



Colorado Department of Labor and Employment

Interim Report on Green Jobs in the Colorado Economy

Conducted by:

**Colorado Department of Labor and Employment
Labor Market Information**

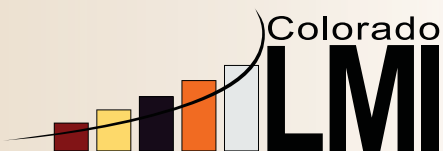
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EXECUTIVE SUMMARY

The Colorado Department of Labor and Employment, Office of Labor Market Information (LMI), in association with the Business Research Division in the Leeds School of Business at the University of Colorado Boulder, conducted a comprehensive survey to estimate the number of green jobs in Colorado and to obtain information on industry distribution, and the types and wages of these green jobs. The survey also was designed to gauge perceptions about the factors that might influence or deter Colorado business units as they consider increasing their presence in the green economy.

Beginning in January 2011, a paper survey was mailed to 29,596 Colorado establishments randomly selected from the Quarterly Census of Employment and Wages (QCEW) database for the Q4 2009. Responses were collected over a period of five months through mail, telephone, and internet surveys. The survey asked employers about the green economic categories they might be involved with and the number, types, and wages of green jobs they have. Employers were also asked to rank sets of factors that may influence or deter their expansion into the green economy.

The estimated overall prevalence of green jobs in Colorado was 2.8% (+/- 0.05%) and ranged from 0.2% (+/- 0.04%) in the Health Care and Social Assistance sector to 12.0% (+/- 0.56%) in the Construction sector. Overall, 18.0% of respondents reported that they were involved in one of six broad categories of green economic activity. Respondents indicated that financial factors, such as profit margin and customer demand, were the most influential factors determining their willingness to increase their involvement in green activities.

This preliminary analysis found a prevalence of green jobs that is similar to recent studies conducted in other states. The data collected from this survey may be helpful in providing a context for future analysis and further exploratory research, and in assisting individuals, policy makers, and the business community in assessing the impact of the green economy in Colorado.

BACKGROUND

Labor Market Information provides information and research to help businesses, citizens, and policy makers understand the Colorado economy. Historically, LMI has conducted research on business clusters such as health care, manufacturing, the creative industries, as well as provided industry and occupational employment projections and wage estimates.

In summer 2010, LMI received an invitation to join a group of western states in a project to help gauge the extent of the green economy by surveying companies to determine the prevalence of green jobs in the state. LMI saw the invitation to join the Northern Plains and Rocky Mountain Green Jobs Survey Consortium (the "Consortium") as an opportunity to conduct exploratory research on the topic of environmentally friendly jobs and on the factors that might lead to the creation of a new and potentially significant segment of the economy. LMI has, for some years, fielded an increasing number of inquiries about the nature and characteristics of that segment of the economy. The topic of the green economy is highly debated and widely promoted as a new and potentially important direction for job creation in the state, and the subject is one that extends to various domains, including government and academia, and, most importantly, to business and commerce in Colorado. As the lead agency charged with providing economic data to the state's business community, it was incumbent upon LMI to begin to explore the topic.

LMI also saw this research opportunity as a supplement to the Bureau of Labor Statistics (BLS) impending green goods and services survey which began in the second half of 2011. The outcomes of the two studies will supply complementary perspectives for a better understanding of the green economy.

It should be noted at the outset that the study results reported in this document are exploratory in nature and are not intended as a definitive statement describing the green economy in Colorado. In fact, it should be understood that the precise accounting of green jobs existing in Colorado is highly dependent on the ability to classify any particular job (which can be subjective) on the interpretation and opinion of survey participants, as well as on the evolving, broad definition of what constitutes a green job. As with every survey, a bias toward inclusion may affect the resulting responses as respondents may or may not desire to be a part of the study. It is also important to note that in this initial analysis of the survey data, a job reported by an employer as falling within the provided definition of a green job was considered valid. In order to compare the Colorado results with those of the other Consortium states, this unfiltered method of measuring jobs was selected as the most reasonable procedure for comparing results. Further analysis of these data in the coming months may employ more refined screening and interpretation methods and will be considered in the revised context and methodology of any supplementary study.

While this study captured the number of employees performing green jobs, these jobs occur within many occupational categories and range in diversity from construction, to engineering, to management occupations¹. While most of the occupations associated with these green jobs pre-date the green economy, some have been adapted to fit the green niche (e.g., water heater installer versus tankless water heater installer), whereas others are now being recognized as serving the green economy (e.g., insulation installer). These jobs produce tangible goods, offer real services, and pay substantial wages. Classifying these jobs as green simply identifies a shared objective (minimizing environmental impact), similar to identifying the multiple industries that contribute to the aerospace cluster.

PROJECT OVERVIEW

In response to a request by LMI, the Business Research Division (BRD) of the University of Colorado Boulder assisted in conducting a baseline survey of green jobs in the state of Colorado. The purpose of the study was to advance LMI's mission to provide timely and relevant economic data to the citizens of the state. Results from this survey may be compared to other states in the Consortium—Iowa, Montana, Nebraska, North Dakota, South Dakota, Utah, and Wyoming.

The green economy is composed of many industry and occupational classifications, making green businesses a cluster in the sense that biosciences, aerospace, and tourism are clusters. Therein lies the challenge in quantifying the size and scope of the cluster—it comprises a relatively small slice of many industries. This study set out to examine the green economy in Colorado by:

- 1) Quantifying the number of green jobs by industry in Colorado,
- 2) Qualifying the types of green occupations in Colorado,
- 3) Identifying the training needs for green jobs in Colorado,
- 4) Quantifying the wage categories for green jobs in Colorado,
- 5) Identifying and ranking the factors that influence the growth of green jobs, and
- 6) Identifying and ranking the factors that inhibit the growth of green jobs.

This report allows for a quality analysis to be conducted of the overall prevalence of green jobs in the Colorado economy, as well as of the factors that employers cite as those influencing or deterring their expansion into the green economy. Additional analysis was performed by industry and size class.

¹ An occupation refers to a set of activities or tasks employees are paid to perform, while a job refers to a person filling a paid position (full time or part time).

It is also worth noting that, as with any survey of this size and scope, the quality and number of responses will vary between questions. Specifically, the number of responses providing the necessary detail on the questions about wages and percentages of time spent on green activities is not sufficient to report with confidence. The responses to this survey, specifically as they relate to wages, may be supplemented in future analyses by information collected in the statewide OES survey and the BLS green goods and services study. Analyses by size class will also be more comprehensively addressed in future reports.

METHODOLOGY

LMI joined the Consortium late in the survey project process. Therefore, both the methodology and the survey instrument had been created and were in service. In order to ensure that the Colorado results were comparable to the survey results of other Consortium members, it was incumbent upon the Colorado research team to use the existing process and instrument. The LMI and BRD research teams worked directly with project leaders from the Consortium in order to closely adopt the methodology deployed in the seven other states that conducted similar studies.

The existing green jobs survey was modified and adopted to solicit information from Colorado companies regarding green jobs in the Colorado economy. An LMI statistician pulled a random sample of all industries of nearly 30,000 Colorado companies from the Quarterly Census of Employment and Wage (QCEW) database for Q4 2009. The sample was drawn across all industries and size classes without pre-judgment regarding the industry or size distribution of companies with green jobs. This design was selected in order to enable the most accurate estimates of green jobs within the overall Colorado economy. The Colorado survey followed the Consortium's methodology that was designed to include a sufficient number of firms within each industry and size class in order to enable the reporting of green jobs at the industry level. The survey was not designed to elicit data on the distribution of green jobs by geographical area within Colorado.

The Colorado green jobs survey was drafted, shared, and tested for validity and clarity with various academic, government, and research groups. The survey was then programmed in an online survey program, and a webpage was devoted to the project on the Leeds School of Business website at the University of Colorado Boulder.

The project team reached out to companies in the sample up to five times. First, companies were sent a "heads-up" postcard introducing the study, which included the URL to the online survey and a unique password. Next, companies were sent a paper survey with a cover letter that further explained the study,

giving company representatives the option to complete the paper survey, or to go online to complete the survey. A reminder postcard was then sent to all nonrespondents, which again included the URL and unique password. Simultaneously, telephone calls were made to nonrespondents. Finally, a short-form survey was sent to all nonrespondents in order to increase response to core survey questions.

Survey

The Consortium provided electronic versions of the survey to the BRD research team. The BRD research team sourced additional survey examples that were used in other states outside of the Consortium and talked with researchers at other institutions for purposes of due diligence and comparative research. The Colorado survey was created to have the same look and feel as the Consortium's. The company information and green jobs questions were identical to the Montana survey. The final section of the survey was left to the discretion of each state project team to gather additional information deemed important to that state. (See Appendix 1 to view the survey instrument.)

The Colorado project team used discretionary questions to capture information regarding influences and inhibitors to cluster growth. Specifically, two sections in the Montana survey requesting information about employment benefits and green business practices were replaced with two sections of questions about the factors that would influence or deter businesses from expanding into the green economy.

The survey instrument was tested for accuracy and understanding. After making minor modifications, the survey was programmed into Qualtrics, an online survey program. This version of the survey required the same password provided on the postcards and paper survey to ensure one survey response per company.

Sample Selection

The CDLE green jobs survey drew its sample from the QCEW file for Q4 2009. That file contains all covered employment in the state of Colorado.² Of the 169,126 business establishments in the file, 29,596 were randomly selected for this study.

The Q4 2009 file was stratified by NAICS sector and size class. Based on the Consortium's methodology for minimum sample units needed to publish results by NAICS sector and size class stratum with a standard error of 3% or less at a 95% level of confidence, certainty cells were identified, and units in the remaining (noncertainty) cells were randomly selected to achieve the target unit allocation for each cell.

²Employment covered by state unemployment insurance laws or, for federal workers, covered by the Unemployment Compensation for Federal Employees program.

The sample was selected to report findings for five size classes. These size classes include firms with the following number of employees:

- From greater than 0 to less than 10
- From 10 to less than 50
- From 50 to less than 100
- From 100 to less than 250
- 250 or greater

In order to better ensure the delivery of the survey to the intended recipients, the addresses were refined as much as possible in the time frame relegated for the study. A key factor was the delivery of surveys to businesses with multiple operating sites in the state (“multis”). In the case of multis, delivery to the main administrative branch was considered the optimal method for targeting the information request to appropriate contact persons.

Cover Letter

The cover letter described the purpose of the study and provided a URL for the green jobs survey hosted by the Leeds School of Business website. On the front of the cover letter were eight logos: those of the organizations conducting the project and those that were endorsing the project. These organizations included:

- State of Colorado
- Colorado Department of Labor and Employment
- Northern Plains and Rocky Mountain Green Jobs Consortium
- Leeds School of Business
- Governor’s Energy Office
- Colorado Municipal League
- Metro Denver Economic Development Corporation
- Economic Development Council of Colorado

The back side of the cover letter was an illustration of “What We Mean by Green,” which was also used by the Consortium. (See Appendix 1 to view the survey instrument.)

Distribution

A pre-notification postcard informing respondents of the impending survey was mailed to all sample units in December 2010. The survey was mailed in January 2011, with a follow-up sent in February and a final request for information in March.

The survey was mailed in an envelope with the CDLE and Leeds School of Business logos in the return-address area. A postage-paid return envelope accompanied the survey. Surveys were mailed first class in order to capture return-to-sender address changes. (See Appendix 1 to view the survey instrument.)

An Excel-based version of the survey was posted on the website as a convenient alternative option created for companies with multiple entities.

The Leeds School of Business hosted a webpage for the green jobs survey (leeds.colorado.edu/greenjobssurvey), which outlined the purpose of the study and provided contact information, descriptions of green jobs, and a link to the online survey.

Defining Green Jobs

The survey definitions of green jobs are based on the categorization of green occupations put forward by the BLS. According to the BLS, green jobs are either:

- 1) Jobs in businesses that produce goods or provide services that benefit the environment or conserve natural resources.
- 2) Jobs in which workers' duties involve making their establishment's production processes more environmentally friendly or use fewer natural resources.³

From these larger categories, the BLS constructed six occupational function descriptions, which were then used to inform Colorado's green jobs survey respondents.

Those functions are:

- Pollution, waste, and greenhouse gas management, prevention, and reduction.
- Energy efficiency and conservation.
- Environmental clean-up and remediation and waste clean-up mitigation.

³Bureau of Labor Statistics. "Overview of the BLS Green Jobs Initiative, Developing the Green Jobs Definition." www.bls.gov/green, accessed May 27, 2011.

- Pollution, waste, and greenhouse gas management, prevention, and reduction.
- Energy efficiency and conservation.
- Environmental clean-up and remediation and waste clean-up mitigation.
- Renewable energy and alternative fuels.
- Education, regulation, compliance and training, and energy trading.
- Sustainable agriculture and natural resource conservation.³

These six green categories, along with the guidance provided to respondents to identify green jobs,⁴ represent the current categorization of green economic activity as determined by BLS, the study's funding authority. These categories and associated guidelines were formulated, in part, to collect data that will help further clarify green job definitions for future research. The intent of this survey, and the definitions used in it, is to gather information on jobs that fall into the green categories. It is not intended to capture green practices, volunteerism, or marketing efforts. That is, the job itself must have, as part of its function, paid activities that produce an environmentally friendly product or service. For example, an employee who voluntarily recycles office paper while on the job would not, based solely on that criterion and for the purpose of this study, be considered a green job. Conversely, an electrician who installs photovoltaic cells would be considered a green job. Any attempt to collect and measure various ancillary green efforts that employees engage in at their jobs would greatly overstate the estimate of green jobs.

Furthermore, because the green jobs survey was constructed and delivered as a point-in-time survey of existing green jobs and wages, the data collected cannot be interpreted to determine any relative growth or decline in the number or quality of jobs in Colorado over a period of time.

Calculating Margins of Error

Two methods were utilized for calculating the margin of error: one for analyses for the primary sampling units (firms), and one for analysis based on the secondary sampling units (jobs).⁵

The margin of error for the firms was a simple estimate of the standard error of a proportion:

$$SE = 1.96 * \sqrt{\frac{p(1-p)}{n}}$$

³Bureau of Labor Statistics. "Overview of the BLS Green Jobs Initiative, the BLS Green Jobs Definition." www.bls.gov/green, accessed May 27, 2011.

⁴"What we Mean by Green" document in Appendix 2.

⁵Lohr, Sharon L. (1999). *Sampling: Design and Analysis*, Brooks/Cole, p. 61.

The calculation of the margin of error for employment drawn from a sample based on firms required methods suited to the cluster design of the survey. In this case, each firm was treated as a cluster of employment within each industry. The variance for green employment within each stratum is calculated by:

$$\widehat{VAR}(GJRate) = \frac{GJRate^2}{TEmp^2} * VAR(TEmp) + \frac{1}{TEmp^2} * VAR(GJEmp) - 2 * \frac{GJRate}{TEmp^2} * COV(TEmp, GJEmp)$$

The variance over all strata is calculated as the weighted average of the stratum-specific variances:

$$\sum \left[\frac{N_h^2}{N^2} * \widehat{VAR}(GJRate) \right]$$

The margin of error for the prevalence of green jobs is then calculated as $1.96 * \sqrt{Variance}$.

LITERATURE REVIEW

Several studies of green jobs and the national green energy industry have been recently conducted. Among those, Oregon, Michigan, Missouri, Kansas, and Washington conducted surveys in 2009 of employers to determine the number of green jobs in their respective states. Although each survey used a unique definition of green job, common elements included increase energy efficiency, produce renewable energy, clean up environmental degradation, and provide services or products related to clean transportation and pollution controls. Survey results varied, from green jobs (direct and support positions) accounting for 1.9% of all Kansas employment to 4.8% of total Missouri employment. The construction and manufacturing industries often reported having the highest concentration of green jobs.

Nationally, the Pew Charitable Trusts completed a study in 2009 on the clean energy economy. Pew compiled a list of companies that were receiving green technology venture capital. After identifying similar and related businesses, analysts verified that each company was involved in green activities. Pew's definition of the green economy comprised five parts: energy efficiency, clean energy, environmentally friendly production, conservation, and pollution mitigation, and training and support. Pew reported that green jobs in the U.S. clean energy economy totaled 770,000 in 2007.

For more details of these studies, please see Appendix 1.

SURVEY SAMPLE

After removing companies that were inactive or out of business, the sample included 29,596 active businesses pulled from the Q4 2009 QCEW dataset (Table 1).

The definitions for the sample identified in Table 1 are:

- Target Allocation: The number of units theoretically required to produce stable estimates under the Consortium assumptions for response rate, confidence level, and error rate.
- Actual Sample: The actual number of units selected to strata following randomization.

TABLE 1: SAMPLE BY INDUSTRY

NAICS	Industry	Firms		Employment
		Target Allocation	Actual Sample	Actual Sample
11	Agriculture, Forestry, Fishing, Hunting	1,047	1,025	12,435
21	Mining	1,060	1,042	22,004
22	Utilities	598	598	14,089
23	Construction	1,144	1,151	55,415
31-33	Manufacturing	2,187	2,187	114,488
42	Wholesale Trade	3,387	3,385	72,220
44-45	Retail Trade	3,490	3,567	159,439
48-49	Transportation & Warehousing	1,147	1,172	64,687
51	Information	1,124	1,127	70,226
52	Finance & Insurance	1,223	1,258	64,918
53	Real Estate, Rental & Leasing	1,213	1,199	22,639
54	Professional & Technical Services	917	951	62,082
55	Management Of Companies & Enterprises	1,010	1,016	27,760
56	Administrative & Waste Services	1,014	996	90,066
61	Educational Services	1,091	1,101	199,152
62	Health Care & Social Assistance	1,235	1,212	166,807
71	Arts, Entertainment & Recreation	1,080	1,065	44,172
72	Accommodation & Food Services	1,230	1,224	56,097
81	Other Services	2,317	2,256	37,574
92	Public Administration	1,739	1,739	138,086
99	Unclassified	325	325	595
All	Total	29,578	29,596	1,494,950

SURVEY RESPONSES

The BRD received responses from 8,052 companies (Table 2). Eighteen industries had response rates 20% or greater, and eight had response rates above 30%.

TABLE 2: RESPONSES BY INDUSTRY

NAICS	Industry	Survey Responses	Response Rate	Percent of Target Response Achieved
11	Agriculture, Forestry, Fishing, Hunting	344	32.9%	109.5%
21	Mining	333	31.4%	104.7%
22	Utilities	185	30.9%	103.1%
23	Construction	391	34.2%	113.9%
31-33	Manufacturing	787	36.0%	120.0%
42	Wholesale Trade	933	27.5%	91.8%
44-45	Retail Trade	745	21.3%	71.2%
48-49	Transportation & Warehousing	294	25.6%	85.4%
51	Information	219	19.5%	64.9%
52	Finance & Insurance	236	19.3%	64.3%
53	Real Estate, Rental & Leasing	338	27.9%	92.9%
54	Professional & Technical Services	230	25.1%	83.6%
55	Management Of Companies & Enterprises	244	24.2%	80.5%
56	Administrative & Waste Services	232	22.9%	76.3%
61	Educational Services	364	33.4%	111.2%
62	Health Care & Social Assistance	368	29.8%	99.3%
71	Arts, Entertainment & Recreation	350	32.4%	108.0%
72	Accommodation & Food Services	240	19.5%	65.0%
81	Other Services	785	33.9%	112.9%
92	Public Administration	369	21.2%	70.7%
99	Unclassified	65	20.0%	66.7%
All	Total	8,052	27.2%	90.7%

SURVEY RESULTS

The following survey results depict green economic activities, prevalence of firms with green jobs, and the prevalence of green jobs by industry. Additionally, survey results shed light on influencing factors and deterring factors cited for creating (not creating) green jobs within companies.

While the survey team went to great lengths to elicit responses from a sample of all industries and firms in the state of Colorado, any survey runs the risk of self-selection bias. These statistics are based on self-reported classifications of green activities and green jobs.

Green Economic Categories

Approximately one-fifth of survey respondents (18.0%) stated that they are involved in one of the following green economic activities:

- Renewable Energy and Alternative Fuels
Definition: Manufacturing, construction, design, research, delivery, operation, storage or maintenance of wind, solar, biomass, hydro, alternative transportation fuels, geothermal, methane, and waste incineration as a fuel source.
- Energy Efficiency and Conservation
Definition: Manufacturing, construction, or installation of energy-efficient products, energy efficiency services, weatherization, building retrofitting/efficiency, energy-efficient production processes, energy distribution improvements, and transportation technology.
- Pollution, Waste, and Greenhouse Gas (GHG) Management, Prevention, and Reduction
Definition: Activities related to controlling emissions and pollution. Includes controlling and reducing greenhouse gas emissions, waste water, and other pollutants.
- Environmental Clean-up and Restoration and Waste Clean-up and Mitigation
Definition: Environmental restoration including the clean-up and disposal of pollution, waste, and hazardous materials; Superfund/brownfield redevelopment; and landfill restoration.
- Education, Regulation, Compliance, Public Awareness, and Training and Energy Trading
Definition: Activities that educate on energy efficiency, renewable energy, energy rating systems certifications, and more efficient energy consumption. Enforcement of compliance requirements and regulations, and training on effective use of energy-related products and services.
- Sustainable Agriculture and Natural Resource Conservation
Definition: Products and services to conserve, maintain, and improve natural resources and environment, including low carbon and organic agriculture, land management, water management and conservation, wetlands restoration, and environmental conservation.

The most commonly cited green economic activity was Energy Efficiency and Conservation (5.5%), followed by Sustainable Agriculture and Natural Resource Conservation (3.5%) (Table 3). The lowest prevalence of primary green activity fell into Environmental Clean-up and Restoration and Waste Clean-up and Mitigation, with 1.7%.

TABLE 3: PREVALENCE OF GREEN ECONOMIC CATEGORIES

Green Economic Categories	Frequency	Percent^a
Renewable Energy and Alternative Fuels	196	2.4%
Energy Efficiency and Conservation	446	5.5%
Pollution, Waste, and Greenhouse Gas (GHG) Management, Prevention, and Reduction	209	2.6%
Environmental Cleanup and Restoration and Waste Clean-up and Mitigation	139	1.7%
Education, Regulation, Compliance, Public Awareness, and Training and Energy Trading	183	2.3%
Sustainable Agriculture and Natural Resource Conservation	280	3.5%
None of the above	6,599	82.0%
Total Response	8,052	100.0%

Aggregated Margin of Error 0.85%, Coefficient of Variation 4.7%.

^aPercentages may not sum to total due to rounding.

Industry-specific results show that businesses in the Agriculture sector indicated their overall involvement in green activities is greater than 37% (Table 4). One-third of the surveyed employers in both the Utilities sector and the Construction sector reported they engaged in some economic activity that fell into one of the green economic categories. A relatively high percentage of business units in the Public Administration sector indicated they were involved in one of the green economic activities (27.1%). The lowest incidence of business units reporting green activity occurred in the Finance and Insurance sector and in the Information sector, with 3.4% and 9.1%, respectively.

TABLE 4: GREEN ECONOMIC CATEGORIES, BY INDUSTRY

NAICS	Industry	Renewable	Efficiency	Pollution	Clean-up	Education	Sustainable	Any Category	NA	Total Count
11	Agriculture, Forestry, Fishing, Hunting	3.5%	2.0%	1.5%	0.6%	0.3%	29.7%	37.5%	62.5%	344
21	Mining	4.5%	0.6%	3.0%	3.9%	0.9%	0.9%	13.8%	86.2%	333
22	Utilities	7.6%	3.2%	8.1%	0.5%	8.1%	5.9%	33.5%	66.5%	185
23	Construction	5.1%	24.8%	0.8%	1.5%	0.5%	0.3%	33.0%	67.0%	391
31-33	Manufacturing	3.4%	5.2%	3.6%	2.0%	1.0%	3.3%	18.6%	81.4%	787
42	Wholesale Trade	4.0%	6.9%	1.6%	1.4%	0.8%	3.5%	18.1%	81.9%	933
44-45	Retail Trade	1.1%	6.3%	1.5%	1.2%	1.2%	1.5%	12.8%	87.2%	745
48-49	Transportation & Warehousing	3.4%	3.1%	3.4%	3.1%	0.7%	1.4%	15.0%	85.0%	294
51	Information	0.0%	1.4%	1.4%	0.0%	5.5%	0.9%	9.1%	90.9%	219
52	Finance & Insurance	0.0%	1.3%	0.4%	0.0%	0.4%	1.3%	3.4%	96.6%	236
53	Real Estate, Rental & Leasing	1.2%	11.5%	0.9%	0.0%	2.1%	0.9%	16.6%	83.4%	338
54	Professional & Technical Services	3.9%	5.7%	2.6%	2.2%	3.0%	0.9%	18.3%	81.7%	230
55	Management Of Companies & Enterprises	2.0%	3.7%	2.0%	2.0%	0.8%	2.0%	12.7%	87.3%	244
56	Administrative & Waste Services	0.9%	2.2%	1.3%	4.7%	1.3%	5.6%	15.9%	84.1%	232
61	Educational Services	0.8%	4.1%	0.5%	1.4%	12.4%	0.5%	19.8%	80.2%	364
62	Health Care & Social Assistance	0.5%	2.7%	2.2%	3.3%	1.4%	0.3%	10.3%	89.7%	368
71	Arts, Entertainment & Recreation	1.7%	3.1%	1.7%	1.1%	1.4%	3.4%	12.6%	87.4%	350
72	Accommodation & Food Services	0.8%	5.0%	1.3%	2.1%	1.3%	2.1%	12.5%	87.5%	240
81	Other Services	1.3%	4.7%	7.4%	2.0%	2.2%	1.5%	19.1%	80.9%	785
92	Public Administration	2.4%	4.1%	3.5%	1.9%	7.6%	7.6%	27.1%	72.9%	369
99	Unclassified	1.5%	1.5%	1.5%	0.0%	1.5%	1.5%	7.7%	92.3%	65
All	Total	2.4%	5.5%	2.6%	1.7%	2.3%	3.5%	18.0%	82.1%	8,052

Prevalence of involvement in any of the green economic categories was more pronounced in companies with 50 or more employees rather than in smaller size classes (Table 5). This held true when examining responses for the individual categories of Renewable Energy and Alternative Fuels; Energy Efficiency and Conservation; and Pollution, Waste, and Greenhouse Gas (GHG) Management, Prevention, and Reduction. Involvement in Sustainable Agriculture and Natural Resource Conservation was inversely related to size (i.e., more green activities in smaller firms), whereas the opposite was the case for involvement in Education, Regulation, Compliance, Public Awareness, and Training and Energy Trading.

TABLE 5: GREEN ECONOMIC CATEGORIES, BY SIZE CLASS

Size Class	Renewable	Efficiency	Pollution	Clean-up	Education	Sustainable	Any Category	NA	Total Count
0-9	1.8%	4.9%	2.1%	1.4%	1.8%	4.5%	16.6%	83.4%	4,051
10-49	2.7%	5.5%	3.0%	2.0%	2.6%	2.6%	18.3%	81.7%	2,658
50-99	4.0%	7.3%	3.3%	2.9%	2.5%	2.5%	22.4%	77.6%	646
100-249	2.9%	6.9%	2.7%	2.1%	3.5%	1.6%	19.7%	80.3%	376
250+	3.1%	8.7%	3.4%	0.9%	3.7%	2.5%	22.4%	77.6%	321
Total	2.4%	5.5%	2.6%	1.7%	2.3%	3.5%	18.0%	82.0%	8,052

Green Jobs

Data were gathered relating to the percentage of firms that reported having green jobs, prevalence of green jobs by industry, and prevalence of green jobs by size class. Additionally, data were analyzed to report on wages for firms with and without green jobs.

Overall, 9.4% of responding firms reported having one or more workers performing a green job (Table 6).

The reporting of green jobs was most prevalent among firms in the Utilities, Construction, Agriculture, Public Administration, and Manufacturing sectors, and least prevalent in the Finance and Insurance, Information, Transportation and Warehousing, and Accommodation and Food Services sectors.

TABLE 6: PREVALENCE OF FIRMS WITH GREEN JOBS

NAICS	Industry	Percent of Firms Reporting Green Jobs	Margin of Error (+/-)
11	Agriculture, Forestry, Fishing, Hunting	16.9%	4.0%
21	Mining	6.9%	2.7%
22	Utilities	24.3%	6.2%
23	Construction	24.0%	4.2%
31-33	Manufacturing	11.1%	2.2%
42	Wholesale Trade	11.0%	2.0%
44-45	Retail Trade	7.1%	1.8%
48-49	Transportation & Warehousing	3.1%	2.0%
51	Information	2.7%	2.2%
52	Finance & Insurance	2.1%	1.8%
53	Real Estate, Rental & Leasing	6.5%	2.6%
54	Professional & Technical Services	10.9%	4.0%
55	Management Of Companies & Enterprises	5.7%	2.9%
56	Administrative & Waste Services	8.2%	3.5%
61	Educational Services	6.0%	2.4%
62	Health Care & Social Assistance	4.1%	2.0%
71	Arts, Entertainment & Recreation	5.1%	2.3%
72	Accommodation & Food Services	3.3%	2.3%
81	Other Services	8.9%	2.0%
92	Public Administration	16.5%	3.8%
99	Unclassified	3.1%	4.2%
All	Total	9.4%	0.6%

Similar to the reporting for green economic activities, the Construction and Agriculture sectors also reported the highest percentage of green jobs (12.0% and 11.7%) (Table 7). Also reporting a relatively high percentage of green jobs were Other Services (10.6%), and Administrative and Support and Waste Management and Remediation Services (8.8%).

TABLE 7: PREVALENCE OF GREEN JOBS

NAICS	Industry Title	Green Jobs	Total Jobs	Percentage	Colorado Total Employment	Estimated Green Jobs	Margin of Error (+/-)
11	Agriculture, Forestry, Fishing, Hunting	411	3,500	11.7%	13,229	1,553	1.07%
21	Mining	114	5,691	2.0%	25,060	502	0.36%
22	Utilities	215	5,754	3.7%	14,190	530	0.49%
23	Construction	1,563	12,993	12.0%	118,173	14,216	0.56%
31-33	Manufacturing	908	27,468	3.3%	127,163	4,204	0.21%
42	Wholesale Trade	910	21,659	4.2%	87,854	3,691	0.27%
44-45	Retail Trade	413	18,541	2.2%	242,743	5,407	0.21%
48-49	Transportation & Warehousing	241	10,219	2.4%	71,862	1,695	0.29%
51	Information	47	13,803	0.3%	71,259	243	0.10%
52	Finance & Insurance	56	15,244	0.4%	98,332	361	0.10%
53	Real Estate, Rental & Leasing	100	7,308	1.4%	41,996	575	0.27%
54	Professional & Technical Services	244	13,513	1.8%	166,941	3,008	0.22%
55	Management Of Companies & Enterprises	173	10,192	1.7%	28,430	483	0.25%
56	Administrative & Waste Services	1,647	18,720	8.8%	133,104	11,711	0.41%
61	Educational Services	162	44,220	0.4%	202,234	741	0.06%
62	Health Care & Social Assistance	74	44,250	0.2%	264,112	444	0.04%
71	Arts, Entertainment & Recreation	245	16,262	1.5%	46,553	701	0.19%
72	Accommodation & Food Services	149	10,966	1.4%	217,984	2,962	0.22%
81	Other Services	1,173	11,027	10.6%	65,035	6,918	0.58%
92	Public Administration	604	31,228	1.9%	138,189	2,673	0.15%
99	Unclassified	8	800	1.0%	173	2	0.69%
All	Total	9,457	343,358	2.8%	2,174,616	59,895	0.05%

Small firms reported the greatest prevalence of green jobs. Companies with fewer than 50 employees reported 4.7% of their workforce had green jobs, while companies with 250 or more employees reported 1.6% had green jobs (Table 8).

TABLE 8: GREEN JOBS, BY SIZE CLASS

Size Class	Green Jobs	Total Sample	Percentage of Green Jobs
0-9	1,755	44,145	4.0%
10-49	3,117	58,509	5.3%
50-99	1,212	43,258	2.8%
100-249	1,116	54,849	2.0%
250+	2,258	142,597	1.6%
All Respondents	9,457	343,358	2.8%

Average wages were analyzed for companies reporting green jobs and for those reporting no green jobs (Table 9). Annualized wage data from the Q4 2010 QCEW⁷ data file indicate that the companies with green jobs pay a 5.5% higher wage than those companies reporting no green jobs.

While the green jobs survey did collect a limited amount of wage information for green jobs, those data await further analysis. Table 9 provides a broad indication of wage patterns and indicates only that employees of companies reporting green jobs received a higher average wage, regardless of whether those employees are performing a green job. Furthermore, these numbers do not take into account differences in industry distribution between companies reporting and not reporting green jobs. The data should not be interpreted as an indication that green jobs are compensated at a higher rate or that the occurrence of green jobs within these companies is the reason for the higher average wage, but poses that question for further analysis.

TABLE 9: GREEN JOBS COMPANIES, AVERAGE WAGES

Jobs	Average Wages	N
With green jobs	\$51,713	731
Without green jobs	\$49,005	6,832
All Respondents	\$49,267	7,563

Influencing Factors

The Colorado green jobs survey also queried businesses throughout the state about the possible factors that might either positively or negatively influence their expansion into the green economy (Table 10). The

⁷The sample was pulled from the Q4 2009 QCEW file. Wage data were pulled from the Q4 2010 data file, which became available following the completion of the study, for firms that responded to the survey.

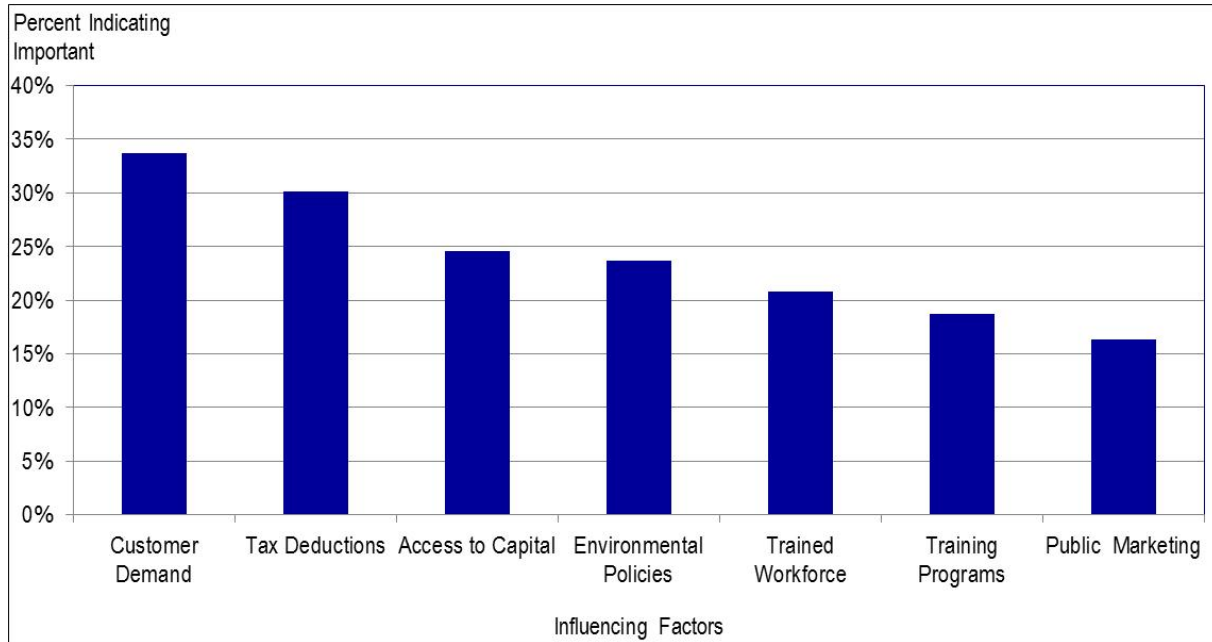
survey question was framed as a scale to indicate preference for some common economic factors and incentives provided as possibilities, with 1 indicating the least importance and 5 indicating most importance. As illustrated in Table 10 and Figure 1, Colorado businesses selected an increase in customer demand as the most influential factor in any decision to increase participation in the green economy. A total of 33.7% of all employer units that responded to that question chose either 4 or 5 on the scale, indicating importance. An incentive in the form of tax deductions or credits to expand their green business activities was selected by 30.1% of respondents. A total of 24.6% of respondents indicated that access to investment capital or financing was considered an important factor.

Additional factors, including policies promoting environmental standards (23.7%), availability of a trained workforce (20.8%), the availability of training programs (18.7%), and a public marketing campaign (16.4%) to influence attitudes and consumer demand placed fourth through seventh, respectively.

TABLE 10: FACTORS INFLUENCING EXPANSION OF GREEN JOBS

Response	Least Important					Most Important 5	Not Applicable	Total
	1	2	3	4				
Tax deductions or credits	540	266	741	721	765	1,903	4,936	
Access to capital or financing	714	391	690	562	652	1,921	4,930	
Policies promoting environmental standards	661	461	960	693	475	1,677	4,927	
An increase in customer demand	394	214	606	738	937	2,087	4,976	
Public marketing or advertising campaigns	915	574	907	493	310	1,712	4,911	
The availability of a trained workforce	756	499	892	533	483	1,722	4,885	
Availability of training programs	814	488	956	562	350	1,706	4,876	

FIGURE 1: FACTORS INFLUENCING EXPANSION OF GREEN JOBS



Customer demand was the most influential factor overall for expanding green activities, but companies in three industries (Utilities, Transportation and Warehousing, and Health Care and Social Assistance) cited policies promoting environmental standards as more influential (Table 11). The existence of tax deductions or credits was cited as the most influential factor for just over one-quarter of industries.

TABLE 11: FACTORS INFLUENCING EXPANSION OF GREEN JOBS BY INDUSTRY

NAICS	Industry	Tax Deduction or Credit	Capital Access	Environmental Policies and Standards	Customer Demand	Public Marketing	Trained Workforce	Training Programs
11	Agriculture, Forestry, Fishing, Hunting	32.7%	31.7%	21.6%	34.1%	15.0%	18.6%	16.3%
21	Mining	26.6%	21.1%	27.4%	36.5%	13.9%	18.8%	19.8%
22	Utilities	13.2%	15.2%	24.4%	23.0%	8.0%	21.0%	16.1%
23	Construction	41.7%	28.4%	33.3%	55.1%	20.6%	33.3%	28.9%
31-33	Manufacturing	37.3%	30.3%	25.9%	43.1%	18.1%	20.4%	19.3%
42	Wholesale Trade	34.6%	25.0%	24.2%	42.7%	17.5%	22.3%	17.5%
44-45	Retail Trade	29.8%	21.2%	22.0%	35.7%	18.4%	22.1%	20.2%
48-49	Transportation & Warehousing	36.1%	27.8%	32.1%	31.5%	17.6%	24.1%	24.1%
51	Information	27.1%	26.6%	15.4%	25.8%	16.8%	20.0%	18.3%
52	Finance & Insurance	22.8%	14.8%	7.0%	15.4%	5.9%	9.7%	3.0%
53	Real Estate, Rental & Leasing	27.1%	19.0%	21.1%	27.6%	15.6%	17.5%	19.0%
54	Professional & Technical Services	25.8%	21.5%	22.3%	27.8%	15.4%	19.4%	13.8%

55	Mgmt. of Companies and Enterprises	25.7%	20.0%	18.2%	24.5%	11.5%	11.0%	6.2%
56	Administrative & Waste Services	34.2%	28.0%	27.1%	38.0%	20.1%	28.9%	28.0%
61	Educational Services	20.7%	23.2%	15.8%	17.0%	15.6%	21.9%	20.3%
62	Health Care & Social Assistance	23.7%	21.0%	23.0%	19.5%	17.2%	22.2%	23.3%
71	Arts, Entertainment & Recreation	30.3%	27.3%	19.7%	27.5%	15.0%	17.6%	13.6%
72	Accommodation & Food Services	31.0%	23.7%	30.2%	36.7%	18.2%	18.2%	16.1%
81	Other Services	31.9%	25.6%	28.2%	34.7%	19.0%	21.1%	19.7%
92	Public Administration	17.2%	25.6%	18.7%	26.7%	10.3%	14.8%	17.6%
99	Unclassified	28.6%	31.4%	30.6%	36.1%	11.4%	21.6%	16.2%
All	Total	30.1%	24.6%	23.7%	33.7%	16.4%	20.8%	18.7%

Deterring Factors

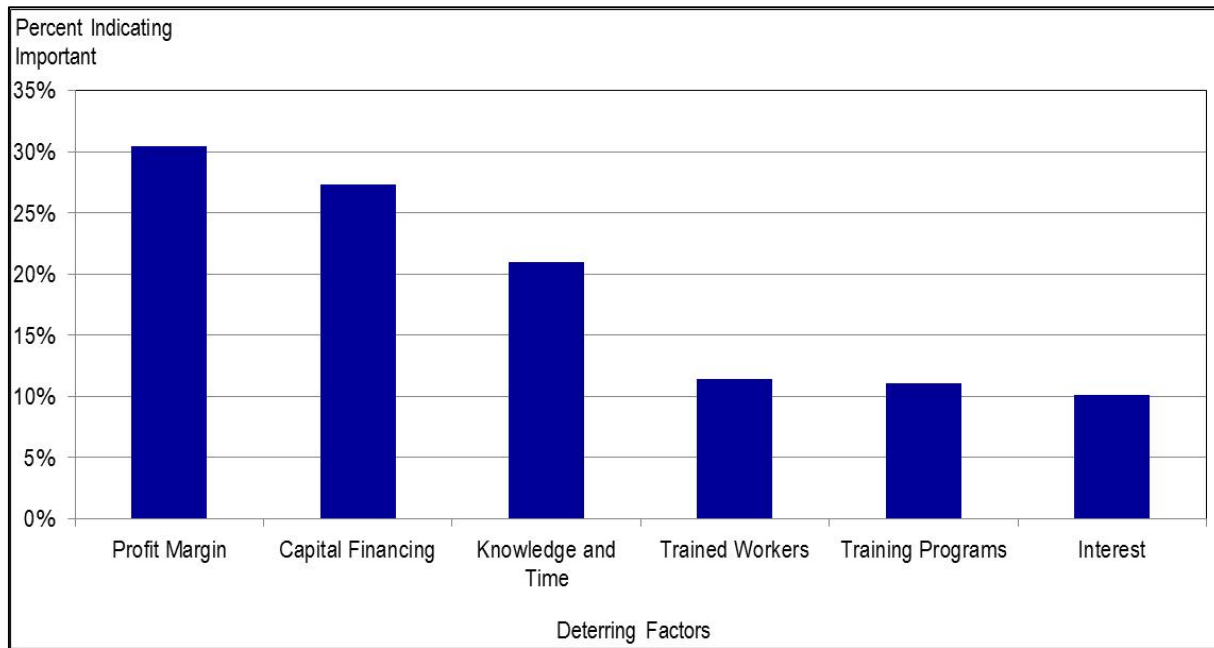
The Colorado green jobs survey also queried businesses throughout the state about possible factors that might discourage or prevent their expansion into the green economy (Table 12 and Figure 2) using the same scale employed in the previous section that explored positive influences. Again, a set of possible options and economic factors was provided for respondents to rate. The results (Table 12) show that, similar to the factors positively influencing expansion, the profit margin, or more specifically the *lack* of profit margin, was the most important factor (30.4%) discouraging expansion into the green economy.

Also similar to the corresponding section on positive influences, the lack of available capital or difficulty of accessing capital financing (27.4%) was the second-most significant deterrent. The lack of knowledge and time as they relate to expansion (21.0%) was the third-most important factor. Similar to the findings of the previous section, the lack of qualified workers (11.4%) and a perceived lack of worker training programs (11.1%) were less commonly cited as important, while a general lack of interest in the green economy (10.1%) was cited the least often.

TABLE 12: FACTORS DETERRING EXPANSION OF GREEN JOBS

Response	Least Important					Most Important	Not Applicable	Total
	1	2	3	4	5			
Profit margin	397	241	672	530	941	2,050	4,831	
Capital financing	587	326	644	568	754	1,951	4,830	
Knowledge and time	604	449	970	611	402	1,797	4,833	
Interest	1,372	422	683	178	297	1,750	4,702	
Trained workers	889	556	906	310	232	1,849	4,742	
Training programs	893	556	923	308	217	1,827	4,724	

FIGURE 2: FACTORS DETERRING EXPANSION OF GREEN JOBS



When examining the response by industry, both the lack of profit margin and the difficulty of obtaining investment financing were cited most often as deterrents by most sectors. The lack of time or knowledge to expand into the green economy was the third-most cited deterrent in most industries, except for the Finance and Insurance sector, which cited it as their foremost deterrent (Table 13).

TABLE 13: FACTORS DETERRING EXPANSION OF GREEN JOBS BY INDUSTRY

NAICS	Industry	Profit Margin Lacking	Capital Financing Lacking	Knowledge and Time Lacking	Interest Lacking	Trained Workers Lacking	Training Programs Lacking
11	Agriculture, Forestry, Fishing, Hunting	43.1%	33.0%	23.0%	14.2%	13.2%	11.4%
21	Mining	32.4%	25.3%	22.8%	12.6%	13.6%	13.0%
22	Utilities	26.3%	21.0%	10.7%	7.6%	13.1%	7.6%
23	Construction	36.0%	29.1%	25.1%	10.8%	16.3%	17.2%
31-33	Manufacturing	40.1%	33.9%	23.4%	11.1%	11.8%	10.6%
42	Wholesale Trade	42.7%	29.6%	19.6%	10.3%	11.1%	9.1%
44-45	Retail Trade	31.1%	24.9%	22.1%	9.0%	10.4%	10.1%
48-49	Transportation & Warehousing	36.1%	34.3%	24.4%	11.2%	15.8%	15.2%
51	Information	22.5%	20.2%	15.7%	9.9%	9.6%	9.4%
52	Finance & Insurance	10.4%	10.4%	20.1%	9.6%	3.1%	5.5%
53	Real Estate, Rental & Leasing	39.9%	26.8%	23.9%	7.5%	11.6%	14.2%
54	Professional & Technical Services	18.9%	19.6%	19.1%	5.1%	7.4%	7.2%
55	Mgmt. of Companies and Enterprises	18.0%	17.2%	8.8%	7.7%	6.9%	4.2%

56	Administrative & Waste Services	29.0%	26.6%	25.0%	13.6%	9.2%	10.7%
61	Educational Services	14.8%	22.5%	15.4%	8.1%	12.8%	14.0%
62	Health Care & Social Assistance	20.8%	22.9%	20.0%	9.0%	10.5%	12.5%
71	Arts, Entertainment & Recreation	26.6%	33.3%	22.3%	8.0%	13.4%	10.7%
72	Accommodation & Food Services	26.3%	22.5%	22.3%	11.6%	10.2%	11.0%
81	Other Services	27.1%	28.8%	22.7%	12.7%	11.4%	12.1%
92	Public Administration	19.6%	36.7%	19.9%	7.7%	11.7%	12.7%
99	Unclassified	17.1%	17.1%	16.7%	5.7%	8.3%	5.6%
All	Total	30.4%	27.4%	21.0%	10.1%	11.4%	11.1%

FUTURE ANALYSIS

Labor Market Information is conducting further analysis relating to specific occupations reported as green.

The response rate for education and training was 7.5% of the total, making it too small to generate inferences regarding training needs.

CONCLUSION

LMI was pleased to join the Northern Plains and Rocky Mountain Green Jobs Survey Consortium by invitation in the summer of 2010. As a late addition to the Consortium and with the largest sample size among participating states, Colorado was, for reasons of consistency and comparability, obligated to adopt the Consortium's survey methodology and process.

The intent of the Colorado survey was to produce an accurate and realistic estimate of jobs considered green. This analysis found a prevalence of green jobs in Colorado of 2.8%—similar to the findings of the partners in the Consortium and of studies conducted in other states.

Some industry by industry results identified in this report are not surprising, specifically, greater concentrations of green jobs in the Agriculture, Administrative and Waste Services, and Construction sectors, and low concentrations in the Health Care and Social Assistance, Information, and Finance and Insurance sectors. Also not surprisingly, small firms tended to identify greater concentrations of green employment than large firms. One interesting result is the relatively high prevalence of green jobs reported by the Retail Trade sector.

Overall, employers indicated the greatest influencing and deterring factors for increasing green employment to be financial considerations. The factors most often cited as important for increasing green employment were customer demand, incentives such as tax deductions or credits, and access to capital or financing. Similarly, factors cited as deterring the growth of green jobs were profit margin (profitability) and a lack of capital or financing.

The data collected from this survey will be helpful in providing a context for future analysis and further exploratory research, and in assisting the business community in accurately assessing the size and impact of the green economy in Colorado.

BIBLIOGRAPHY

Ayre, Art, Nick Beleiciks, Ron Conrad, et al. June 2009. *The Greening of Oregon's Workforce: Jobs, Wages, and Training*. Oregon Employment Department Workforce and Economic Research Division.
<http://www.qualityinfo.org/pubs/green/greening.pdf> (accessed October 1, 2010).

Bureau of Labor Statistics. "Overview of the BLS Green Jobs Initiative, Developing the Green Jobs Definition." www.bls.gov/green. (accessed May 10, 2011).

_____. "Overview of the BLS Green Jobs Initiative, the BLS Green Jobs Definition."
www.bls.gov/green. (accessed May 10, 2011).

Hardcastle, Alan. March 2010. *2009 Washington State Green Economy Jobs*.
http://www.workforceexplorer.com/admin/uploadedPublications/10258_Green_Jobs_Report_for_Web_2009.pdf (accessed October 13, 2010).

Kansas Department of Labor (Labor Market Information Services). 2009. *2009 Kansas Green Jobs Report*.
<http://www.dol.ks.gov/LMIS/GoingGreen/KansasGreenJobsReport.pdf> (accessed October 11, 2010).

Missouri Economic Research and Information Center. 2009. *The Missouri Green Jobs Report*.
http://www.missourieconomy.org/pdfs/mo_green_jobs_report.pdf (accessed October 11, 2010).

The Pew Charitable Trusts. 2009. *The Clean Energy Economy: Repowering Jobs, Investments and Businesses Across America*.
http://www.pewcenteronthestates.org/uploadedfiles/clean_economy_report_web.pdf. (accessed February 9, 2011).

Waclawek, Richard, Bruce Weaver, Rhea Acuna, et al. May 2009. *Michigan Green Jobs Report 2009: Occupations and Employment in the New Green Economy*. Michigan Department of Energy, Labor & Economic Growth (prepared by the Bureau of Labor Market Information and Strategic Initiatives).
http://www.michigan.gov/documents/nwlb/GJC_GreenReport_Print_277833_7.pdf (accessed October 1, 2010).

APPENDIX 1: SURVEY DOCUMENTS

FIGURE 3: INITIAL POSTCARD (FRONT SIDE)



FIGURE 4: INITIAL POSTCARD (BACK SIDE)

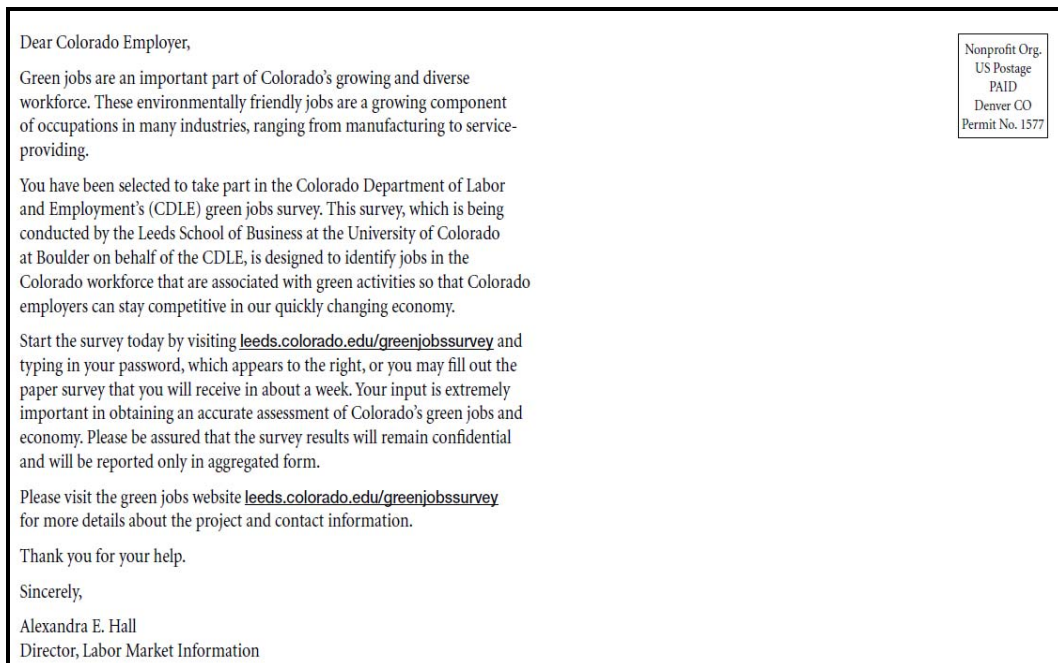




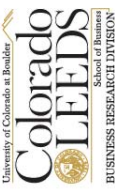
FIGURE 5: SURVEY INSTRUMENT (PAGE 1 AND PAGE 4)



Colorado
Department of
Labor & Employment



greenjobs



University of Colorado at Boulder
Colorado
LEEDS
School of Business
BUSINESS RESEARCH DIVISION

4. Regarding the factors listed below, what would most influence you to increase the number of green job workers that you employ, even if you do not have any green job positions now? Please rank each of the factors from 1-5, with 5 being most important.

	FACTOR					Not Applicable
	1 Least Important	2	3	4	5 Most Important	
Tax deductions or credits for changing to green business practices/expanding green job employment.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Access to capital or financing to start or expand a green enterprise.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Policies promoting environmental standards in your industry.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
An increase in customer demand for your company's green services.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Public marketing or advertising campaigns promoting green business practices and hiring.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The availability of a trained workforce.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The availability of training programs.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other: _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

5. Regarding the factors listed below, what deters you from creating/hiring or expanding a green workforce? Please rank each of the factors from 1-5, with 5 being most important.

	FACTOR					Not Applicable
	1 Least Important	2	3	4	5 Most Important	
The profit margin is not conducive to creating or expanding to green jobs and practices (not profitable).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lack of capital or financing for starting or expanding your green business.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lack of time or knowledge to convert workforce or business practices (expensive).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Not interested or don't care about the green economy.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lack of qualified workers.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Shortage of available training programs.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other: _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

We are conducting a survey about jobs in our economy where green activities result in environmental benefits. Your response to the survey is important even if you do not consider your business activities to be green. Please complete all items to the best of your knowledge, either online at leads.colorado.edu/greenjobsurvey or by completing this paper survey and returning it in the envelope provided. Even if you do not have any green jobs, please complete questions 4 and 5 on page 4. Please respond by January 26, 2011.

This survey is also available for you to complete online at:
leads.colorado.edu/greenjobsurvey

If your business is not currently in operation, please indicate which situation best applies and return the survey form in the envelope provided. Thank you for your time.

Temporarily out of business
 Permanently out of business
 Sold/Merged

password: <<name1>>
<<name2>>
Address 1
Address 2
City, CO Zip

password

COMPANY INFORMATION

If you have any questions about the survey, please contact:
Leeds School of Business at 303-492-3307

- How many employees does your organization currently have at this location? _____ employees
(do not include contractors)
- Your company may be involved in more than one of the green economic categories listed below, but please check the box that most closely corresponds to the primary green category within your business.
 - Renewable Energy and Alternative Fuels
Manufacturing, construction, design, research, delivery, operation, storage or maintenance of wind, solar, biomass, hydro, alternative transportation fuels, geothermal, methane and waste incineration as a fuel source.
 - Energy Efficiency and Conservation
Manufacturing, construction, or installation of energy efficient products, energy efficiency services, weatherization, building retrofit/energy efficiency, energy efficient production processes, energy distribution improvements, and transportation technology.
 - Pollution, Waste, and Greenhouse Gas (GHG) Management, Prevention, and Reduction
Activities related to controlling emissions and pollution. Includes controlling and reducing greenhouse gas emissions, waste water, and other pollutants.
 - Environmental Cleanup and Restoration and Waste Clean-up and Mitigation
Remediation including the cleanup or disposal of pollution, waste and hazardous materials; Superfund/brownfield redevelopment; and landfill restoration.
 - Education, Regulation, Compliance, Public Awareness, and Training and Energy Trading
Activities that include public awareness, education, training, compliance requirements and regulations, and training on effective use of energy-related products and services.
 - Sustainable Agriculture and Natural Resources Conservation
Water management and conservation, wetlands restoration and environmental conservation, including low carbon and organic agriculture, land management, water management and conservation, wetlands restoration and environmental conservation.
 - None of the Above *The establishment does not participate in any of the above green categories.*

4. Regarding the factors listed below, what would most influence you to increase the number of green job workers that you employ, even if you do not have any green job positions now? Please rank each of the factors from 1-5, with 5 being most important.

	FACTOR					Not Applicable
	1 Least Important	2	3	4	5 Most Important	
Tax deductions or credits for changing to green business practices/expanding green job employment.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Access to capital or financing to start or expand a green enterprise.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Policies promoting environmental standards in your industry.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
An increase in customer demand for your company's green services.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Public marketing or advertising campaigns promoting green business practices and hiring.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The availability of a trained workforce.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The availability of training programs.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other: _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

5. Regarding the factors listed below, what deters you from creating/hiring or expanding a green workforce? Please rank each of the factors from 1-5, with 5 being most important.

	FACTOR					Not Applicable
	1 Least Important	2	3	4	5 Most Important	
The profit margin is not conducive to creating or expanding to green jobs and practices (not profitable).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lack of capital or financing for starting or expanding your green business.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lack of time or knowledge to convert workforce or business practices (expensive).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Not interested or don't care about the green economy.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lack of qualified workers.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Shortage of available training programs.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other: _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Contact Information:

Name: _____ Date Completed: _____ / _____ / _____

Phone Number: _____ If your organization would like a copy of the findings, how would you like them delivered?

Email: _____ Email Postal Mail

Thank you for taking the time to provide us with this valuable information.

Page 4

FIGURE 7: ENVELOPE



FIGURE 8: POSTAGE-PAID RETURN ENVELOPE

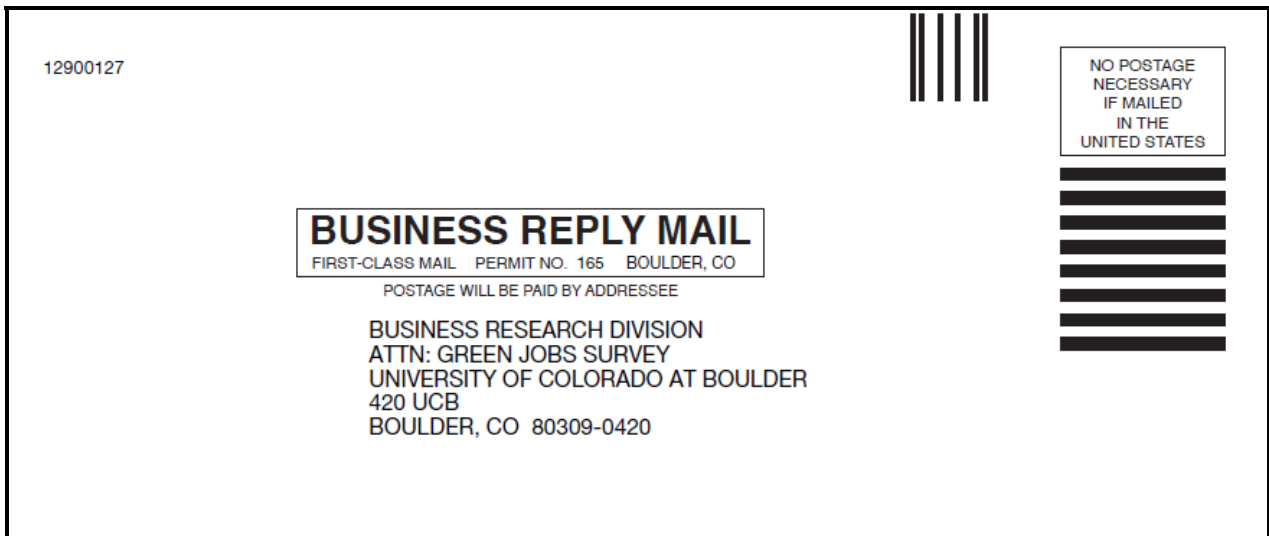


FIGURE 9: WHAT WE MEAN BY GREEN

Pollution, Waste, and Greenhouse Gas (GHG) Management, Prevention and Reduction

Activities and research related to controlling commercial, transportation, and industrial emissions and pollution; water treatment, recycling operations, waste product management and treatment; includes controlling and reducing emissions of carbon dioxide, other greenhouse gases, waste water and other pollutants.

- Examples include:**
- ✔ Carbon emissions monitoring, biomass or biodiversity preservation
 - ✔ Recycling center operations
 - ✔ Mass transit administration
 - ✔ Wastewater treatment plants



- Examples DO NOT include:**
- ✘ Workers who telecommute or carpool
 - ✘ Cleaning services using "eco-friendly" chemicals
 - ✘ Workplaces using recycled paper

Education, Regulation, Compliance, and Training & Energy Trading

Activities to educate the public, business and government on energy efficiency, renewable energy, energy rating systems certifications, and more efficient energy consumption. Also informing appropriate parties and enforcing compliance requirements and regulations, promoting state energy standards and plans, and training on effective use of energy related products and processes. In theory, energy trading could include buying and selling of power or fuels related to energy efficiency and renewable energy as well as cap and trade activity to control pollution.

- Examples include:**
- ✔ Policy analysis, energy auditing, environmental science research
 - ✔ Carbon credit brokering, certifying environmental practices
 - ✔ Environmental testing



- Examples DO NOT include:**
- ✘ Educational administrative staff
 - ✘ Secretarial services at law firms

Energy Efficiency & Conservation

Manufacturing, construction, installation, production of energy efficient products (such as Energy Star rated appliances, more efficient lighting), energy efficiency services, weatherization, building retrofitting/efficiency, energy efficient production processes, energy distribution improvements (smart grid), transportation technology, and battery development and storage improvement.



- Examples include:**
- ✔ Manufacturing/installation of geothermal components
 - ✔ Insulation, energy efficient windows and doors
 - ✔ LEED certified design and construction

- Examples DO NOT include:**
- ✘ Workers at firms that have become "greener" by replacing light bulbs, reducing office thermostat temperatures, purchasing fuel efficient fleet vehicles, carpooling

Environmental Cleanup and Remediation & Waste Clean-up Mitigation

Environmental remediation including the cleanup and disposal of pollution, waste and hazardous materials; Superfund/Brownfield redevelopment; and landfill restoration.

- Examples include:**
- ✔ Operations which recycle plastic, metal and other salvage, and Freon and ethylene glycol
 - ✔ Hazardous waste handling and disposal
 - ✔ Wetlands restoration



- Examples DO NOT include:**
- ✘ Volunteers
 - ✘ Workers that "adopt-a-street"
 - ✘ Garbage disposal service

Sustainable Agriculture & Natural Resource Conservation

Products and services to conserve, maintain and improve natural resources and environment, including low carbon agriculture, land management, water management and conservation, wetlands restoration and mitigation, and environmental and wildlife conservation. Includes bioscience related activities and research.



- Examples include:**
- ✔ Sustainable organic farming, including practices that lessen the admissions of carbon and/or increase removal of carbon from the atmosphere when compared to standard farming practices
 - ✔ Conservation activities which reduce soil erosion, enhance water supplies and water quality

- Examples DO NOT include:**
- ✘ Workers who garden or buy organic products
 - ✘ Landscapers

Renewable Energy & Alternative Fuels

Manufacturing, production, construction, design, research, delivery, operation, storage and maintenance of wind, solar, biomass, hydro, alternative transportation fuels, geothermal, methane and waste incineration as a fuel source.

- Examples include:**
- ✔ Manufacturing/installation of wind turbines, methane gas captures, solar photovoltaic (PV) cells or electrolyzes
 - ✔ Hydro-electric generator repair, design of renewable energy plants
 - ✔ Geothermal drilling
 - ✔ Production of bio-fuels, biomass or cellulose



- Examples DO NOT include:**
- ✘ Electrical power distribution
 - ✘ Producing high voltage electric lines

FIGURE 10: COVER LETTER

BILL RITTER, JR.
Governor
DONALD J. MARES
Executive Director
ALEXANDRA E. HALL
Director



DEPARTMENT OF LABOR AND EMPLOYMENT

LABOR MARKET INFORMATION

633 17th Street, Suite 600
Denver, Colorado 80202-2107
MAIN: 303.318.8850
FACSIMILE: 303.318.8899

<http://lmigateway.coworkforce.com/lmigateway>



January 7, 2011



Dear Colorado Employer:

As an employer you know the importance of accurate information about the local labor market and emerging labor trends. Colorado is partnering with six other states in the Northern Plains & Rocky Mountain Consortium to study the prevalence of green jobs in the state's economy. To help us gather this information, your business has been scientifically selected to provide information about green jobs within your company. Even if your firm does not have green jobs, your participation is integral to understanding the relative prevalence of green jobs in various industries.



A green job is one in which an employee produces a product or a service that improves energy efficiency, expands the use of renewable energy, or supports environmental sustainability. Your participation in this survey will help identify the existing and emerging needs of employers in Colorado's green economy and promote effective workforce training programs.

Please take a moment to review examples of green jobs in "What We Mean by Green" on the reverse side of this letter.



While the enclosed questionnaire requests detailed employment information, it does not solicit any personal, identifying information about individual employees or employers. The Colorado Department of Labor and Employment is bound by strict rules mandating confidentiality. All published information will be aggregated and protected, as it is for all CDLE labor surveys.



For your convenience, you may complete this survey online by visiting leeds.colorado.edu/greenjobssurvey, clicking on "Take Green Jobs Survey," and entering your password (found on the front of the enclosed survey). Please remember that all survey research undertaken by the department is performed and provided in order to help Colorado employers understand their business environment and to better compete in our ever-changing economy. Your participation in this study and accurate responses are critical to the success of this valuable service.

Please submit your completed survey by January 28, 2011.

Thank you for your help.

Alexandra E. Hall
Director
Labor Market Information



APPENDIX 2: LITERATURE REVIEW

Oregon Green Jobs Survey—2009

In 2009, the Oregon Employment Department completed a survey that asked a sample of Oregon employers to report the number of employees they hired to do green jobs. The survey defined green jobs as jobs that increase energy efficiency; produce renewable energy; prevent or diminish environmental degradation; clean up the natural environment; or provide education, accreditation, or policy support for the other services listed. The results of the survey showed over 50,000 green jobs in Oregon, about 3% of total employment in the state. The jobs were spread across 226 occupations but were most concentrated in Construction (17%), Wholesale and Retail Trade (16%), and Administrative and Waste Services (14%). The survey also found that the mean wage for green jobs (\$22.61 per hour) was slightly higher than the state average but that green jobs had comparable minimum education requirements to the rest of the state (Ayre, Beleiciks, Conrad, et al., 2009).

Michigan Green Jobs Report—2009

In May 2009, the Michigan Department of Energy, Labor & Economic Growth released a report on the number and growth of green jobs in the state. The study consisted primarily of a survey (where respondents reported the number of employees hired for green jobs) and an analysis of the growth trends of industries considered green related. The report defined green jobs as jobs that provide products or services in “agriculture and natural resource conservation, clean transportation and fuels, increased energy efficiency, pollution prevention or environmental clean-up, and renewable energy production” (Waclawek, Weaver, and Acuna, et al., 2009). The report concluded that Michigan has 109,067 green jobs, 12,300 of which are support green jobs. The total number of support and direct green jobs amounts to 3% of Michigan’s overall employment. Of the green-related industries analyzed, Semiconductor Manufacturing, Wholesale Trade of Recyclable Material, and Environmental Consulting were the only sampled industries that showed growth, while the economy as a whole lost jobs. The employment expansion of these three green industries was 7.7%, while the Michigan economy had a 5.4% loss of employment (Waclawek, Weaver, Acuna, et al., 2009).

Missouri Green Jobs Report—2009

The Missouri Economic Research and Information Center (MERIC) conducted a survey in 2009 to determine the number of green jobs in the state. For the purpose of the survey, jobs were considered green if the employee was “directly involved in generating or supporting a firm’s green related products or services” (Missouri Economic Research and Information Center, 2009). To clarify further, the study listed industries considered green-related: reduction of environmental impacts, energy efficiency, renewable energy, production of organic products, and research and development related to the green industries. The study identified 131,103 green jobs in the state, 28,720 primary green jobs and 102,383 support green jobs. Both types of green jobs account for 4.8% of Missouri’s total employment. Some sectors of Missouri’s green economy have growth potential up to 16% in the next six years. However, growth rates appeared to be tied to economic conditions. More than 70% of employers identified current economic conditions as the largest barrier to hiring more green workers (Missouri Economic Research and Information Center, 2009).

Kansas Green Jobs Report—2009

The Kansas Department of Labor surveyed just over 6,000 businesses in 2009 to calculate the number of green jobs in the state. The survey defined green jobs as jobs that make products or provide services in renewable energy, natural resource conservation, clean up or prevention of environmental degradation, clean transportation, and energy efficiency. The survey results showed the primary job responsibilities of 20,047 employees were primarily devoted to green activities, totaling 1.5% of all Kansas employment. In addition, the number of employees working to support primary green jobs accounted for 1.9% of total employment. The survey also collected data on minimum education requirements for primary green jobs. Almost 70% of primary green jobs required a high school diploma or less. This concentration was potentially due to the fact that 30% of primary green jobs were in Construction and Maintenance, Installation, and Manufacturing (Kansas Department of Labor, 2009).

Washington Survey of Green Jobs—2009

To follow up a green jobs survey conducted in 2008, the Washington State Employment Security Department conducted a second survey of green jobs in 2009. The 2009 study polled over 13,000 businesses and calculated that Washington state has 76,137 green jobs. Green jobs accounted for 3.3% of Washington’s employment in 2009, a large increase from 2008 when green jobs were estimated to be 1.6%

of employment. The larger pool of respondents in 2009 accounted for some of this growth, as well as the addition of green jobs in businesses that had not reported any during the 2008 survey. The 2009 study divided green jobs into four key areas: preventing and reducing environmental pollution (46% of total green jobs), increasing energy efficiency (38.9%), mitigating or cleaning up environmental pollution (11.6%), and producing renewable energy (4.3%). The median earnings of green workers were between \$40,000 and \$55,000 per year. In addition, the study found that the average green employee needed one to four years of post-high school education and potentially on-the-job training as well (Hardcastle, 2010).

Clean Energy Economy Study—2009

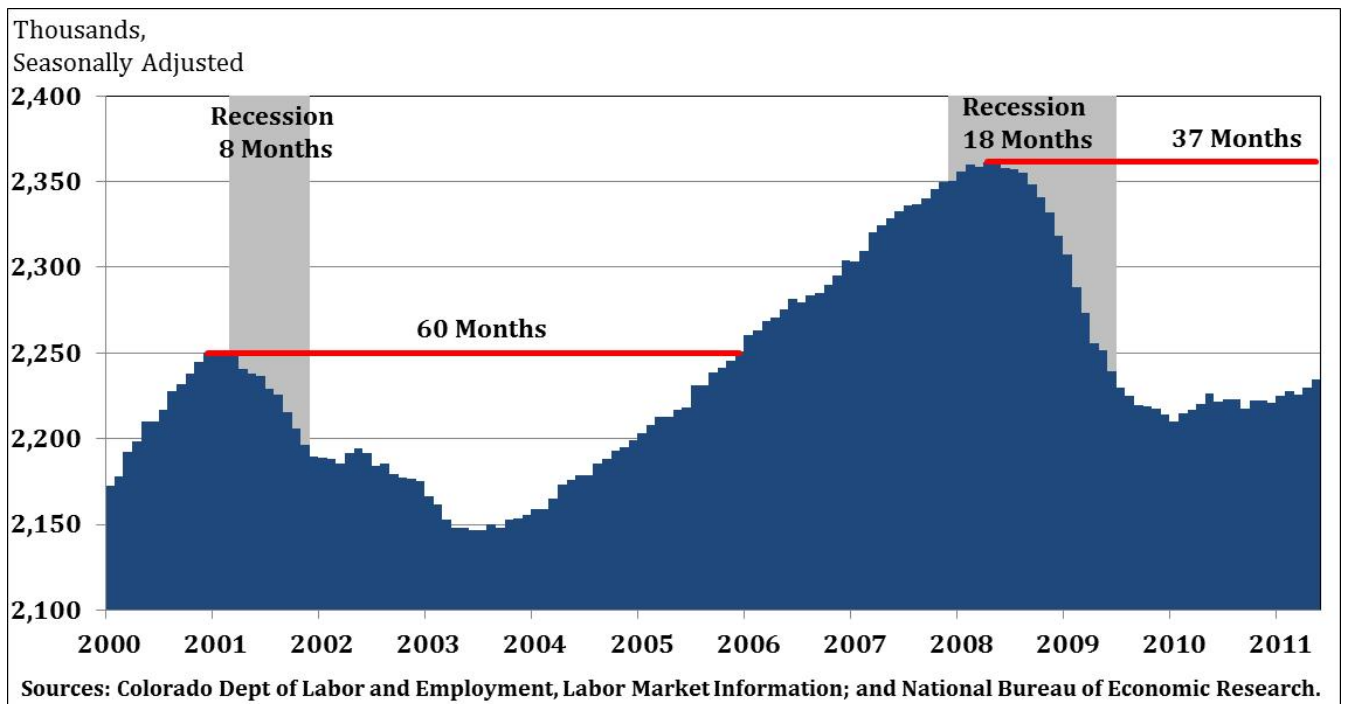
The Pew Charitable Trusts completed a study in 2009 on the national clean energy economy. To identify clean energy businesses, Pew compiled a list of companies that were receiving green technology venture capital. After identifying similar and related businesses, analysts verified online that each company was involved in green activities. The nature of the research methodology potentially lowered the number of businesses and jobs the study identified. Pew's definition of the green economy had five parts: energy efficiency, clean energy, environmentally friendly production, conservation and pollution mitigation, and training and support. Nationally, Pew reported 770,000 green jobs (The Pew Charitable Trusts, 2009).

APPENDIX 3: ECONOMIC OVERVIEW

The 18-month recession from December 2007 to June 2009 had, and continues to have, profound impacts on Colorado’s economy, the effects of which can be seen in employment, labor force, unemployment, retail sales, and many other metrics. The economic metrics that follow provide a foundation of the economic environment that coincides with the study period.

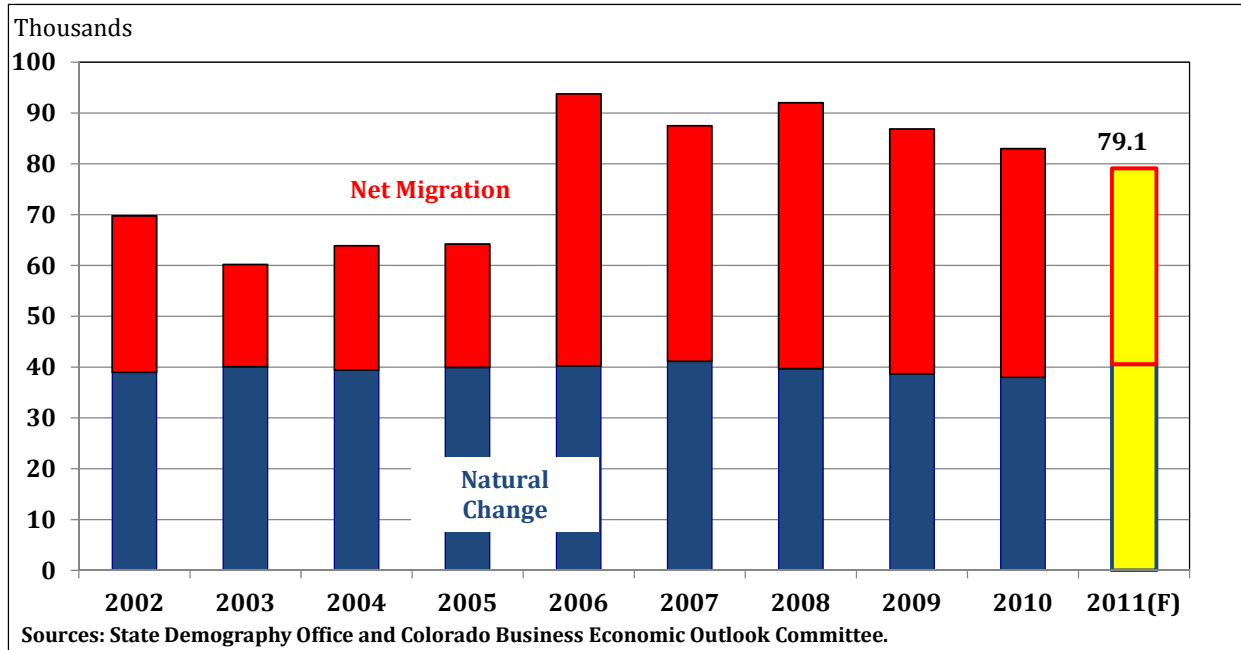
From the start of the 2001 recession, it took Colorado 60 months—until 2005—to recover the jobs it had lost in the downturn. By the time economic conditions worsened in 2008, the state had gained more than 100,000 jobs. Since employment tends to lag the economy, Colorado continued to build jobs well into 2008. Employment totaled 2.36 million in April 2008 (seasonally adjusted), then proceeded to fall by approximately 150,000 before reaching the trough in August 2010. Figure 11 represents seasonally adjusted statewide employment figures, showing the long road back to full employment.

FIGURE 11: COLORADO NON-AGRICULTURAL WAGE AND EMPLOYMENT, 2000-2010



The recession and resulting job losses had little impact on Colorado’s population growth, both in terms of the natural increase (births-deaths) and net migration (moving in-moving out). From 2006 through 2010, the state population grew by more than 443,000 (Figure 12).

FIGURE 12: COLORADO POPULATION, COMPONENTS OF CHANGE, 2002-2011



Consumers' reacted quickly to the recession by pulling back on retail trade sales, which impacted both industry and government (state and local) revenue. After peaking in 2007, sales fell in Colorado by 0.9% in 2008, followed by a 12.3% decline in 2009 (Figure 13). While the 12-month rolling average continued negative through June 2010, the trajectory was on an upward swing, and single month year-over-year figures were positive, signaling the consumer's return to spending.

FIGURE 13: COLORADO RETAIL TRADE SALES, 2002-2009

