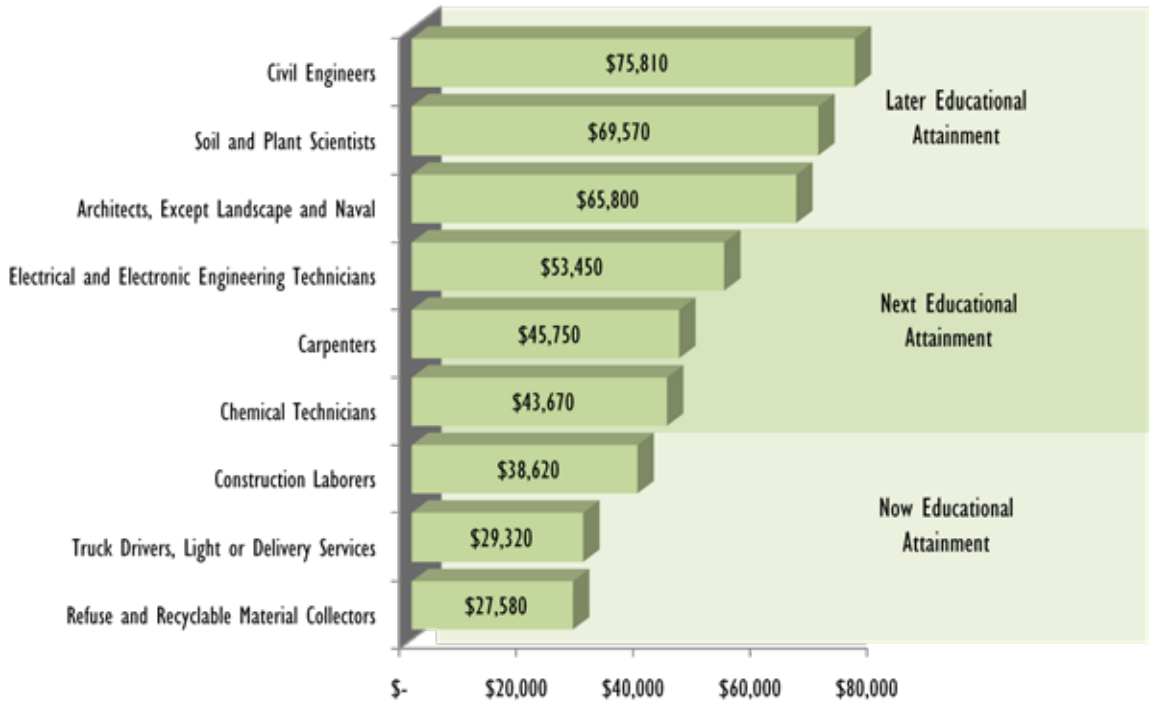
Although some of Missouri's fastest growing and highest paying primary green jobs require higher levels of educational attainment, there are many growth opportunities for green jobs that require a mix of education and skill sets.

Educational Attainment and Growth in Primary Green Occupations

Level of Education	Occupation	Green Jobs 2008	Employment (All Industries) 2006	Employment (All Industries) 2016	Change (All Industries) #	Change (All Industries) %
Now	Farmworkers and Laborers, Crop, Nursery, and Greenhouse	740	5,042	5,528	486	9.6%
	Pipelayers	197	1,105	1,203	98	8.9%
	Construction Laborers	736	19,277	20,966	1,689	8.8%
Next	Heating, Air Conditioning, and Refrigeration Mechanics and Installers	1,226	6,263	7,196	933	14.9%
	Electricians	311	12,736	14,265	1,529	12.0%
	Environmental Engineering Technicians	238	180	195	15	8.3%
Later	Construction Managers	975	5,532	6,235	703	12.7%
	Environmental Engineers	360	1,357	1,514	157	11.6%
	Soil and Plant Scientists	206	252	277	25	9.9%

Source: Missouri Economic Research and Information Center

Educational Attainment and Wages in Primary Green Occupations



Source: Missouri Economic Research and Information Center

Appendix A

Missouri Green Businesses Survey
Missouri Economic Research and Information Center (MERIC)
Missouri Department of Economic Development
University of Missouri-Columbia
Center for Advanced Social Research
June 2009

Question YesAns1

Hello, this is [fill name] calling from the University of Missouri on behalf of the Missouri Department of Economic Development. I am not trying to sell you anything. I am calling because we are conducting a brief study to learn your opinions about workforce development in producing green products and services. Your company has been identified as potentially being a green business in Missouri. All information provided will be kept completely confidential. The survey takes 8 minutes to complete. Is now a good time to talk?	[1] [3] [4] [5] [7] [8] [9]	Continue Call Back Later Wrong Number Other Unavailable Refusal Communication Barrier Ineligible

Question GTOK

Before we begin, I just want to assure you that all the information that you provide will be kept completely confidential. Your participation in the survey is absolutely voluntary and you may stop or refuse the questions at any time when you do not feel comfortable with it. If you have any questions regarding the survey, please contact Dr. Kenneth Fleming at (573) 882-3396 or the University's Campus Institutional Review Board (IRB) at (573) 882-9585. The Campus IRB oversees all research activities involving human subjects at the University of Missouri.	[1] [2] [3]	Continue No Time, Call Back Refusal

Question Confirm

During the survey I'm referring to the business or organization of [business name].	[1]	Continue if correct IF NOT CORRECT BUSINESS Go to previous introductions to see if you dialed right. Find out correct number or enter "wrong number" if necessary.

Question Screen_1

First of all, I'd like to ask you a few questions about your business. As a business, do you currently produce or install green goods, research or develop green products, or supply green services in any of the following "green sectors?"
[READ ALL and Check all that apply]

- Energy Production
- Green Building
- Green Manufacturing
- Green Farming
- Green Public Administration
- Green Salvage/Remediation
- None of the above
- Continue to next question

Question Screen_2

Do you have any plans in the next six months to a year to do so?	[1]	Yes
	[2]	No
Interviewer can read this if necessary:		
Do you have any plans in the next six months to a year to produce or install green goods, research or develop green products, or supply green services in any of the sectors just mentioned?	[8]	Don't Know/Not Sure
	[9]	Refused

Question Screen_3

In which sector?
[Read if Necessary and check all that apply]

- Energy Production
- Green Building
- Green Manufacturing
- Green Farming
- Green Public Administration
- Green Salvage/Remediation
- Other
- Don't Know/Not Sure
- Refused
- Continue to next question

Question Screen_4

As a business, which ONE of the following "green sectors" would you MOST associate your business with?
[Read categories w/out pause, then take response - check ONLY ONE response]

- Energy Production
- Green Building
- Green Manufacturing
- Green Farming
- Green Public Administration
- Green Salvage/Remediation
- Other
- Don't Know/Not Sure
- Refused

Question N_Emp

How many employees work at this business?	[0]	Less than one
Do NOT include consultants, outside contractors, vendors, and others who are not considered to be employees.	[1-6000]	Number of Employees in business
	[6001]	More than 6000
	[8888]	Don't Know/Not Sure
	[9999]	Refused

Question S_Emp

How many of these are employees who hold SUPPORT jobs for your "green-related" business activities?	[0]	Less than one
	[1-6000]	Number of Employees in business
	[6001]	More than 6000
	[8888]	Don't Know/Not Sure
	[9999]	Refused

Question P_Emp

How many of the total number of employees at your business are employees whose PRIMARY function is the production of "green-related" products and services?	[0]	Less than one
	[1-6000]	Number of Employees in business
	[6001]	More than 6000
	[8888]	Don't Know/Not Sure (Probe for a ball-park figure if they say don't know/not sure)
	[9999]	Refused

Question GJOB

Now, I need to ask you to list to me the job titles in your business of those employees whose primary function is the production of "green-related" products and services.	[1]	Specify Position DO NOT LEAVE JOB TITLE BLANK!!
What is the [first/next] job title tied to "green-related" products and services?	[5]	No More / No Others
	[8]	Don't Know/Not Sure
	[9]	Refused

Question JB00

Now I want to focus on the position with the job title [Fill Job Title].	[1]	Continue

Question JB01

Would you please give me a brief (4-6 word) description of the occupation with the job title [read job title]?	[1]	Specify
	[8]	Don't Know/Not Sure
	[9]	Refused

Question JB02

Is this a full-time or part-time job?	[1]	Full-time job
	[2]	Part-time job
	[3]	Mixed (There are some that are full-time and some that are part-time)
	[8]	Don't Know/Not Sure
	[9]	Refused

Question JB03

How many individuals are currently employed with this job title in your company?	[1-777]	# of Openings
	[888]	Don't Know/Not Sure
	[999]	Refused

Question JB04

How many individuals with this job title do you expect to employ in 2010 in your company?	[1-777]	# of Openings
	[888]	Don't Know/Not Sure
	[999]	Refused

Question Large_1

What is an email address that we can use to contact you regarding attaining job titles in your business whose primary job duties are tied to "green-related" products and services?	[1]	Specify email address
	[8]	Don't Know/Not Sure
	[9]	Refused

Question Worker_1

What methods are used at your business to prepare current workers to produce green products or services?
[Read and check all that apply]

- In house classroom/on-the-job training
- Industry-recognized green certification or training
- Apprenticeship programs
- Hire only workers who are already trained
- Community College courses
- College Degree (AA/AS or above)
- Others - specify
- Continue to next question

Question Worker_2

First what new skills or knowledge will future employees need in order to perform work activities at your business?
[Read and check all that apply]

- Principles of energy conservation
- Waste minimization
- Pollution reduction and control
- Vehicle technology/maintenance
- Information technology
- Alternative energy - specify
- Others - specify
- Continue to next question

Question Barrier

What barriers, if any, stand in the way of hiring more workers at your business?
[Read and check all that apply]

- Shortage of workers with the knowledge or skills
- Shortage of available training programs
- Training classes too full to enroll
- Regional economic conditions
- Government policies/regulations
- Costs of implementation
- Others - specify
- Continue to next question

Question Recon

The researchers of the survey may be interested in learning more about your opinions on green industry issues in the future. Would you be willing to be interviewed by someone from the University of Missouri if they called you in the future?	[1]	Yes
	[2]	No
	[8]	Don't Know/Not Sure
Again, the interview would be confidential and only take a few minutes	[9]	Refused

Question Name

So that we will know who to ask for, could I please have your name and phone number?	[1]	Name AND phone is CORRECT
	[2]	Name OR phone INCORRECT
CONTACT INFO:		Enter correct info - SPECIFY
Press 1 if the all of the above is correct	[8]	Don't Know/Not Sure
Press 2 to enter correct contact information	[9]	Refused

Question TCS

That was the last of my questions. Thank you for your time and cooperation. Have a nice day/evening.	[1]	Press to continue

Question NOTE01

Contact Info	[1]	Proceed w/o Leaving A Note
Sometimes respondents are interested in the results of our surveys. We can take down the respondent's contact information and forward it to the client.	[5]	Leave A Note
Use this screen to record this contact information if necessary.		

Appendix B - Survey Methodology

Sample Selection

The 2009 Missouri Green Job Survey was based on a sampling frame of employers from the Quarterly Census of Employment and Wages (QCEW) database. This database contains Missouri companies liable under the Unemployment Insurance Compensation system. The sampling frame was limited to establishments in 117 6-digit NAICS codes. The sample was divided into strata. This stratification was conducted by 10 Missouri regions, by 6 green industry sectors, and by 2 employment size classes. Firms within each stratum were selected through random sampling except establishments with 250+ employees. These were selected with certainty and had a selection probability of 1.0.

Sample Summary	Number of Establishments
Population of Establishments	18,799
Final Sample Size	3,880

Total In and Out of Sample, by Reason	
Reason code	Number of Establishments
B. Completed surveys	2,537
C. Disconnected	1,847
D. Fax	131
E. Communication barriers	5
F. Wrong numbers	504
G. Refusals (after two attempts)	753
H. Ineligible [1]	436
I. Ring No Answer [2]	3,549
J. Callbacks [3]	270

Response Rate (RR)	
RR=B/(B+G+J)	71.2%

Survey Data Collection

Two thousand five hundred thirty-seven (2,537) telephone interviews were completed with the companies in Missouri from July to August 2009. Telephone interviews were conducted by staff at the University of Missouri – Columbia Center for Advanced Social Research. In conducting the survey, at least fifteen attempts were made to complete an interview at every sampled telephone number. The calls were scheduled over days of the week to maximize the chances of making a contact with a potential respondent. All refusals were re-contacted at least once in order to attempt to convert them to completed interviews.

Estimate Production

Employers reported employment by job title (see copy of survey form in Appendix). These job titles were coded by occupation using the Standard Occupational Classification (SOC) system. Once coded, survey responses were weighted based on each stratum's share of sample units to total universe establishments, and then multiplied by a non-response adjustment factor. These adjustments converted survey counts of green jobs by job title into estimates of total green jobs by occupation.

Percentage of Establishments With or Without Green Jobs	
With Green Jobs	46.8%
Without Green Jobs	53.2%

Notes:

1. Ineligible numbers were defined as those that were not business owners, not in charge of hiring, and etc.
2. Ring-no-answers are defined as those in which no one answered to any of the fifteen attempts made during the period when the project was implemented.
3. Callbacks are defined as the numbers in which someone answered during the project implementation period but a callback was scheduled because the selected person was not available.

Reference:

The American Association for Public Opinion Research. 1998. Standard Definitions: Final Dispositions of Case Codes and Outcome Rates for RDD Telephone Surveys and In-Person Household Surveys. Ann Arbor, Michigan: AAPPOR

Appendix C - Definition of Green Jobs and Industry Sectors Sent to Employers

State of Missouri Green Job Survey Definitions

Green occupations serve the function of growing the state's workforce and its economy through jobs in environmental sustainability, protection, and preservation. Occupations may be defined as green either by the nature and purpose of the job tasks, or the nature and purpose of the employer.

Green Industry Sectors

Green Energy

Green Energy is the conversion from conventional sources of energy to the technology and development of renewable, clean energy resources. Examples of these activities include:

- Energy production and generation activities
- Power distribution and plant operations
- Turbine power generation
- Installation, repair and electronics for windmills
- Bio-fuel manufacturing

Green Building

Green Building includes jobs typically found in construction related activities, household manufacturing, household appliance manufacturing, design and remodeling services, and remediation services.

- Uses environmentally friendly materials and methods for residential and non-residential infrastructure
- Converts existing property to lessen negative impacts on the environment
- Provides healthy living spaces
- Converts sustainable or renewable resources into energy
- Replenishes resources such as water and oxygen

Green Manufacturing

Green Manufacturing includes jobs found in engineering, research and development firms, and across nearly all manufacturing sectors. Jobs in this sector include those involved in the research, development, and production of materials, parts, and final products within the following categories:

- Energy Efficiency
- Health
- Renewable Energy
- Safety

Green Public Administration

Green Public Administration includes jobs typically found in local, state, and federal government or in contracts related to government policy. Examples of these activities include the execution, oversight, and operational management of public policy in the areas of:

- Environmental Conservation
- Green Building
- Resource Management
- Energy

Green Salvage/Remediation

Green Salvage/Remediation includes jobs found in waste management, environmental engineering, chemistry, salvage, and maintenance occupations. Examples of these activities include the process of renewing resources through:

- Material Extraction
- Environmental Cleanup
- Re-use
- Product Conversion

Green Farming

Green Farming includes jobs found in agriculture and forestry that fall into the following classifications:

- Organic/Free Range Food Production
- Forest Preservation
- Renewable Energy Resource Production

Appendix D – List of Green Related Industries

NAICS	Industry Description	Green Sector
111000	Crop Production	Green Farming
112000	Animal Production	Green Farming
113000	Forestry and Logging	Green Farming
114000	Fishing, Hunting, and Trapping	Green Farming
115000	Agriculture and Forestry Support Activities	Green Farming
221111	Hydroelectric Power Generation	EnergyProduction
221119	Other Electric Power Generation	EnergyProduction
221121	Electric Bulk Power Transmission	EnergyProduction
221122	Electric Power Distribution	EnergyProduction
221310	Water Supply and Irrigation Systems	Green Public Administration
221320	Sewage Treatment Facilities	Green Public Administration
221330	Steam and Air-conditioning Supply	Green Manufacturing
236115	New Single-Family Housing Construction	Green Building
236116	New Multifamily Housing Construction	Green Building
236117	New Housing Operative Builders	Green Building
236118	Residential Remodelers	Green Building
236210	Industrial Building Construction	Green Building
236220	Commercial Building Construction	Green Building
237110	Water and Sewer System Construction	Green Building
237130	Power & Communication Line & Related Structures Construction	EnergyProduction
237130	Power/Communication System Construction	EnergyProduction
237310	Highway, Street, and Bridge Construction	Green Building
237990	Other Heavy Construction	Green Building
238151	Residential Glass/Glazing Contractors	Green Building
238152	Nonresidential Glass/Glazing Contractors	Green Building
238161	Residential Roofing Contractors	Green Building
238162	Nonresidential Roofing Contractors	Green Building
238170	Residential Siding Contractors	Green Building
238191	Other Residential Exterior Contractors	Green Building
238192	Other Nonresidential Exterior Contractors	Green Building
238211	Residential Electrical Contractors	Green Building
238212	Nonresidential Electrical Contractors	Green Building
238221	Residential Plumbing/HVAC Contractors	Green Building
238222	Nonresidential Plumbing/HVAC Contractors	Green Building
238311	Residential Drywall and Insulation Contractors	Green Building
238312	Nonresidential Drywall and Insulation Contractors	Green Building
238911	Residential Site Preparation Contractors	Green Building
238912	Nonresidential Site Preparation Contractors	Green Building
283172	Nonresidential Siding Contractors	Green Building

NAICS	Industry Description	Green Sector
311222	Soybean Processing	EnergyProduction
321219	Reconstituted Wood Product Manufacturing	Green Building
325193	Ethyl Alcohol Manufacturing	EnergyProduction
325314	Fertilizers (Mixing Only)	Green Salvage/Remediation
325412	Pharmaceutical Preparation Manufacturing	Green Manufacturing
325611	Soap and Other Detergent Manufacturing	Green Manufacturing
325998	All Other Miscellaneous Chemical Product and Preparation Manufacturing	Green Manufacturing
326212	Tire Retreading	Green Salvage/Remediation
333132	Oil and Gas Field Machinery and Equipment Manufacturing	Green Manufacturing
333319	Other Commercial and Service Industry Machinery Manufacturing	Green Manufacturing
333414	Heating Equipment, Except Warm Air Furnaces	Green Building
333415	AC, Refrig., & Forced Air Heating	Green Building
333611	Turbine Generator & Generator Set Units	EnergyProduction
333618	Other Engine Equipment Manufacturing	Green Manufacturing
333911	Pump & Pumping Equipment Manufacturing	EnergyProduction
334413	Semiconductor & Related Devices	EnergyProduction
334512	Automatic Environmental Control Manufacturing	Green Manufacturing
334513	Industrial Process Variable Instruments	Green Manufacturing
334514	Totalizing Fluid Meters and Counting Devices	Green Manufacturing
334519	Other Measuring and Controlling Device Manufacturing	Green Manufacturing
335110	Electric Lamp Bulb and Part Manufacturing	Green Manufacturing
335121	Residential Electric Lighting Fixture Manufacturing	Green Building
335122	Nonresidential Electric Lighting Fixture Manufacturing	Green Building
335221	Household Cooking Appliance Manufacturing	Green Manufacturing
335222	Household Refrigerator and Home Freezer Manufacturing	Green Manufacturing
335224	Household Laundry Equipment Manufacturing	Green Manufacturing
335228	Other Major Household Appliance Manufacturing	Green Manufacturing
335228	Other Major Household Appliance Manufacturing	Green Manufacturing
335311	Electric Power & Specialty Transformers	EnergyProduction
335312	Motor and Generator Manufacturing	Green Manufacturing
335911	Storage Battery Manufacturing	Green Manufacturing
335912	Primary Battery Manufacturing	Green Manufacturing
335999	Miscellaneous Electrical Equipment	EnergyProduction
336111	Automobile Manufacturing	Green Manufacturing
336112	Light Truck and Utility Vehicle Manufacturing	Green Manufacturing
336120	Heavy Duty Truck Manufacturing	Green Manufacturing
336213	Motor Home Manufacturing	Green Manufacturing
336312	Gasoline Engine and Engine Parts Manufacturing	Green Manufacturing
336350	Motor Vehicle Power Train Components Manufacturing	Green Manufacturing

NAICS	Industry Description	Green Sector
336411	Aircraft Manufacturing	Green Manufacturing
336412	Aircraft Engine and Engine Parts Manufacturing	Green Manufacturing
336611	Ship Building and Repairing	Green Manufacturing
336612	Boat Building	Green Manufacturing
336991	Motorcycle, Bicycle, and Part Manufacturing	Green Manufacturing
423140	Motor Vehicle Parts (Used Wholesale)	Green Salvage/Remediation
423930	Recyclable Material Wholesalers	Green Salvage/Remediation
453310	Used Merchandise Stores (Excluding Pawn Shops)	Green Salvage/Remediation
541310	Architechtural Services	Green Building
541320	Landscape Architechtural Services	Green Building
541320	Landscape Architectural Services	Green Manufacturing
541330	Engineering Services	EnergyProduction
541330	Engineering Services	Green Manufacturing
541350	Building Inspection Services	Green Building
541380	Testing Laboratories	Green Salvage/Remediation
541410	Interior Design Services	Green Building
541420	Industrial Design Services	Green Building
541614	Process and Logistics Consulting Services	Green Manufacturing
541620	Environmental Consulting services	Green Salvage/Remediation
541711	Research and Development in Biotechnology	Green Manufacturing
541712	Physical, Engineering, and Biological Research	Green Manufacturing
562111	Solid Waste Collection	Green Salvage/Remediation
562112	Hazardous Waste collection	Green Salvage/Remediation
562119	Other Waste Collection	Green Salvage/Remediation
562211	Hazardous Waste Treatment and Disposal	Green Salvage/Remediation
562212	Solid Waste Landfill	Green Salvage/Remediation
562213	Solid Waste Combustors and Incinerators	Green Salvage/Remediation
562219	Other Hazardous Waste Disposal	Green Salvage/Remediation
562910	Remediation Services	Green Building
562910	Remediation Services	Green Salvage/Remediation
562991	Septic Tank and Related Services	Green Salvage/Remediation
562920	Materials Recovery Facilities	Green Salvage/Remediation
562998	Miscellaneous Waste Management Services	Green Salvage/Remediation
924110	Administration of Air Water Resource and Solid Waste Management Programs	Green Public Administration
924120	Administration of Conservation Programs	Green Public Administration
925110	Administration of Housing Programs	Green Public Administration
925120	Administration of Urban Planning and Community and Rural Development	Green Public Administration
926130	Regulation and Admin. of Communications, Electric, Gas, and Other Utilities	Green Public Administration
926150	Regulation, Licensing, and Inspection of Misc. Commercial Sectors	Green Public Administration

Appendix E – List of Green Related Occupations

SOC	Occupation	Total Employment
11-1011	Chief Executives	867
11-1021	General and Operations Managers	316
11-2021	Marketing Managers	16
11-2022	Sales Managers	12
11-2031	Public Relations Managers	12
11-3011	Administrative Services Managers	78
11-3031	Financial Managers	11
11-3040	Human Resources Managers	6
11-3051	Industrial Production Managers	24
11-3061	Purchasing Managers	6
11-3071	Transportation, Storage, and Distribution Managers	6
11-9011	Farm, Ranch, and Other Agricultural Managers	212
11-9012	Farmers and Ranchers	97
11-9021	Construction Managers	975
11-9041	Engineering Managers	46
11-9121	Natural Sciences Managers	33
13-1022	Wholesale and Retail Buyers, Except Farm Products	6
13-1041	Compliance Officers	188
13-1051	Cost Estimators	91
13-1073	Training and Development Specialists	52
13-1111	Management Analysts	6
13-2011	Accountants and Auditors	86
13-2031	Budget Analysts	6
13-2072	Loan Officers	39
15-1032	Computer Software Engineers, Systems Software	6
15-2031	Operations Research Analysts	52
17-1011	Architects, Except Landscape and Naval	1,145
17-1012	Landscape Architects	155
17-2051	Civil Engineers	337
17-2061	Computer Hardware Engineers	26
17-2071	Electrical Engineers	93
17-2072	Electronics Engineers, Except Computer	6
17-2081	Environmental Engineers	360
17-2111	Health and Safety Engineers, Except Mining Safety Engineers and Inspectors	6
17-2131	Materials Engineers	47
17-2141	Mechanical Engineers	95
17-3011	Architectural and Civil Drafters	164
17-3012	Electrical and Electronics Drafters	6
17-3019	Drafters, All Other	11

SOC	Occupation	Total Employment
17-3022	Civil Engineering Technicians	47
17-3023	Electrical and Electronic Engineering Technicians	65
17-3025	Environmental Engineering Technicians	238
19-1012	Food Scientists and Technologists	45
19-1020	Soil and Plant Scientists	206
19-1021	Biochemists and Biophysicists	6
19-1031	Conservation Scientists	42
19-1032	Foresters	5
19-2031	Chemists	12
19-2041	Environmental Scientists and Specialists, Including Health	594
19-2042	Geoscientists, Except Hydrologists and Geographers	12
19-3011	Economists	9
19-3021	Market Research Analysts	38
19-3051	Urban and Regional Planners	31
19-4031	Chemical Technicians	1,265
19-4061	Social Science Research Assistants	23
19-4091	Environmental Science and Protection Technicians, Including Health	276
23-1011	Lawyers	5
25-9031	Instructional Coordinators	6
27-1021	Commercial and Industrial Designers	6
27-1025	Interior Designers	500
27-3031	Public Relations Specialists	70
27-3042	Technical Writers	78
29-2011	Medical and Clinical Laboratory Technologists	18
29-2051	Dietetic Technicians	5
37-1012	First-Line Supervisors of Landscaping, and Groundskeeping Workers	11
37-2021	Pest Control Workers	5
37-3011	Landscaping and Groundskeeping Workers	45
41-1012	First-Line Supervisors of Non-Retail Sales Workers	11
41-2031	Retail Salespersons	28
41-4011	Sales Representatives, Technical and Scientific Products	215
41-4012	Sales Representatives, Wholesale and Manufacturing	32
41-9031	Sales Engineers	13
43-3021	Billing and Posting Clerks and Machine Operators	6
43-3031	Bookkeeping, Accounting, and Auditing Clerks	62
43-4051	Customer Service Representatives	50
43-4071	File Clerks	6
43-4151	Order Clerks	6
43-5061	Production, Planning, and Expediting Clerks	24

SOC	Occupation	Total Employment
43-5071	Shipping, Receiving, and Traffic Clerks	53
43-5081	Stock Clerks and Order Fillers	12
43-6011	Executive Secretaries and Administrative Assistants	96
43-6014	Secretaries, Except Legal, Medical, and Executive	25
43-9021	Data Entry Keyers	6
43-9022	Word Processors and Typists	17
43-9061	Office Clerks, General	30
45-1011	First-Line Supervisors of Farming, Fishing, and Forestry Workers	6
45-2091	Agricultural Equipment Operators	97
45-2092	Farmworkers and Laborers, Crop, Nursery, and Greenhouse	740
45-2093	Farmworkers, Farm and Ranch Animals	219
45-4011	Forest and Conservation Workers	64
47-1011	First-Line Supervisors of Construction Trades and Extraction Workers	305
47-2021	Brickmasons and Blockmasons	266
47-2031	Carpenters	528
47-2061	Construction Laborers	736
47-2073	Operating Engineers and Other Construction Equipment Operators	538
47-2081	Drywall and Ceiling Tile Installers	435
47-2111	Electricians	311
47-2121	Glaziers	84
47-2131	Insulation Workers, Floor, Ceiling, and Wall	65
47-2141	Painters, Construction and Maintenance	64
47-2151	Pipelayers	197
47-2152	Plumbers, Pipefitters, and Steamfitters	1,263
47-2161	Plasterers and Stucco Masons	136
47-2181	Roofers	188
47-2211	Sheet Metal Workers	35
47-2231	Structural Iron and Steel Workers	65
47-3012	Helpers--Carpenters	45
47-3013	Helpers--Electricians	26
47-3014	Helpers--Painters, Paperhangers, Plasterers, and Stucco Masons	6
47-3015	Helpers--Pipelayers, Plumbers, Pipefitters, and Steamfitters	52
47-4011	Construction and Building Inspectors	6
47-4041	Hazardous Materials Removal Workers	70
47-4051	Highway Maintenance Workers	24
47-4071	Septic Tank Servicers and Sewer Pipe Cleaners	18
47-4099	Construction and Related Workers, All Other	12
47-5021	Earth Drillers, Except Oil and Gas	173
47-5081	Helpers--Extraction Workers	26

SOC	Occupation	Total Employment
49-1011	First-Line Supervisors of Mechanics, Installers, and Repairers	38
49-2093	Electrical and Electronics Installers and Repairers, Transportation Equipment	45
49-2094	Electrical and Electronics Repairers, Commercial and Industrial Equipment	6
49-2095	Electrical and Electronics Repairers, Powerhouse, Substation, and Relay	395
49-2098	Security and Fire Alarm Systems Installers	6
49-3022	Automotive Glass Installers and Repairers	6
49-3023	Automotive Service Technicians and Mechanics	46
49-3031	Bus and Truck Mechanics and Diesel Engine Specialists	6
49-9011	Mechanical Door Repairers	19
49-9021	Heating, Air Conditioning, and Refrigeration Mechanics and Installers	1,226
49-9041	Industrial Machinery Mechanics	30
49-9042	Maintenance and Repair Workers, General	76
49-9043	Maintenance Workers, Machinery	6
49-9051	Electrical Power-Line Installers and Repairers	6
49-9098	Helpers--Installation, Maintenance, and Repair Workers	38
49-9099	Installation, Maintenance, and Repair Workers, All Other	6
51-1011	First-Line Supervisors of Production and Operating Workers	53
51-2022	Electrical and Electronic Equipment Assemblers	79
51-2031	Engine and Other Machine Assemblers	105
51-2041	Structural Metal Fabricators and Fitters	18
51-2092	Team Assemblers	476
51-4121	Welders, Cutters, Solderers, and Brazers	86
51-4122	Welding, Soldering, and Brazing Machine Setters, Operators, and Tenders	6
51-7021	Furniture Finishers	34
51-7031	Model Makers, Wood	5
51-8031	Water and Liquid Waste Treatment Plant and System Operators	178
51-9041	Extruding, Forming, and Compacting Machine Setters, Operators, and Tenders	13
51-9061	Inspectors, Testers, Sorters, Samplers, and Weighers	318
51-9111	Packaging and Filling Machine Operators and Tenders	18
51-9122	Painters, Transportation Equipment	23
51-9197	Tire Builders	175
51-9198	Helpers--Production Workers	18
51-9199	Production Workers, All Other	39
53-1031	First-Line Supervisors of Transportation and Material-Moving Machine Operators	64
53-3032	Truck Drivers, Heavy and Tractor-Trailer	39
53-3033	Truck Drivers, Light or Delivery Services	209
53-6041	Traffic Technicians	32
53-6051	Transportation Inspectors	59
53-7021	Crane and Tower Operators	6

SOC	Occupation	Total Employment
53-7032	Excavating and Loading Machine and Dragline Operators	39
53-7061	Cleaners of Vehicles and Equipment	361
53-7062	Laborers and Freight, Stock, and Material Movers, Hand	140
53-7081	Refuse and Recyclable Material Collectors	1,849

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