



Montana
Department of Labor and Industry

**Green Jobs in Montana:
Examination and Estimation**

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**WHITE
PAPER
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Executive Summary

High energy prices and a growing recognition of the value of ecological services have resulted in businesses and consumers going “green” to minimize environmental damage and reduce energy costs. Businesses have responded to this change by hiring more workers whose jobs are connected to conservation and environmental protection. Economists, economic developers, and workforce training professionals are now trying to keep up with the greener economy and trying to find methods to adequately identify and measure green jobs. The funding and attention directed towards green jobs in the American Recovery and Reinvestment Act of 2009 (P.L. 111-5) intensified the demand for accurate and consistent methods of identifying and tracking green jobs.

The effort to identify and track green jobs is complicated by an inconsistent definition of the term ‘green jobs’ and by the need to utilize existing data sources for employment statistics. The first hurdle lies within the definition of “green,” a concept that is still changing, but gradually gaining definition through usage. The second hurdle is to align the definition of green with existing definitions and classifications of industries and occupations so that green jobs can be measured and tracked using existing data sources.

This white paper is an attempt to solidify the definition of green jobs through the review of existing literature and to apply this definition to Montana. The paper then provides seven alternatives on how the number of green jobs in our economy could be measured. The definitions and estimates developed within this paper are intended to be a starting point for policy-maker discussions on the appropriate definition and measurement of green jobs in the Montana economy.

This report is organized into two sections. The first section provides background on the definition of green jobs and the difficulties in measuring green jobs by reviewing the literature produced by various government, nonprofit, and academic entities. The second section provides seven estimates of the level of green jobs in Montana with a discussion of the failures and successes of each estimation method. Using a definition that green jobs are jobs that conserve energy or protect, regulate, or restore the environment, the estimate of green jobs could range from 4,079 to 22,060.

Background and Literature Review

Defining Green Jobs

Broadly defined, green jobs are jobs where the work activity aids in environmental protection, renewable energy generation, conservation, or restoration. The green economy refers to the economic impact of these jobs. Other terms often used to discuss green jobs include ‘green practices,’ which are work methods that minimize environmental damage, such as recycling, and ‘green knowledge and skills,’ which refer to the knowledge and skills required to implement green practices in a green job.ⁱ According to the State of Washington’s Employment Security Department (WAESD), the green economy and green jobs are defined as:

“The green economy is rooted in the development and use of products and services that promote environmental protection and energy security. It is composed of industries and businesses engaged in energy efficiency, renewable energy, preventing or reducing pollution, or mitigating or cleaning up pollution. Green jobs promote environmental protection and energy security.”ⁱⁱ

The United Nations Environment Programme (UNEP) indicates that green jobs:

“contribute substantially to preserving or restoring environmental quality. Specifically, but not exclusively, this includes jobs that help to protect and restore ecosystems and biodiversity; reduce energy, materials, and water consumption through high-efficiency and avoidance strategies; decarbonizes the economy; and minimize or altogether avoid generation of all forms of waste and pollution.”ⁱⁱⁱ

The green job description can also be applied to jobs that provide education, certification, or other support services to green job activities. The Oregon Employment Department defines green jobs similarly to UNEP and WAESD, but also includes jobs that “provide education, consulting, policy promotion, accreditation, trading and offsets, or similar services supporting [the other types of green jobs].”^{iv} Research by the PEW Charitable Trusts provides examples of green jobs that provide specialized training and support to other green businesses, such as lawyers that provide legal services to green companies, researchers and engineers that develop new energy generation technologies, and vocational teachers that train new workers for the green jobs.^v

Green jobs are not necessarily new jobs added to the economy, but may be old jobs that have added more environmentally friendly practices in response to the growing recognition of the importance of the environment and ecological services to our economy. As stated by the economic consulting firm Global Insight, “the greening of the U.S. economy, of the global economy, is not a dismantling of the past, but a new step forward – the next step in a continuous process of economic growth and transformation that began with industrialization and led us through the high-tech revolution.”^{vi} As such, it may not be appropriate to divide jobs into green or not green categories. Instead, all jobs are becoming more green, and the focus should be on new green skills versus abandoned practices that were more harmful to the environment.^{vii}

The available studies on green jobs are fairly unified on the general concept of green jobs – green jobs help the environment, including the promotion of cleaner energy, conservation, and reduced carbon emissions. However, the definition of green jobs remains stubbornly nebulous in the specifics. Coal-powered energy promotes U.S. energy security relative to foreign oil, and the coal industry also conducts research on improving the efficiency of coal power and reducing carbon emissions. Yet, coal-powered energy is not considered green because there are cleaner renewable alternatives.

If the definition of green can only be made relative to other alternatives, the rapid development of new energy-efficient technologies may mean that the definition of green will be constantly changing, as pointed out by the UNEP: “given technological progress and the urgent need for improvement, the dividing line between efficient and inefficient must rise over time. Seen in this context, “green jobs” is a relative and highly dynamic concept.”^{viii} Bus drivers of old diesel buses, who are currently considered green because they promote energy conservation and reduce carbon emissions compared to individual drivers, may no longer be considered green if the individual drivers switched to low-emission, hybrid vehicles.

The definition of green jobs is further complicated by the more-recent inclusion of socio-economic criteria for green jobs. Some policy and advocacy groups require green jobs to meet certain social criteria, such as high wages, good working conditions, and the ability to organize worker unions.

For example, the Obama/Biden Administration’s Middle Class Task Force, led by the Office of the Vice President of the United States, recently released a report on green jobs that was intended to provide guidance for and evaluation of assistance programs to create green jobs in the American Recovery and Reinvestment Act of 2009. The Task Force’s report defines green jobs using the following criteria:

- “green jobs involve some task associated with improving the environment, including reducing carbon emissions and creating and/or using energy more efficiently;
- green jobs should be good jobs that provide a sustainable family wage, health and retirement benefits, and decent working conditions; and
- green jobs should be available to diverse workers from across the spectrum of race, gender, and ethnicity.”^{ix}

The definition of green jobs used by the Middle Class Task Force adds qualitative and socio-economic dimensions to the more widely used definition of green jobs that includes only environmental considerations. In addition to promoting the environment, this definition requires green jobs to also be socially-responsible jobs that provide high wages and benefits and promote worker diversity.

It is not clear whether the Task Force intended these criteria to exclude environmentally-friendly jobs that are low-paying from the definition of green jobs, or whether their intent was to state that environmentally friendly jobs tend to display these desired socio-economic characteristics, similarly to how knowledge-based jobs tend to have higher wages. However, there is some debate over whether jobs promoting the environment and conservation are good paying jobs. On one hand, these jobs may require new or additional skills, which should result in higher pay. On

the other hand, being green may involve higher operating costs, which are passed on to workers through lower pay. Recent research by an alliance of labor unions and environmental groups indicated that green jobs pay less than similar jobs in non-green businesses, largely because the green jobs are not union jobs.^x This conclusion is in conflict with the conclusions of the Middle Class Task Force: “green jobs have the potential to be quality, family-sustaining jobs that also help to improve our environment. They are largely domestic jobs that can’t be offshored. They tend to pay more than other jobs, even controlling for worker characteristics.”^{xi} The Oregon Employment Department also found that Oregon green jobs were more likely to pay higher wages, but green jobs were also more likely to require special certification than all jobs, which may help explain the higher wages paid to green workers.^{xii}

Even with general consensus on the green job definition, ambiguity remains when drawing a line between green and non-green jobs. The boundary of green jobs is often only expressed in relative terms by comparing a green job to a non-green job. Further, the indefinite boundary of green jobs is dynamic and changes with improved technologies. Yet, in order to quantify and track green jobs, a dividing line between green and not-green must be drawn. Researchers, including the authors of this study, are often left to make a subjective decision themselves. The UNEP summarizes this subjective decision:

“The critical question is where to draw the line between efficient and inefficient practices. A low threshold will define a greater number of jobs as green, but may yield an illusion of progress” (p 4)...In an ideal state of affairs, a green economy is one that does not generate pollution or waste and is hyper-efficient in its use of energy, water, and materials. Using this green utopia as a yardstick would mean that there are few, if any, green jobs. (p 35)”^{xiii}

Summary Points:

- Green jobs are defined as environmentally-friendly jobs that promote renewable energy and conservation, protect or restore the environment, and provide education, certification, or other support services for other green jobs.
- Green jobs are not a new phenomenon, but a gradual adaptation of the economy to adjust for increased awareness of the value of ecological services.
- Some organizations extend the definition of green jobs to include certain social criteria, such as requiring green jobs to pay high wages, have good working conditions, allow for union participation, and encourage minority representation. Other groups argue that the social criteria are not requirements, but that green jobs demonstrate the desired social characteristics of ‘good jobs.’
- The definition of green jobs is relative and dynamic, often placing certain occupations in the green jobs category only because they are ‘greener’ than other jobs, and often changing due to new technologies and practices.
- Researchers attempting to measure green jobs must draw a subjective boundary between green and non-green jobs, a process that is likely biased by the researchers’ knowledge and intent.

Issues in the Measurement of Green Jobs

Even beyond the need to create a less-subjective definition of green jobs, researchers encounter additional challenges when attempting to measure the number of green jobs. First, the green job definition does not easily align with the taxonomies currently used to measure employment statistics, making it difficult to separate out green workers from non-green workers within industry or occupational groups. Second, many workers that perform green activities only do so for a portion of their job, making it difficult to determine whether the job should be counted as green.

The labor market statistics gathered by the Montana Department of Labor and Industry and the Bureau of Labor Statistics (BLS) divide employment either by industries or occupations. Industries are classified according to the North American Industry Classification System (NAICS), a standard shared between the U.S., Canada, and Mexico. Occupations are classified according to the Standard Occupational Classification (SOC) Manual. Existing data on employment and wages utilize one or both of these classification systems.

Neither NAICS nor SOC include a green designation, largely because these systems were developed long before the recognition of the green economy emerged. Also, the definition of green jobs depends on the outcome of the work effort, not on the job title or industry of the worker.^{xiv} The green job definition also contains social or political considerations that are independent of the occupation or industry. The primary difficulty of measuring green jobs is to align the definition of green with the currently-used NAICS and SOC taxonomies.

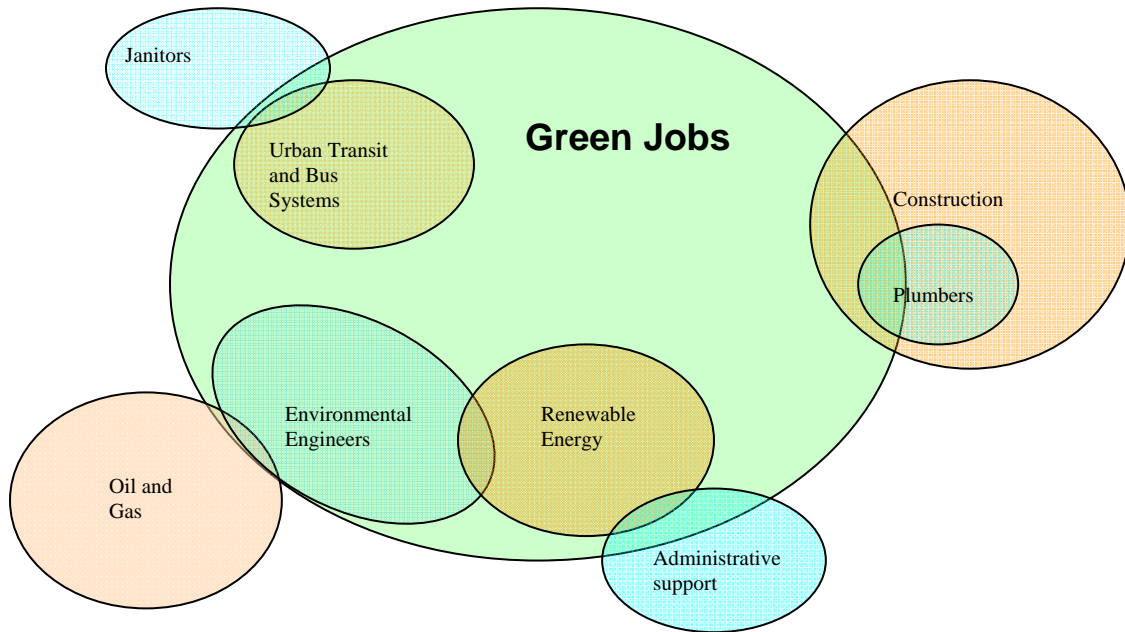
The U.S. Department of Labor is exploring a definition of green jobs that will adhere to these taxonomies and complement existing surveys and data sources, such as the Quarterly Census of Employment and Wages (QCEW), the Current Employment Statistics (CES), and the Occupational Employment Statistics (OES). The results of this effort are not yet available. The U.S. Department of Labor also hosted a February 2009 workshop in Washington, D.C. at the Green Jobs Good Jobs National Conference to partner with representatives of federal agencies, educational institutions, and the environmental, energy, construction, and transportation industries in order to develop an understanding of green jobs and to promote network and information sharing for emerging green workforce requirements.^{xv}

The complicated relationship between green jobs, industries, and occupations is illustrated in Figure 1, with industries represented in orange and occupations represented in blue. Industries are comprised of businesses that share common outputs. Occupations are a group of workers with common job duties who support the purpose of the business.

Green jobs cut across the boundaries of both industries and occupations. There are some industries that are considered green, such as urban transit and bus systems or renewable energy; that lay fully within the green jobs sphere. Yet, even though the industry may be a green industry, there are payroll clerks, accountants, janitors, and others that do not perform tasks that directly impact the environment. These workers may be considered green to the extent that they work in green industries. In Figure 1, janitors that work within the urban transit and bus system

industry and administrative support in the renewable energy industry are considered green, but those workers not within a green industry may not be green.

Figure 1: Diagram of the Relationships between Green Jobs, Industries, and Occupations



Occupations can be just as ambiguous when deciding whether or not the worker is a green worker or not. Figure 1 also represents the occupation of environmental engineers, which is considered a green occupation. Some environmental engineers work in industries that are green, such as renewable energy, but others work in industries that are not green, such as oil and gas. However, all environmental engineers, even those working within the oil and gas industry, may still be considered green jobs because their jobs work to prevent environmental degradation by the oil and gas drilling and ensuring that their company adheres to environmental regulation.

Finally, Figure 1 illustrates construction and plumbing jobs, which is an industry and occupation where some workers are green and others are not. For example, the construction industry is shown in Figure 1 as partially within the green jobs sphere, representing those construction businesses that promote energy conservation in buildings. There are plumbers that work within the construction industry who are green workers because they install water efficient systems, but other plumbers do not meet the green job criteria.

Measuring the number of jobs in industries that are partially green, such as construction, is particularly nuanced because some workers spend only a portion of their time in green activities. For example, residential construction workers are generally not considered as green unless they install energy-efficient improvements into a home. A plumber may spend only 10% of his time installing energy efficient toilets, with the rest of the time spent in traditional activities. The question is whether this plumber should be counted as one green job or one-tenth of a green job.

Summary Points:

- Employment is currently classified by industries or occupations. The definition of green cuts across these classifications, making it difficult to use current statistics to measure green jobs.
- The Bureau of Labor Statistics is attempting to define green jobs using the current industry and occupational taxonomies, but has not yet published their results.
- Workers in some jobs spend a portion of their time in green activities, yet the majority of their time in traditional activities. It is unclear how to account for these jobs.

Prior Studies Measuring Green Jobs

Attempts to measure green jobs thus far have struggled with the definition of green jobs and its alignment with the current taxonomies used for employment statistics. In general, most studies have focused only on the industries and occupations that lie fully within the green job sphere, avoiding situations where the industry or occupation may be considered only partially green.^{xvi} For example, the Pew Charitable Trusts estimated the number of green jobs in Montana to be 2,155, but including only businesses that fell fully within the green sphere.^{xvii} Other studies utilize economic models that estimate the employment impacts of funding directed toward green jobs, which result in job estimates, but not an actual count of green jobs.^{xviii} The majority of studies do not consider any social criteria for green jobs, although the OEDWERD study indicated that green jobs in Oregon pay slightly higher wages, require special certification, but do not require higher education levels that Oregon jobs overall.

Both the Oregon Employment Department Workforce and Economic Research Division (OEDWERD) and the State of Washington's Employment Security Department (WAESD) (in conjunction with Washington State University) have conducted surveys to determine the number of green jobs in their state using the current taxonomies for industries and occupations. These studies are helpful in that they measure employment in partially-green occupations. For example, the WAESD study found that 25% of the electricians in their state considered themselves to be completing green work, but the rest were not green workers.

The OEDWERD and WAESD studies are also remarkable because their use of the standard NAICS and SOC taxonomies allows their results to be used in other states, like Montana, that utilize the same classifications. If 8.8% of carpenters in Washington are green workers, we can generalize that 8.8% of carpenters in Montana are also green because the definition of carpenter is the same in both states.

Both the OEDWERD and WAESD studies used a survey methodology to estimate the number of green jobs in the state by mailing surveys to a sample of businesses and allowing the business to self-define green jobs. Even with careful efforts to include all green businesses in the survey, these surveys may underestimate the number of green jobs due to unreturned surveys or because the definition of green was not clearly understood by the responding businesses. Further, surveys are designed to include a representative sample of businesses; they do not include every

business. Occupations that are rare, such as environmental economists, have a low likelihood of appearing in the sample. Each study also has shortcomings because they excluded some employment from the survey. The WAESD study only included private sector jobs, while the OEDWERD study excluded employers with less than two employees.

The WAESD study also did not include any green jobs within the oil, natural gas, or coal industries, even though those industries employ environmental engineers and technicians to ensure compliance with environmental regulations. This may be because the oil, natural gas, or coal industries are not large industries in Washington and therefore unlikely to be within the survey, or it may be because these workers were not considered green because the overall industry is non-green. However, this is a large industry in Montana and likely hires significant employment to ensure environmental standards are met.

Summary Points:

- Research has thus far counted jobs within industries that are fully within the green sphere, excluding those that are partially green.
- Two studies from Washington and Oregon include partially green industries and occupations and use the NAICS and SOC taxonomies, making the research useful for counting green jobs in Montana.
- Very few studies use the social criteria in defining green jobs, although many attempt to measure the wage levels for green jobs.

Measuring Green Jobs in Montana

Borrowing from other research, particularly the WAESD and OEDWERD studies, seven different estimates of Montana green jobs have been developed using 2008 employment data. For the purposes of this study, green jobs were defined as jobs that improve energy conservation, produce renewable energy, or contribute to the conservation, regulation, protection, and restoration of the environment. Each alternative estimates interprets this definition in different ways and uses a different methodology to count green jobs using existing industry or occupational data.

Each alternative measure also includes information on the percentage of workers that are female, that are covered by union contract, that are white, and that earn over \$12.00 an hour in order to provide a rough conception of the number of environmentally-friendly jobs that also meet the qualitative and social green job criteria proposed by some organizations. The demographic information was calculated using data from the Current Population Survey (CPS) by the BLS. Data from the 2007 national sample was used to calculate the percent of workers that are female and that are represented by unions. The race demographic data, shown as the percentage of workers that are white only, is derived from the three-year average for the years of 2006 to 2008 from the Montana sample of the CPS. The Montana sample was used because Montana's race demographics differ significantly from the U.S. due to higher-than-average American Indian populations and lower-than-average populations of other races. The three-year average was used because Montana's CPS sample is small and has a large margin of error.

The demographic estimates are a weighted average of the demographic across industries and occupations. For example, 22% of national workers in crop production are female, while 30% of national chief executives are female. Assuming that each occupation has 10 green workers, the percentage of green workers that are female between these two occupations is 25% $((22\% * 10 + 30\% * 10) / (10 + 10))$.

Because of data limitations, the estimates on the number of green workers that are female, represented by unions, and that are white have limited reliability and should be considered rough estimates only. The CPS estimates by industry and occupation have a large margin of error. Further, the methodology is questionable if percentage of female, minority, and union representation in Montana's industries differ significantly from the national average. Finally, it is possible that the demographics of workers in green jobs differ significantly from non-green jobs within the same industry or occupational classification, which would not be accounted for through this methodology.

The estimates are summarized in Figure 2. Estimates 1 – 3, and 6 use an occupation basis for the estimate; estimates 4 and 5 use an industry basis. Estimate 7 uses both an occupation and industry basis to measure green jobs. The estimates range from 4,079 to 22,060 green workers, which is approximately 0.9% to 5% of the total number of Montana jobs. The first estimate is the sum of Montana employment in eight occupations included by the Bureau of Labor Statistics in their publication "Jobs for the Environment."^{xix} The second estimate uses the percent green employees in each occupation found in the WAESD study of the Washington Economy. The

third and fourth estimates use the percent green employees in each occupational and industry group found in the OEDWERD study on the Oregon green economy. Finally, estimates 5, 6, and 7 are estimates catered to Montana’s economy using a compilation of occupations and industries defined as green in other research or known to be green within the Montana economy. Further descriptions of each estimate, along with the shortcomings of each methodology, are discussed below.

Figure 2: Seven Estimates of Montana Green Jobs						
Description	2008 Green Jobs	Average Wage for Green Jobs	% Female	% Represented by Unions	% White	% Workers Earning \$12.00
1 Bureau of Labor Statistics "Environment Jobs"	4,079	\$40,140	37%	2%	84%	84%
2 WAESD Study Occupation Percentages	8,714	\$40,988	15%	1%	95%	80%
3 OEDWERD Occupation Percentages	22,060	\$34,678	29%	16%	94%	66%
4 OEDWERD Industry Percentages	13,186	\$37,191	37%	10%	95%	n.a.
5 Green Industries, Subjective Definition	9,907	\$45,818	38%	30%	97%	n.a.
6 Green Occupation, Subjective Definition	7,707	\$33,846	37%	2%	90%	69%
7 Montana Green Jobs using both Industry and Occupations, Subjective Definition	15,759	\$39,382	25%	2%	92%	76%
Montana Averages for Wage and Demographic Variables		\$33,301	46.80%	2.80%	94.3%	42.4%

As stated earlier, the determination of green is highly subjective, relative, and influenced by the biases of the authors, who admit ignorance to recent breakthroughs and knowledge in environmental protection. Therefore, the authors encourage discussion about which methodology to measure green jobs should be used and which occupations or industries to include as green jobs in future research. These seven estimates are designed to stimulate discussion and to provide policy-makers with a greater understanding of the existing data and its inherent restrictions.

Estimate 1 – BLS “Jobs for the Environment:

The Bureau of Labor Statistics (BLS) published a short report on jobs for the environment that does not cover all green jobs, but does include eight occupations that protect and preserve the environment. These occupations are:

- 17-2081 – Environmental Engineers
- 17-3025 – Environmental Engineering Technicians
- 19-1031 – Conservation Scientists
- 19-1032 – Foresters
- 19-2041 – Environmental Scientists and Specialists, including Health
- 19-4091 – Environmental Science and Protection Technicians, including Health
- 19-4093 – Forest and Conservation Technicians
- 45-4011 – Forest and Conservation Workers

Using these occupations to define green jobs, there are 4,079 green jobs in Montana. The average wage for these jobs was \$40,140 in 2008, higher than the state average of \$33,301. Over 84% of these workers make over \$12.00 an hour. Approximately 37% of these green jobs are held by women compared to 47% for all jobs, 84% are held by workers who are white compared to 94% for all jobs, and union representation is roughly equal to that of all jobs. This estimate of green jobs is fairly limited in the occupations included and likely underestimates the number of green jobs in Montana.

Estimate 2: Washington Percentages for Occupations

The second estimate utilizes the WAESD study, which includes the number of green jobs in each occupation in their Appendix. Using these figures and the private employment per occupation for the State of Washington from the Occupational Employment Survey (OES), the percentage of green jobs for each occupation was calculated.^{xx} Although the WAESD covered only private employment, this percentage was assumed to also hold true in the public sector employment. Estimate 2 applied the Washington percentages to occupations in Montana, so that if 8% of private carpenters were found to be green workers in the WAESD study, it was assumed that 8% of all carpenters in Montana were green workers.

However, Estimate 2 relies on a number of questionable assumptions. First, Estimate 2 assumes that Montana's economy is similar to Washington's economy both in the industries and occupations in the economy and in the extent that industries and occupations follow green practices. However, there is reason to believe this assumption is not true. For example, the WAESD survey did not recognize green workers in the oil and gas industry, even though Montana's oil and gas industry employs environmental engineers to ensure compliance with environmental regulations. Second, Estimate 2 assumes that the percentages found among private employers in Washington also apply for public employers. There is no way of determining whether this assumption is appropriate.

Estimate 2 results in a green job count of 8,714 green jobs with an average salary of \$40,988, and 80% of the workers earning more than \$12.00 per hour. Women are underrepresented in these green occupations, with an estimated 29% of the green workers being female compared to 47% for all occupations. These workers are also underrepresented by unions, with only 1% represented by unions compared to 2.8% for all jobs. Minority representation is approximately equal to the average.

Estimate 3: Oregon's Percentage Green Jobs by Occupation

The third estimate uses a similar methodology to Estimate 2, but instead of using the WAESD study, the percentage green in each occupation from the OEDWERD study was used. Estimate 3 therefore has some of the same problems regarding assumptions as Estimate 2. Further, the OEDWERD study only reported these percentages by large occupational category, which makes Estimate 3 less refined than the other estimates. Given that Estimate 3 is the highest estimate, it seems likely that the use of large occupational categories contributed to an overestimate of Montana green jobs.

Estimate 3 indicates that there are 22,060 green jobs in Montana with an average salary of \$34,678. This average salary is lower than most of the other green job estimates, but still higher

than the state average of \$33,301. Over 66% of these green job workers earned over \$12.00 per hour. Estimate 3 indicates that females are underrepresented, and unions are overrepresented in green jobs with compared to the state averages. Minority representation is roughly equal to the state average.

Estimate 4 – Green Industries using the OEDWERD study:

The fourth estimate also used the percentages in the OEDWERD study to estimate Montana green employment, but instead of using occupations, the estimate is based on NAICS industries. The OEDWERD study provided estimates that approximately 11% of Natural Resources and Mining jobs were green jobs; Estimate 4 assumed that this percentage is also true in Montana. This methodology includes many questionable assumptions, as outlined in the description of Estimate 2, which may not be valid.

Estimate 4 indicates that there are 13,186 green jobs in Montana with average annual salaries of \$37,191. Again, females are underrepresented in these green jobs, with only 37% of the green jobs being held by females compared to 47% of all jobs. Minority representation is roughly equal to the state average. Union representation is much higher than the average, with 10% of green jobs being represented by unions compared to 2.8% of all jobs.

Estimate 5 – Green Industries, Subjective Definition:

For the fifth estimate, the authors defined green jobs on the industry classification (NAICS) alone, which would not include green occupations that may work in non-green industries. This methodology is similar to the methodology used by Global Insight and the American Solar Energy Society. The employment statistics used in estimate 5 are from the 2008 Quarterly Census of Employment and Wages (QCEW). The fifth estimate required a subjective decision by the authors to include certain industries in the estimate and exclude others. Employment from the following 6-digit NAICS codes was included in the estimate:

- 111191 – Oilseed and grain combination farming
- 111421 – Nursery and tree production
- 113210 – Forest nursery and gathering forest products
- 221111 – Hydropower generation
- 311223 – Other oilseed processing
- 325199 – All other basic organic chemical manufacturing
- 423930 – Recyclable material merchant wholesalers
- 485113 – Bus and other motor vehicle transit
- 485119 – Other urban transit systems
- 485210 – Interurban and rural bus transportation
- 485410 – School and employee bus transportation
- 541620 – Environmental consulting services
- 562112 – Hazardous waste collection
- 562211 – Hazardous waste treatment and disposal
- 562910 – Remediation Services
- 562920 – Materials recovery facilities
- 813312 – Environment and conservation organizations
- 924120 – Administration of conservation programs

The total employment in these industries is 9,907 with an average salary of \$45,818. The average wage for all jobs in Montana during 2008 was \$33,301. Of the 9,907 green jobs, an estimated 97% are held by whites, 30% are represented by unions, and 38% are held by females. In comparison, 94.3% of all employed workers in Montana are white, 2.8% are represented by unions, and 46.8% are female.

Because this estimate is based on industry codes only, it would exclude green occupations in non-green industries, such as environmental consultants in the oil and gas industry or insulation workers in the construction industry. There are also NAICS codes that are not included that some may consider green, including the following industries:

- 561730 – Landscaping services
- 562119 – Other waste collection
- 924110 – Air, water, and waste program administration

Further, some may argue that the industries of grain farming or rural bus transportation do more harm than good to the environment and should not be considered green jobs.

Estimate 6: Green Occupations, Subjective Definition:

The sixth estimate sums the employment in occupations codes that were considered by the authors to be green occupations based on the definition of the occupation's duties and tasks or by their inclusion as green jobs in other publications. The included occupations and their SOC codes are as follows:

- 17-2081 – Environmental engineers
- 17-3025 – Environmental engineering technicians
- 19-1031 – Conservation scientists
- 19-2041 – Environmental scientists and specialists
- 19-4091 – Environmental science and protection technicians
- 19-4093 – Forest and conservation technicians
- 25-1043 – Forestry and conservation science teachers, postsecondary
- 25-1053 – Environmental science teachers, postsecondary
- 33-3031 – Fish and game wardens
- 47-2131 – Insulation workers, floor, ceiling, and wall
- 47-2132 – Insulation workers, mechanical
- 47-4041 – Hazardous material removal workers
- 49-3091 – Bicycle repairers
- 51-8031 – Water and liquid waste treatment plant and system
- 53-3021 – Bus drivers, transit and intercity
- 53-3022 – Bus drivers, school
- 53-7081 – Refuse and recyclable material collectors

Estimate 6 results in green employment of 7,707 workers with an average salary of \$33,846. About 69% of these workers earned \$12.00, higher than the average of 42.4% for all jobs. Using this estimate, green workers are 37% female, 2% represented by unions, and 90% white,

compared to 47% female, 94% white, and 2.8% represented by unions for all jobs. In other words, representation of females is slightly less than the average, while minority representation is slightly higher than average. Union representation is roughly equal to the average.

Estimate 6 required a subjective decision of which occupations to include as green. This decision may be disputed. For example, estimate 6 did not include the following occupations as green jobs, even though other research has included these occupations as green:

- 19-1013 – Soil and plant scientists
- 19-1032 – Foresters
- 27-1023 – Floral designers
- 33-2022 – Forest fire inspectors and prevention specialists

Estimate 7: Combined Occupational and Industry Results from WAESD, Customized for Montana

The fifth method for measuring green jobs is to adjust the percentages in the Washington Study to account for differences between the Washington economy and the Montana economy, and to account for government employment. A significant number of environmental protection and regulation jobs are within the government sector.

The fifth methodology is to accept the Washington percentages for each occupation, but increase the percentages for industries and occupations considered green by their definitions or by other studies. Adjustments that are based on both occupation and industry require a matrix that is only available at the 4-digit NAICS code level.

All jobs in the following industries are considered green. The green percentage was increased to 100% for these industries.

- 1114 – Greenhouse and nursery production
- 1132 – Forest nursery and gathering forest products
- 4851 – Urban transit systems
- 4852 – Interurban and rural bus transportation
- 4854 – School and employee bus transportation
- 9241 – Administration of environmental programs

In addition to including jobs in the above industries, this estimate increased the percentage of green employees for some occupations. The percentages were increased in order to customize the WAESD results for the Montana economy. The occupations adjusted are shown in Table 3, along with the justification for the increase.

Estimate 7 indicates green jobs of 15,759 with an average salary of \$39,382 and over 76% of the workers earning about \$12.00 per hour. Women are underrepresented in these green jobs, with 25% of the jobs held by women compared to 47% for all jobs, but minority representation is higher than the expected with 92% of the workers white compared to 94% for all jobs. Union representation is approximately equal to the average for all jobs.

Table 3: Occupations where the Green Percentage was Increased for Estimate 7 with Justification for the Increase

Occ Code	Title	WA Percentage	Increased Percent	Justification	Jobs in 'Green' Industries
11-9121	Natural Science Managers	2.8%	75%	Most of these jobs are in the Federal Government sector, working for the Interior Department supervising natural science research and publishing of the latest information. Private industry employment includes ARCO (which conducts remediation activities for their mines) and nonprofit conservation groups. Federal, nonprofit, and ARCO employment is equal to 75% of all Natural Science Managers.	275
17-2081	Environmental Engineers	10.6%	100%	Definitional	239
17-3025	Environmental Engineering Technicians	2.7%	100%	Definitional	26
19-1013	Soil and Plant Scientists	3.3%	70%	Most of these workers are state workers for either the Department of Environmental Quality or the Department of Public Health and Human Services (DPHHS). In DPHHS, the job duties of soil scientists is described as an occupation "in which employees apply biological, chemical, and public health principles to control, eliminate, ameliorate, and/or prevent environmental health hazards." Other employment includes researchers at Montana State University that are studying carbon sequestration and private employees of environmental consulting firms.	89
19-1023	Zoologists and Wildlife Biologists	2.6%	41%	About 41% of the occupation works for either conservation advocacy groups or state and federal conservation agencies.	166
19-1029	Biological Scientists, all other	N.A.	40%	Montana has an unusually large number of scientists in this category. These scientists should likely be included in one of the other biological science categories. 40% is an average green jobs in the other biological science categories.	
19-1031	Conservation Scientists	0.9%	100%	Definitional	294
19-1032	Foresters	33.8%	83%	Approximately 83% of foresters work for the public sector or social advocacy groups. This estimate assumes that the foresters from the public sector and social advocacy groups are green because they help balance environmental protection with lumber production. The remainder of the employment in the private sector is assumed to be primarily focused on non-environmental concerns and are considered to be not green workers. Some of the private industry foresters may carry on green activities, but they would be excluded from this estimate.	217
19-2041	Environmental Scientists and Specialists, Including Health	11.3%	100%	Definitional	724
19-2043	Hydrologists	14.3%	75%	Many hydrologists are hired by state and federal agencies to manage water resources. Privately employed hydrologists likely carry out some restoration work, or ensuring compliance with environmental regulations. Others would not be conducting green activities.	89
19-4091	Environmental Science and Protection Technicians, Including Health	34.2%	100%	Definitional	127
19-4093	Forest and Conservation Technicians	2.1%	80%	Largely definitional. Forest technicians also work on fire suppression.	suppressed
25-1042	Biological Science Teachers, Postsecondary	0.0%	40%	About 40% of biological science workers in Montana are green, and someone must be teaching them green practices. Therefore, the 40% was used for the teachers as well.	81
25-1043	Foresetry and Conservation Science Teachers, Postsecondary	0.0%	80%	About 80% of forestry and conservation workers are green workers, and they must be taught green practices. The 80% is also used for the teachers of these practices.	suppressed
25-1053	Environmental Science Teachers, Postsecondary	2.5%	100%	All environmental scientists are considered green jobs. Because the teachers must pass on these green practices, 100% of environmental science teachers are considered green.	suppressed
33-3031	Fish and Game Wardens	N.A.	100%	Definition includes both enforcement and data collection on fish and wildlife populations and the environment, both are green. Other activities of this occupation may not be considered green, such as managing controlled hunts.	102
47-2131	Insulation Workers, Floor, Ceiling, and Wall	66.2%	100%	Energy efficiency, which requires insulation workers, is green.	206
47-2132	Insulation Workers, Mechanical	3.0%	100%	Energy efficiency, which requires insulation workers, is green.	26
47-4041	Hazardous Material Removal Workers	21.7%	100%	These workers are primarily involved in restoration work, which is green.	13
49-3091	Bicycle Repairers	N.A.	100%	Many studies include non-car and public transportation as green jobs. Even though bike repairers could also be recreational, the alternate recreation vehicle would be motorized.	45
51-8031	Water and Liquid Waste Treatment Plant and System Operators	5.8%	100%	BLS definition of occupation lists the duties to be "remove harmful pollutants from domestic and industrial liquid waste so that it is safe to return to the environment."	431
53-3021	Bus Drivers, Transit and Intercity	0.0%	100%	Many other studies included public transit.	276
53-3022	Bus Drivers, School	0.0%	100%	Many other studies included public transit.	2,111

Conclusion

Estimating the number of green jobs in Montana is a process fraught with complications. First, a standard definition of green jobs does not exist. While ongoing research may result in a standard definition, developing technologies may mean that the dividing line between green and not green jobs is dynamic. Second, the definition of green jobs is based on the outcome of the work effort, not on a specific industry or occupation, making it difficult to measure the number of green jobs using current statistics based on the current NAICS and SOC classification of jobs. Finally, some workers only spend a portion of their time conducting green activities, making it difficult to place the worker within a green or non-green classification.

This study does not claim to provide any definitive answers to the problems in defining and measuring green jobs. It seeks only to provide public officials and interested parties with some insight into the nuances of defining and measuring green jobs with the hope of stimulating discussion and decisions on these issues.

As an example of how green job measurement might be conducted, this research has attempted to utilize existing documentation on defining and measuring green jobs in other states in order to provide an estimate of the number of green jobs in Montana. Seven different methodologies to estimate green jobs were used, resulting in green job estimates ranging from 4,079 to 22,060. All estimates indicated that green jobs paid higher wages than the state average for all jobs. Rough demographic estimates were developed for the green jobs based on federal and state statistics. In every estimate, females were underrepresented in green jobs when compared to the percent of females in all jobs in the state. The minority and union representation varied significantly based on the estimate methodology. Further research in Montana and in other states will likely provide greater insight into how these estimates could be refined.

Endnotes

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