CO-LABS ECONOMIC IMPACT STUDY

Economic and Fiscal Impacts of Federally Funded Research Facilities in Colorado, FY2011–FY2013

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EXECUTIVE SUMMARY

Federal laboratories have long been coveted members of Colorado's economy owing to the numerous jobs and federal dollars infused in the local and state economies. However, given the nature of the research and development conducted at the various facilities, employment and expenditures represent only a fraction of the true benefits of federal research facilities in Colorado. These auxiliary benefits include the emergence and existence of high-tech firms that locate near the facilities, collaborations with Colorado universities on cutting-edge research, experience for higher-education students through internships and part-time jobs, world-renowned research conducted in the state, and the economic stability common to federally supported programs.

This study quantified the economic impacts that federal research facilities and their university affiliates have on Boulder, Jefferson, and Larimer counties, and on the state of Colorado. This report estimates the economic benefits and fiscal impacts associated with these facilities, and identifies the intangible benefits, including spin-off companies, commercialized research, research awards, and strategic affiliates that contribute to the uniqueness of the federal research presence in the state. Primary data on operating and capital expenditures were collected from the facilities using a survey.

The economic benefits of federal research facilities and their affiliates totaled $2.3 billion in FY 2011 and in FY 2012 in output in Colorado. Given moderate employment declines and completed construction projects, this impact decreased to an estimated $2.0 billion in FY 2013. In total, these facilities accounted for 7,966 full-time, part-time, contract, and student jobs in Colorado in FY 2012, and an additional 7,716 indirect jobs. Economic activity in Boulder, Jefferson, and Larimer counties totaled $743.2 million, $733.3 million, and $148.2 million, respectively, in FY 2012.

Federal research facilities occupy 6.3 million square feet of leased and owned real estate in Colorado. Construction at the facilities topped $173 million in FY 2012. Activity in the FY 2011–FY 2013 period included new space and renovations, such as NREL's Research Support Facility and NIST's Precision Measurement Laboratory, and resulted in an estimated 2,500 total construction and related jobs.

Overall, Colorado federal lab employees are a highly educated group, with 29% having attained a doctorate, 24% a master's degree, and 32% a four-year degree (highest level attained). This exceeds the educational attainment of the general Colorado population: 13.4% have attained a graduate or professional degree (including doctorate) and 23.3% a bachelor's degree. This is expected as high levels of knowledge and training are necessary to perform the work and conduct research in these facilities.

There are many metrics for measuring Colorado's rank for federal research and development. Most notably, Colorado ranked 2nd in the nation for funding from NASA, the Department of Commerce, and the Department of Interior, and was in the top 5 for the National Science Foundation. Data from the National Science Foundation show that in 2010 Colorado received more than $2.3 billion in federal R&D expenditures, or 1.9% of the national total of $125.3 billion. Colorado ranked 20th for all R&D funding (federal and nonfederal) in 2010. Among the concentration of labs in the Federal Laboratory Consortium for Technology Transfer, Colorado ranks 7th. In FY 2009, Colorado ranked in the top 25 states in terms of R&D funding from 10 federal agencies, and was in the top 10 for funding received from 6 of them. These federal R&D expenditures impact both government research facilities and private contractors, and help support the high-tech industry clusters in the state.

Last, the economic and community impacts of labs stretch beyond operating expenditures, employment, and construction. Federal labs push scientific discoveries. They collaborate with business on joint research and commercialization, with records of tech transfer, licenses, and spin-off companies. They are partners in education, with opportunities ranging from K-12 facility tours to graduate and doctoral programs.

STUDY OVERVIEW

The Business Research Division (BRD) at the Leeds School of Business was commissioned by the CO-LABS organization to objectively measure the economic and fiscal impacts of federal research labs located in Colorado for fiscal years 2011, 2012, and 2013. This study is an update of economic impact studies conducted by the BRD for CO-LABS in 2008 and 2010. In addition to the economic impacts quantified in this report, four case studies in the final appendix of this report illustrate the research and partnerships of the National Renewable Energy Laboratory, the University Corporation for Atmospheric Research, and the Centers for Disease Control and Prevention.

CO-LABS is a consortium of federally funded scientific laboratories, universities, businesses, local governments, and community leaders organized to establish Colorado as a global leader in research, technology, and their commercialization (www.co-labs.org). In this study, 30 federal labs were identified in Colorado, represented by 20 broad federal organizations.

Colorado federal labs include:

- Bureau of Reclamation, U.S. Department of the Interior (BUREC TSC)
- Centers for Disease Control and Prevention (CDC-DVBD)
- Cooperative Institute for Research in the Atmosphere (CIRA)
- Cooperative Institute for Research in Environmental Sciences (CIRES)
- DOI North Central Climate Science Center (NC CSC)
- JILA
- Laboratory for Atmospheric and Space Physics (LASP)
- National Ecological Observatory Network (NEON)
- National Oceanic and Atmospheric Administration (NOAA)
    - Earth System Research Laboratory (ESRL)
    - National Geophysical Data Center (NGDC)
    - National Weather Service (NWS)
    - National Environmental Satellite, Data, and Information Service (NESDIS)
    - Space Weather Prediction Center (SWPC)
- National Institute of Standards and Technology (NIST)
- National Renewable Energy Laboratory (NREL)
- National Telecommunications and Information Administration (NTIA)
- University Corporation for Atmospheric Research (UCAR)
    - National Center for Atmospheric Research (NCAR)
- U.S. Department of Agriculture - Agricultural Research Service (ARS)
    - Natural Resources Research Center (NRRC)
    - National Center for Genetic Resources Preservation (NCGRP)
    - Crops Research Laboratory (CRL)
    - Central Great Plains Research Station (CGPRS)
- U.S. Department of Agriculture - Rocky Mountain Research Station (RMRS)
- U.S. Department of Agriculture - National Wildlife Research Center (NWRC)
- DOT/FRA-Transportation Technology Center (TTC)
- US Air Force Academy (USAFA)
- UNAVCO
- U.S. Geological Survey (USGS)

The research team strives for consistency in data gathering and assumptions. Variance inherently exists in estimating lab impacts as different assumptions may be made by new lab staff when gathering data, as the economy changes, and as the research team is presented with new data. For these reasons, caution should be exercised when comparing reports from different years. This report presents an estimate of the economic impacts of federal lab impacts in Colorado in FY2011-FY2013.

RESEARCH AND DEVELOPMENT

Federal R&D Rankings

A literature review was conducted to examine studies detailing the economic impacts of federal facilities and research collaborations, as well as the broader impact of research and development (R&D) on economic activity across the country. For example, the National Science Foundation's *Science and Engineering Indicators 2012* report highlights major developments in international and U.S. science and technology with an emphasis on broad trends in areas such as education, workforce, and R&D expenditures. The United States remains the single-largest R&D performing country, with a total of nearly $407 billion expended in 2010 and $414 billion in 2011.

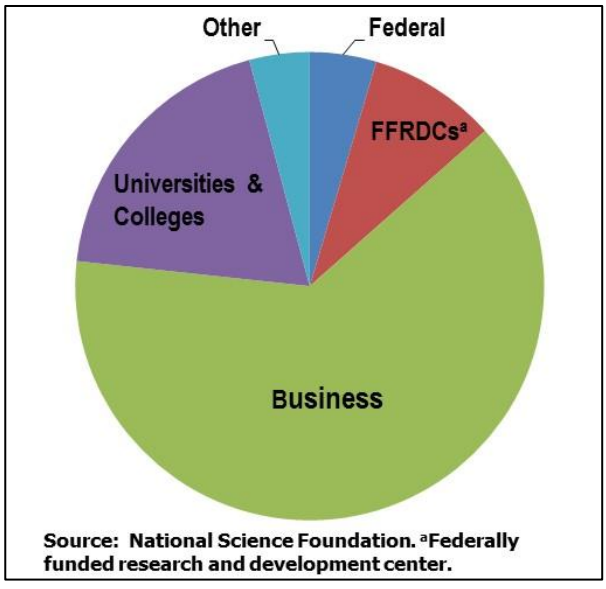
Industry still accounts for most of the U.S. R&D performance and funding, performing an estimated $284 billion in R&D in 2011, or 69% of the U.S. total, and funding an estimated $247 billion. The academic sector is the second-largest performer of U.S. R&D, accounting for an estimated $63 billion in 2011, and the federal government is the second-largest funding source of U.S. R&D, providing $134 billion in 2011, or just under one-third of the total.

The U.S. science and engineering workforce has grown faster than the country's overall workforce and now represents about 4.3% of all U.S. jobs. Additionally, some studies reviewed for this project discuss the value of technology transfer from the research facilities as measured by analysis of new patents and new firms stemming from their activities. The *Federal Laboratory Technology Transfer, Fiscal Year 2010, Summary Report to the President and Congress,* prepared by the National Institute of Standards and Technology in 2010, for example, indicates that federal tech transfer programs across 11 agencies produced roughly 4,800 new inventions, 1,800 new patents, and 13,500 active licenses. These activities helped to support such vital national interests as tsunami training and readiness, diagnostic testing for avian flu, energy efficiency, military advancement, and infrastructure development.

Colorado R&D Rankings

It is difficult to quantify exactly how states rank in terms of their federal research and development activity. Whether it is funding, number of labs, or another metric, rankings inevitably fail to capture the whole federal R&D picture for a state. Nevertheless, rankings can offer insight into how successfully a state competes for federal R&D and the benefits that come with it, such as highly skilled labor, higher wages, and technological and economic development. Data from the National Science Foundation show that, in 2010, the most recent year for which data are available, Colorado received more than $2.3 billion in federal R&D expenditures, or 1.9% of the national total of $125.3 billion. Colorado ranked 20th for all R&D funding (federal and nonfederal) in 2010.

FIGURE 1: 2010 COLORADO R&D EXPENDITURES BY PERFORMING SECTOR



Source: National Science Foundation. [a]Federally funded research and development center.

In FY 2009, Colorado ranked in the top 25 states in terms of R&D funding from 10 federal agencies, and was in the top 10 for funding received from 6 of them. Most notably, Colorado ranked 2nd in the nation for funding from NASA, the Department of Commerce, and the Department of Interior, and was in the top 5 for the National Science Foundation. These federal R&D expenditures impact both government research facilities and private contractors, and help support the high-tech industry clusters in the state.

TABLE 1: COLORADO FEDERAL OBLIGATIONS FOR R&D BY FEDERAL AGENCY

Funding Agency	Amount Received (in thousands)	Percent of Agency Total	National Ranking
NASA	$1,237,123	20.9%	2
Dept. of Commerce	206,149	18.0	2
Dept. of Interior	65,391	9.1	2
National Science Foundation	333,853	5.5	4
Dept. of Energy	341,881	3.5	8
Dept. of Transportation	21,596	2.6	8
Dept. of Agriculture	47,243	2.1	15
Dept. of Defense	1,209,987	1.6	18
Dept. of Health & Human Services	393,792	1.1	20
Dept. of Homeland Security	4,920	0.7	23

Source: National Science Foundation.

While Colorado's high educational attainment is not solely attributable to federal R&D, the state enjoys a relatively large, highly educated workforce in the fields of science and engineering. In 2008, Colorado ranked 7th in the country for high-tech employment as a percentage of total employment (13.7%), and in 2010, the state ranked 4th for the percentage of its workforce in science and engineering occupations, at 5.9%.

The Federal Laboratory Consortium for Technology Transfer (FLC) is a nationwide network of federal labs that provides a forum to develop strategies, partnerships, and other opportunities for linking lab technologies and expertise to the market. Out of 317 labs in the FLC, Colorado is home to 13, tying with Ohio for 4th-most FLC labs behind Maryland (59), California (25), and Virginia (22). Colorado also ranks 7th among the 50 states, not including the District of Columbia, for population per FLC lab, with Maryland, Wyoming, and Mississippi holding the top three spots.

TABLE 2: POPULATION PER FLC LAB, TOP 10 STATES

Rank	State	Population per FLC Lab
1	Maryland	99,738
2	Wyoming	288,206
3	Mississippi	331,658
4	North Dakota	349,814
5	Alaska	365,725
6	Virginia	372,085
7	Colorado	399,045
8	South Dakota	416,677
9	New Mexico	417,108
10	New Hampshire	440,239

Sources: Lab data from the Federal Laboratory Consortium and population data from the Census Bureau. Calculations by BRD staff.

External data, studies, and articles helped inform the research study. A review of relevant R&D data and economic impact studies may be found in Appendix 1, and related news articles are presented in Appendix 2.

ECONOMIC AND DEMOGRAPHIC OVERVIEW OF AREA

Federal labs impact the communities in which they operate through direct spending and employment, high educational attainment, or the clustering effect of companies and industries. Boulder, Jefferson, and Larimer counties receive the greatest direct economic boost from research facilities in Colorado due to the location of these facilities. The City of Boulder, located in Boulder County, is home to the Cooperative Institute for Research in Environmental Sciences (CIRES), JILA, the Laboratory for Atmospheric and Space Physics (LASP), the National Ecological Observatory Network (NEON), the National Oceanic and Atmospheric Administration (NOAA), the National Institute of Standards and Technology (NIST), the National Telecommunications and Information Administration (NTIA), the University Corporation for Atmospheric Research (UCAR), and the National Center for Atmospheric Research (NCAR). In Jefferson County, Golden hosts the National Renewable Energy Laboratory (NREL), and the U.S. Geological Survey (USGS) and the Bureau of Reclamation Technical Service Center (BUREC TSC) are located in Lakewood. The Centers for Disease Control and Prevention (CDC-DVDB), the Cooperative Institute for Research in the Atmosphere (CIRA), the DOI North Central Climate Science Center (NC CSC), the U.S. Department of Agriculture - Agricultural Research Service (ARS), the Rocky Mountain Research Station (RMRS), and the National Wildlife Research Center (NWRC) are located in Fort Collins, Larimer County. Furthermore, the University of Colorado Boulder, the Colorado School of Mines, and Colorado State University are also located in these three counties. The surrounding counties also receive an economic benefit, primarily from the spending of the employees who reside in those respective counties.

While Boulder, Jefferson, and Larimer counties comprise only 3.9% of the state's land area, 22.4% of Colorado's population resides in this region.[1] The full overview of basic demographic and economic information and county comparisons within the region may be found in Appendix 3. Some excerpts from the overview include:

- Population in the three counties grew faster than the state from 1970 to 2000, but slower than the state from 2000 to 2010.
- The population in Boulder, Jefferson, and Larimer counties recorded more bachelor's, graduate, and professional degrees than the state and national average and the Denver Metro region in 2011.
- Per capita personal income in Boulder and Jefferson counties is higher than the state and nation, but slightly lower in Larimer County in 2011.
- Per capita personal income growth in Boulder and Jefferson counties grew below the national and state average between 2005 and 2011, and between 2010 and 2011.
- In Boulder County, federal employment declined from 2007 to 2012, while Jefferson County, Larimer County, the Denver metropolitan region, and Colorado all recorded federal employment growth.
- The federal government sector recorded higher than average county wages in 2012.
- The Denver-Boulder-Greeley CPI and core CPI grew at a slower rate than the nation between 2002 and 2012.

[1] http://quickfacts.census.gov/qfd/states/08000.html, as of July 31, 2013.

METHODOLOGY

Researchers from the Business Research Division met with representatives from the federal facilities and from CO-LABS to modify the survey instrument that was used in the previous CO-LABS study. The facilities were informed of the survey by the CO-LABS Board, as well as by BRD researchers. Surveys were subsequently sent via e-mail to the facility representatives.

Primary data for the study were derived from a survey that was delivered to administrators at 19 research facilities in the state. Their responses included answers representing subsidiary affiliates. The Business Research Division received formal responses from 18 of the 19 primary facilities for a response rate of 94.7%. Responses were solicited for FY 2011–FY 2013. Some labs did not provide FY 2011 totals or FY 2013 estimates, thus, the employment and expenditure data for these years were extrapolated for select labs. The newly established North Central Climate Science Center did not respond as it officially opened in October 2012 and did not have data for the full reporting year. UNAVCO was added to the list of Colorado labs in August 2013 after the economic analysis was completed.

The facilities represented in this study are based on 18 survey responses completed by parent facilities. Surveys were received from:

- Bureau of Reclamation, U.S. Department of the Interior (BUREC TCS)
- Centers for Disease Control and Prevention (CDC-DVBD)
- Cooperative Institute for Research in the Atmosphere (CIRA)
- Cooperative Institute for Research in Environmental Sciences (CIRES)
- JILA
- Laboratory for Atmospheric and Space Physics (LASP)
- National Ecological Observatory Network (NEON)
- National Oceanic and Atmospheric Administration (NOAA)
- National Institute of Standards and Technology (NIST)
- National Renewable Energy Laboratory (NREL)
- National Telecommunications and Information Administration (NTIA)
- University Corporation for Atmospheric Research (UCAR)
- U.S. Department of Agriculture - Agricultural Research Service (ARS) (Fort Collins)
- U.S. Department of Agriculture - Agricultural Research Service (ARS) (Akron)
- U.S. Department of Agriculture - Rocky Mountain Research Station (RMRS)
- U.S. Department of Agriculture - National Wildlife Research Center (NWRC)
- DOT/FRA-Transportation Technology Center (TTC)
- U.S. Geological Survey (USGS)

The impacts in this study are summarized into three areas: economic benefits, public revenues, and public costs. This study used the IMPLAN input-output model to quantify the economic impacts of federal research facilities and their affiliates. Further research external to the IMPLAN model quantified the public revenues and costs related to facility operations in Colorado.

Economic benefits refer to dollars generated and distributed throughout the economy due to the existence of an establishment. Public revenues indicate state, county, and local tax revenues generated due to the existence of an establishment via income taxes, sales taxes, property taxes, and special taxes. Public costs refer to the cost of proving government services to the facilities and their employees, both

on-site and off-site. Public revenues are included in economic benefits, thus the net economic benefits are the economic benefits minus public costs.

The sources of impacts that sum to economic benefits, public costs, and public revenues derive from operations, capital expenditures (construction), and offsite employee effects.

Construction comprises new construction, tenant improvements, and additions. Economic benefits arise from expenditures on materials, architectural and engineering services, and construction labor. The projects inherently generate tax revenues, including sales taxes on materials, impact fees, and property taxes. Public costs derive from providing government services to the property development and construction workers.

Operation costs include the purchases of materials and equipment, maintenance costs, utilities, and salaries and benefits. Direct public revenues are scarce in relation to federal facilities due to their tax-exempt status; however, public costs still exist when providing government services to the facilities (i.e., fire and police protection).

Off-site employee effects include the impact of employees incurred outside the workplace. Benefits encompass employee spending, including expenditures on housing (rent or own), retail purchases, transportation, entertainment, and other disposable income expenditures. Public revenues include sales taxes and property taxes, while public costs include services to respective households. The off-site impacts rest primarily in the county of employee residence rather than in the locale of the facility.

Secondary effects, or the multiplier effects, estimate the indirect and induced employment and earnings generated in the study area due to the interindustry relationships between the facility and businesses. As an example, consider a federal lab operating in Boulder County. The lab employs scientists, managers, engineers, and support staff for its direct operations. In addition, the facility spends on goods and services to support its operations, leading to auxiliary jobs in the community in transportation, utilities, wholesale goods, and so on—the indirect impact. Furthermore, employees spend their earnings on goods and services in the community, leading to jobs in retail, accounting, entertainment, and so on—the induced impact.

Conceptually, multipliers quantify the number of jobs. Multipliers are static and do not account for disruptive shifts in infrastructure without specifically addressing infrastructure changes. This model uses IMPLAN multipliers purchased from the Minnesota IMPLAN Group (MIG) and aggregated for each study area. Public revenues and public costs are not tabulated due to the unknown residence dispersion of secondary employees.

MODEL INPUT DATA AND ASSUMPTIONS

Annual Budget

Of the 18 federal facilities that submitted data, 17 provided information on their annual budgets. Estimated budgets for FY 2012 totaled $1.5 billion. More than 47% of the $1.5 billion was from Jefferson County facilities, 44.6% from Boulder County facilities, 6.7% in Larimer County, and 1.3% from other counties (i.e., Pueblo, Washington). Only 14 facilities provided estimated budgets for FY 2013, demonstrating the uncertainty revolving around continuing resolutions and congressional directed automatic federal budget cuts, known as the sequester.

Of the 18 responding facilities, 15 also provided a breakdown of their FY 2013 annual budget by funding source. The Departments of Energy, Commerce, and Defense provided nearly half of the funding, accounting for almost 40%, or $385 million, of the $992 million in total funding reported by the 15 labs. NREL is the primary reason the Department of Energy (DOE) appears as the top funding source, with nearly $250 million of its funding coming from the DOE alone. While these three cabinet departments account for a plurality of the funding reported by the 15 labs, a wide variety of other sources contribute as well. CIRES, for example, received more than $11 million from NASA, $6 million from the NSF, and $1.1 million from private nonprofits in FY 2013, while 2% of UCAR's $231 million in funding came from foreign sources.

Real Estate

With roughly 6.3 million square feet of total facility space in FY 2013, Colorado's federal laboratories have a very large footprint in the state, not only economically, but physically as well. In fact, this square footage total means that combined, Colorado's labs could fill almost five buildings the size of the CenturyLink tower in downtown Denver, or fill up about 90% of the Pentagon in Washington, DC. The National Renewable Energy Laboratory in Golden is the largest of the state's federal labs, at 1.35 million square feet, followed by the U.S. Geological Survey (1.22 million square feet) and the National Institute for Standards and Technology (800,000 square feet). Jefferson County-based facilities account for the most federal lab space in Colorado, with nearly 2.7 million square feet, while Boulder County-based operations account for 2.3 million square feet and Larimer County operations account for 890,000 square feet.

FIGURE 2: TOTAL FEDERAL LAB SQUARE FOOTAGE BY HOME COUNTY

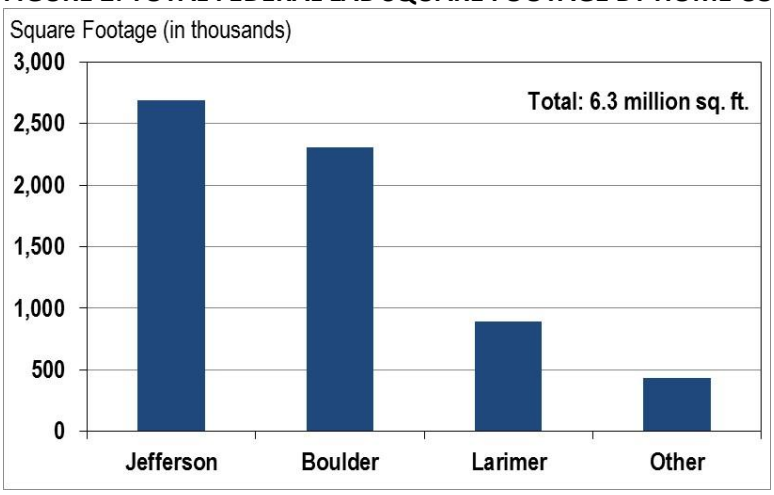
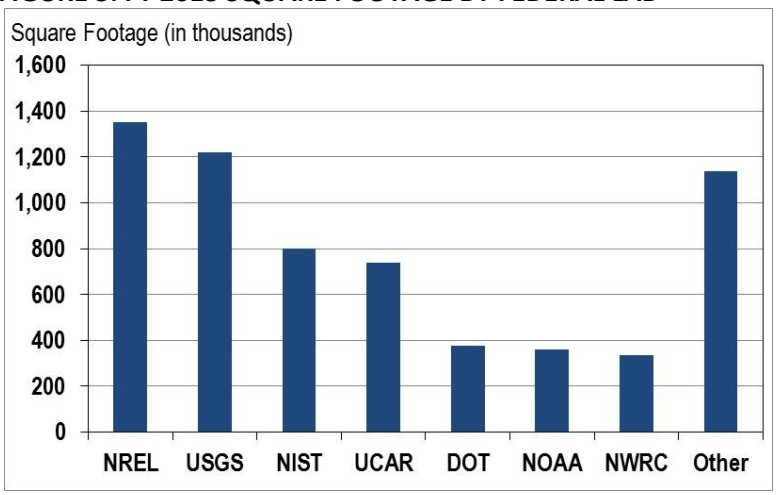


FIGURE 3: FY 2013 SQUARE FOOTAGE BY FEDERAL LAB



Construction

Total direct construction impacts at the research facilities are limited to those reported in the survey instrument. Facilities were surveyed about their estimated construction expenditures, as well as the spatial distribution of such purchases in and out of Colorado. Labs estimated the portion of construction spending in Colorado. The commercial and institutional buildings multiplier was applied to construction, and the architectural, engineering, and related services multiplier was applied to soft costs when specified.

Eleven of the surveyed research facilities reported more than $214 million in construction in FY 2011. Construction budgets fell to $173 million in FY 2012 at 12 facilities, and are estimated at $77.6 million in FY 2013 at 11 facilities. Over this three-year period, facilities in Jefferson County recorded the greatest construction spending ($240 million), followed by Boulder County ($217 million) and Larimer County ($6 million). Construction projects ranged from renovations to new construction, such as the new Precision Measurement Laboratory at NIST, Phase II of NREL's Research Support Facility, and updates to USGS space at the Denver Federal Center.

Operations

Operating expenditures were reported for FY 2011 and FY 2012. Budget uncertainty with the continuing resolution and sequestration led to uncertainty around FY 2013 budgets, and the numbers were reported as estimates. Facility operating expenditures reported from the facilities totaled $1.7 billion in FY 2012. Employee compensation is the single-largest expenditure and is inherently local. Other operating expenditures may or may not be local based on availability and lowest-cost sourcing.

Employment and Wages

Colorado labs reported a total of 6,519 full-time employees, 772 part-time employees and student employees,[2] and 675 contract workers for a total of 7,966 in FY 2012. Average salary and benefits totaled $98,819 across all facilities. Reported benefit rates for full-time workers averaged 29.7% of total compensation, including retirement and health benefits.

[2] Student workers were counted as 0.2 FTE.

TABLE 3: TOTAL EMPLOYMENT BY COLORADO FEDERAL LAB LOCATION, FY 2012

Primary County	Full-Time Employees	Part-Time Employees and Student Workers[a]	Contract Workers	Total Workers	Total Compensation (Millions)[b]	Average Compensation[b]
Boulder	3,150	416	31	3,597	$388.3	$107,942
Jefferson	2,754	273	605	3,632	$334.2	$92,010
Larimer	531	69	39	639	$55.6	$87,065
Other	84	14	0	98	$9.1	$92,857
Colorado	6,519	772	675	7,966	$787.2	$98,819

[a]Student workers are represented here as 0.2 employees.
[b]Compensation includes salary and benefits.

Expenditures

The primary facilities in each county reported on their Colorado operations, disaggregating lease payments, operating expenditures, employees, maintenance, and utilities. Total state expenditures reported by the primary facilities totaled $1.2 billion in Colorado; $549.1 million in Boulder County, $535.2 million in Jefferson County, and $90.9 million in Larimer County.

TABLE 4: EXPENDITURES BY COLORADO FEDERAL LAB LOCATION (IN MILLIONS), FY 2012

Primary County	Labor	Operating Expenditures, Maintenance, and Utilities	Lease Payments	Total Direct Colorado Operations
Boulder	$424.4	$112.3	$12.5	$549.1
Jefferson	$329.4	$176.2	$29.6	$535.2
Larimer	$53.0	$30.0	$7.9	$90.9
Colorado	$763.5	$375.0	$50.2	$1,188.8

Off-Site Employee Effects

Facilities were asked to provide the total number of employees living in each ZIP code in Colorado in order to assign off-site economic benefits to their respective counties. ZIP codes were provided by all but one facility, representing 99% of employment. The employee labor shed was extrapolated for this last facility based on responses from other labs.

Based on the survey data, 71% of lab workers live in the primary counties of operations (Boulder, Jefferson, Larimer, Pueblo, and Washington counties). The cities of Boulder, Denver, Fort Collins, Longmont, and Golden, which are located in the primary research counties, were the top five cities where the greatest number of Colorado lab employees live.

TABLE 5: COUNTY RESIDENCES OF COLORADO FEDERAL LAB EMPLOYEES

County	Employees	Percentage	County	Employees	Percentage
Boulder	2,947	37%	Arapahoe	162	2%
Jefferson	1,795	23%	Douglas	115	1%
Larimer	625	8%	Mesa	48	1%
Denver	561	7%	El Paso	48	1%
Broomfield	345	4%	Washington	26	0%
Weld	321	4%	Other Colorado	79	1%
Adams	315	4%	Colorado Total	7,642	96%
Pueblo	255	3%	**Lab Total***	**7,966**	**100%**

*Estimated 342 workers not Colorado residents.

TABLE 6: CITY RESIDENCES OF COLORADO FEDERAL LAB EMPLOYEES

City	Employees	Percentage	City	Employees	Percentage
Boulder	1,887	24%	Loveland	84	1%
Denver	1,213	15%	Westminster	64	1%
Fort Collins	460	6%	Brighton	64	1%
Longmont	449	6%	Nederland	62	1%
Golden	440	6%	Wheat Ridge	57	1%
Louisville	401	5%	Englewood	41	1%
Broomfield	345	4%	Thornton	38	0%
Littleton	342	4%	Berthoud	38	0%
Arvada	340	4%	Morrison	37	0%
Pueblo	241	3%	Grand Junction	36	0%
Lafayette	204	3%	Colorado Springs	34	0%
Erie	117	1%	Other Colorado	451	6%
Evergreen	101	1%	Colorado Total	7,642	96%
Aurora	96	1%	**Lab Total***	**7,966**	**100%**

*Estimated 342 workers not Colorado residents.

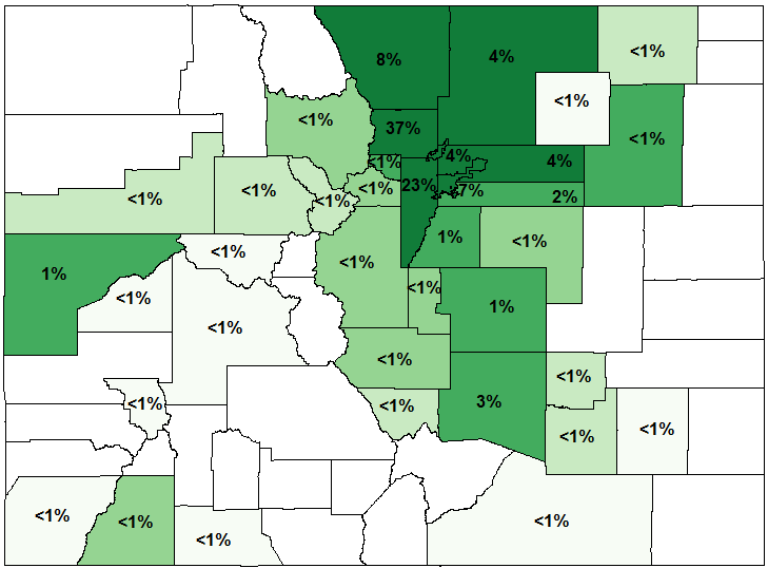
With the federal labs concentrated along Colorado's Front Range, most lab employees live in Boulder (37%), Jefferson (22%), Larimer (8%), and Denver (7%) counties. Nearly 25% of the remaining lab employees live in other areas in the state. Lab employees reside mostly in Colorado's 2nd Congressional District (63%) and 1st Congressional District (14%), followed by the 7th and 4th Congressional Districts, with 8% and 5%, respectively.

TABLE 7: LAB EMPLOYEE RESIDENCES BY CONGRESSIONAL DISTRICT

Colorado Congressional District	Employees	Percentage
1	1,076	13.5%
2	5,004	62.8%
3	317	4.0%
4	417	5.2%
5	56	0.7%
6	168	2.1%
7	604	7.6%
Total Colorado	7,642	95.9%
Lab Total*	**7,966**	**100.0%**

*Estimated 342 workers not Colorado residents.

FIGURE 4: EMPLOYEE LABOR SHED OF COLORADO FEDERAL LABS



Social, demographic, and housing statistics were gathered from the U.S. Census Bureau's 2011 American Community Survey[3] for use in the impact model. Data include average household size, percentage of single-family and multifamily units, kindergarten through 12th grade enrollment, median home prices, and median rents.

TABLE 8: SOCIAL, DEMOGRAPHIC, AND HOUSING DATA, 2011

County	Average Household Size (people)	Single Family[a] (% of units)	Multi-family (% of units)	K-12 Enrollment (% of population)	Median Owner-Occupied Unit Value	Median Monthly Rent
Boulder	2.45	69.8%	30.2%	18.9%	$344,600	$1,054
Jefferson	2.44	73.4	26.6	15.9	255,700	907
Larimer	2.50	78.1	21.9	14.2	241,500	945
Denver Metro	2.65	68.0	32.0	16.8	243,600	920
Colorado	2.60	73.5	26.5	16.4	233,700	900

[a]Single family includes mobile homes.
Sources: U.S. Census Bureau 2011 American Community Survey, U.S. Department of Education, and Colorado Demography Office.

Consumer spending data were gathered from the Bureau of Labor Statistics' 2010−11 Consumer Expenditure Survey for MSAs in western states.[4] It is estimated that 16.7% of gross income and 21.3% of consumers' expenditures are spent on taxable retail goods and services. This assumes the following taxable goods and services: food away from home, alcoholic beverages, housekeeping supplies, household furnishings and equipment, apparel and services, vehicle purchases, vehicle maintenance and repairs, personal care products and services, reading, other lodging, and tobacco products and smoking supplies.

[3]Factfinder2.census.gov, retrieved May 20, 2013.
[4]http://www.bls.gov/cex/csxregion.htm#y1011, retrieved July 9, 2013.

Indirect Effects

Multipliers were selected based on the published North American Industrial Classification System (NAICS) codes. IMPLAN multipliers were obtained from MIG by matching the NAICS description to IMPLAN's corresponding disaggregated sectors. Employment, earnings, and output multipliers were based on NAICS sector Professional, Scientific, and Technical Services sector 541). Other multipliers were selected based on the specified expenditures, including maintenance, construction, operations, and utilities. Additional relevant data on taxes and the economy may be found in Appendix 3.

Cost of Government

Colorado's federal research facilities provide economic benefits and public revenues to Colorado through operations and employees' off-site impacts. However, costs exist in providing state, county, and local government services to the facilities and their employees, including general government administration, public works (e.g., roads, utilities), public safety (e.g., fire protection, police protection), parks and recreation, etc. Comprehensive annual financial reports (CAFRs) were used to identify these costs at state, county, and city levels. Costs were assigned to residents and businesses based on government function, and per capita expenses were derived using total business employment and residential population as denominators.

The cost of providing state government services was estimated at $1,220 per resident and $849 per employee. The weighted average cost of county services was $422 per resident and $362 per employee, and the weighted average cost of city services was $411 per resident and $423 per employee.

Economic and Fiscal Impact of Research Facilities

Impact on Colorado

The economic impact of federal research facilities and their university affiliates on the state of Colorado totaled $2.3 billion in FY 2011 and in FY 2012, dropping to an estimated $2.0 billion in FY 2013. The greatest impact derived from facility operations, with Colorado employee compensation totaling $763.5 million alone. Direct operations, maintenance, and utilities purchased in Colorado totaled an estimated $375 million, and lease payments totaled $50.2 million. Colorado construction expenditures were estimated at $158 million in 2012, with some economic leakage from materials, architectural, and engineering services sourced out of state. Budget decreases and attrition is observed in the FY 2013 estimates.

Construction at Colorado's federal research facilities topped $214.2 million in FY 2011 before decreasing to $173.4 million in FY 2012. Estimates for FY 2013 are $77.6 million in construction spending. While much of this activity remains in Colorado through the hiring of local engineering firms, general contractors, and materials, a portion of construction purchases are made out of state. Total output derived from the Colorado portion of construction spending totaled $324.1 million in FY 2011, $303.1 million in FY 2012, and $123.1 million in FY 2013. The direct and indirect employment resulting from construction expenditures is estimated at 2,721 in FY 2011, 2,503 in FY 2012, and 995 in FY 2013.

Given the tax-exempt status of the federal facilities, the bulk of public revenues derive from employee income taxes, as well as off-site sales and property taxes. Income taxes were estimated at $15.3 million, sales taxes at $7.4 million, and property taxes at $13.7 million. These three revenue streams summed to

$36.4 million in FY 2012. For the purpose of this study, other taxes and fees are considered fees for service, such as vehicle registration fees or recreation fees, and are excluded from the analysis.

While the federal facilities are tax exempt, they do receive government services, including police and fire protection, and the positive externalities of parks and roads. The costs of providing government services to the facilities and employees totaled an estimated $44.4 million in FY 2012.

TABLE 9: IMPACT OF COLORADO FEDERAL LABS ON COLORADO, FY 2011–FY 2013

Summary of Impacts	FY2011	FY2012	FY2013*
Operations			
Output (Millions)	$2,024.2	$2,023.8	$1,922.7
Value Added (Millions)	$1,448.5	$1,439.1	$1,367.3
Employment	16,162	15,749	14,913
Construction			
Output (Millions)	$324.1	$303.1	$123.1
Value Added (Millions)	$181.7	$169.5	$69.4
Employment	2,721	2,503	995
Total			
Output (Millions)	$2,348.2	$2,326.9	$2,045.8
Value Added (Millions)	$1,630.2	$1,608.6	$1,436.7
Employment	18,883	18,253	15,908

*Estimated based on fiscal year-end projections.

Impact on Boulder County

The economic impact of Colorado's federal labs on Boulder County totaled $743.2 million in FY 2012. While federal labs drive millions in spending on goods and services across the state, only a portion of those goods and services may be sourced locally. While 3,539 employees work at Boulder federal labs, not all federal lab workers live in Boulder County. The largest local lab expenditure is on labor, with an estimated 2,984 full-time, part-time, and contract lab workers living in Boulder County with salaries and benefits totaling $292.1 million in FY 2012. Other local expenditures included subcontracted research, real estate lease payments, as well as some locally sourced construction and maintenance.

TABLE 10: IMPACT OF COLORADO FEDERAL LABS ON BOULDER COUNTY, FY 2011–FY 2013

Summary of Impacts	FY2011	FY2012	FY2013*
Operations			
Output (Millions)	$710.5	$713.9	$669.1
Value Added (Millions)	$578.4	$572.7	$533.4
Employment	5,759	5,629	5,466
Construction			
Output (Millions)	$42.1	$29.3	$30.6
Value Added (Millions)	$24.2	$16.8	$17.6
Employment	379	259	266
Total			
Output (Millions)	$752.5	$743.2	$699.7
Value Added (Millions)	$602.6	$589.5	$551.0
Employment	6,138	5,888	5,732

*Estimated based on fiscal year-end projections.

Impact on Jefferson County

The economic impact of Colorado's federal labs on Jefferson County totaled $733.3 million in FY 2012.While federal labs drive millions in spending on goods and services across the state, only a portion of those goods and services may be sourced locally. While 3,578 employees worked at federal labs in Jefferson County in FY 2012, not all federal lab workers lived in Jefferson County. The largest local lab expenditure is on labor, with an estimated 1,817 full-time, part-time, and contract lab workers living in Jefferson County with salaries and benefits totaling $162.4 million in FY 2012. Other local expenditures included subcontracted research, real estate lease payments, as well as some locally sourced construction and maintenance.

TABLE 11: IMPACT OF COLORADO FEDERAL LABS ON JEFFERSON COUNTY, FY 2011–FY 2013

Summary of Impacts	FY2011	FY2012	FY2013*
Operations			
Output (Millions)	$696.8	$664.9	$649.4
Value Added (Millions)	$501.1	$491.2	$472.8
Employment	5,649	5,392	5,058
Construction			
Output (Millions)	$63.6	$68.4	$12.5
Value Added (Millions)	$36.9	$39.7	$7.3
Employment	564	597	108
Total			
Output (Millions)	$760.4	$733.3	$661.9
Value Added (Millions)	$538.0	$531.0	$480.0
Employment	6,212	5,989	5,166

*Estimated based on fiscal year-end projections.

Impact on Larimer County

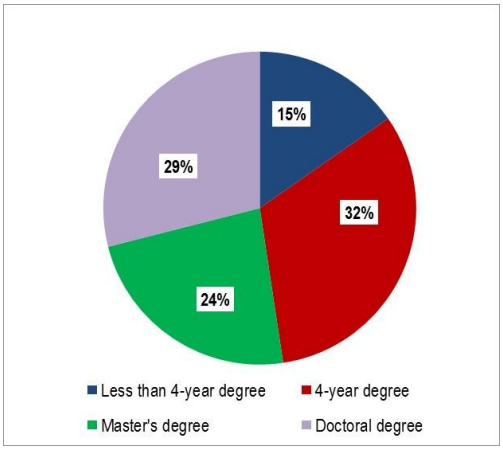
The economic impact of Colorado's federal labs on Larimer County totaled $148.2 million in FY 2012.While federal labs drive millions in spending on goods and services across the state, only a portion of those goods and services may be sourced locally. A total of 609 employees worked at federal labs in Larimer County in FY 2012. More lab workers call Larimer County *home* than who *work* in Larimer County as residents commute to labs in other counties. The largest local lab expenditure is on labor, with an estimated 632 full-time, part-time, and contract lab workers living in Larimer County with salaries and benefits totaling $55.6 million in FY 2012. Other local expenditures included subcontracted research, real estate lease payments, as well as some locally sourced construction and maintenance.

TABLE 12: IMPACT OF COLORADO FEDERAL LABS ON LARIMER COUNTY, FY 2011–FY 2013

Summary of Impacts	FY2011	FY2012	FY2013*
Operations			
Output (Millions)	$132.6	$141.4	$154.5
Value Added (Millions)	$97.4	$98.6	$105.0
Employment	1,195	1,211	1,296
Construction			
Output (Millions)	$8.3	$6.8	$1.2
Value Added (Millions)	$4.5	$3.7	$0.7
Employment	82	66	12
Total			
Output (Millions)	$140.9	$148.2	$155.8
Value Added (Millions)	$101.9	$102.3	$105.6
Employment	1,277	1,277	1,307

*Estimated based on fiscal year-end projections.

FIGURE 5: EMPLOYEE EDUCATION



Educational Attainment

Overall, Colorado federal lab employees are a highly educated group, with 53% having attained a master's degree or doctorate, and 32% having attained a four-year degree. Comparing this to all Colorado residents, 13.4% have attained a graduate or professional degree and 23.3% a bachelor's degree. This is expected as high levels of knowledge and training are often necessary to perform the work and conduct research in these industries. Higher than average wages at these federal labs often reflect, and are commensurate with, higher educational attainment.

Intangible Benefits

Beyond their measurable economic impact, the federal facilities create a number of intangible benefits for their local communities, the state, and broader social structure in general. These labs help spur the development of new technologies, spawn tech transfer and spin-off companies, and work collaboratively with private business, resulting in greater business investment in the state. The facilities and the employees foster community relationships through education and volunteerism.

The facilities surveyed reported donating to charitable organizations, including the Combined Federal Campaign and other local groups. Employees from the federal facilities participate in the Salvation Army's Adopt-a-Family Program, and assist with food and gift drives. These projects enrich the cultural, intellectual, and social fabric of communities around the state.

Aside from the work with community-service organizations, researchers and scientists educate school children and the public. Employees are intricately involved with all levels of the education community—from kindergarten to graduate and doctoral programs. They participate as judges at science fairs and as volunteers at after-school science programs, and give presentations.

Many of the facilities offer employees opportunities for training, scholarships, tuition reimbursement, research fellowships, postdoctoral programs, internships, work-study positions, research assistantships,

tuition waivers, and more. These opportunities facilitate crossover and cooperation between universities and government facilities that conduct advanced research. These relationships help improve and develop intellectual capital and research potential.

The federal research labs in Colorado maintain extensive alliances with other research institutions and associations within the state, across the nation, and around the globe. These include industry organizations, nonprofits, federal agencies and programs, private research companies, and universities across the country.

The Colorado federal facilities bring high-level recognition to the state, including Presidential Rank awards, multiple Nobel Prizes in Physics, a host of government agency awards, teaching awards, and innovation awards. Most recently, Dr. David J. Wineland, with NIST, was awarded the Nobel Prize in Physics in 2012.

Last, federal facilities are responsible for onsite and offsite visitors for the purposes of operational meetings, training, research, and conferences. Benefits accrue from the visitors' expenditures on hotels and motels, vehicle rentals, dining, and other miscellaneous expenditures, as well as marketing the state to future visitors.

IMPACT BY FACILITY

Bureau of Reclamation Technical Service Center (BUREC TSC)
Department of Interior
PO Box 25007
Denver, CO 80225
www.usbr.gov/pmts/tech_services/

As the largest wholesaler of water in the United States, the Bureau of Reclamation brings water to more than 31 million people and provides irrigation water for 10 million acres of farmland. It is the second-largest producer of hydroelectric power in the nation.[5] The laboratory at the Technical Service Center provides material, hydraulic, and biologic testing and research for the Bureau of Reclamation.

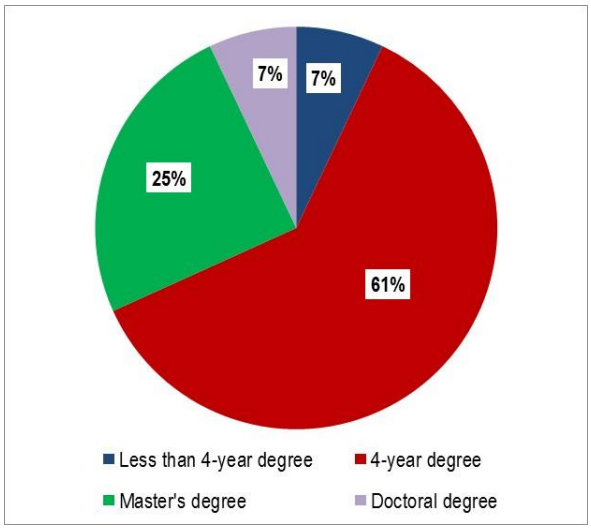
Funding

The Bureau of Reclamation's Technical Service Center is funded 100% by the U.S. Department of the Interior. In FY 2012, the Technical Service Center operated on a $15 million budget.

Employment and Occupations

In FY 2012, the Technical Service Center employed 85 workers, earning average salaries of $82,940 plus benefits. The majority of Technical Service Center jobs (53%) are engineering-based, 29% are biologists and botanists, and the remaining 18% are all other jobs, including administrators and staff. This federal laboratory employs 6 student workers (included in the number above), which fosters on-site educational experiences that mutually benefit the student and the center. Examining job titles at the Bureau of Reclamation's Technical Service Center, it is estimated that occupations are comprised of 82% scientific functions (e.g., hydraulic engineer, biologist/botanist) and 18% administrative and business support functions.

FIGURE 6: BUREC TSC EMPLOYEE EDUCATION



Education

The workforce of the Technical Service Center was comprised of 61% of workers with a four-year degree, approximately 7% with a doctorate, and 25% with a master's degree. The remaining 7% did not have a four-year degree.

Educational attainment represents the highest degree earned. For the Bureau of Reclamation's Technical Service Center, the educational attainment of the workforce exceeds that of Jefferson County, the lab's home county, and the state as a whole. At the center, 32% of the employees hold a graduate or professional degree, compared to nearly 14% of Jefferson County workers and roughly 13% of all Colorado workers. The

[5] U.S. Department of the Interior, Bureau of Reclamation, http://www.usbr.gov/main/about/, retrieved May 29, 2013.

proportion of the Jefferson County population with a bachelor's degree as the highest degree earned was 26% and for the state it was 23%.

Economic Impact

The economic impact of the Bureau of Reclamation's Technical Service Center on the state of Colorado was measured by examining various expenditure data on operations and employees, as well as their multiplier effects. In FY 2012, the Technical Service Center contributed $30.3 million to the state economy and supported direct and indirect employment of 217 workers.

TABLE 13: BUREC TSC, ECONOMIC AND FISCAL IMPACTS, FY 2012

Summary of Impacts	FY2012
Operations	
Output (Millions)	$30.3
Value Added (Millions)	$21.1
Employment	217
Construction	
Output (Millions)	$0.0
Value Added (Millions)	$0.0
Employment	-
Total	
Output (Millions)	$30.3
Value Added (Millions)	$21.1
Employment	217

Intangible Benefits

The facility provides lab tours to educate the public. It also holds an annual Bridge Building Competition for high school students across Colorado. The high school students who gather for this competitive event have the opportunity to interact with professional engineers and test their homemade bridges for a chance to go to the National Bridge Building Competition. The bridge that lasts the longest before cracking under pressure wins.

Centers for Disease Control and Prevention, Division of Vector-Borne Diseases (CDC-DVBD)
Centers for Disease Control and Prevention
U.S. Department of Health and Human Services
3156 Rampart Road
Fort Collins, CO 80521
www.cdc.gov

The Centers for Disease Control and Prevention (CDC), Division of Vector-Borne Diseases (DVBD), located in Fort Collins, Colorado, is uniquely responsible for protecting the American public from domestic and invasive endemic and epidemic diseases carried by blood-sucking arthropods (vectors)—mosquitoes, ticks, and fleas.

The CDC-DVBD:

- Conducts surveillance, investigations, and studies of vector-borne viral and bacterial diseases and plague to define disease etiology and to develop effective methods and strategies for diagnosis, prevention, and control;
- Conducts research on the biology, ecology, and control of arthropod vectors as a basis for development of new and/or modification of existing measures for more effective prevention and control;
- Conducts or participates in clinical, field, and laboratory studies to develop, evaluate, and improve laboratory methods and materials and therapeutic practices used for diagnosis, prevention, and treatment of vector-borne infectious diseases;
- Provides epidemic aid and epidemiologic consultation, and reference/diagnostic services, upon request, to state and local health departments, other federal agencies, and national and international health organizations;
- Conducts research and collaborates on development and evaluation of immunizing agents;
- Provides scientific and technical assistance to other CDC components when the work requires unique expertise or specialized equipment not available in other components;
- Provides intramural and extramural technical expertise and assistance in professional training activities; and
- Serves as designated national and international reference centers for vector-borne viral and bacterial diseases.

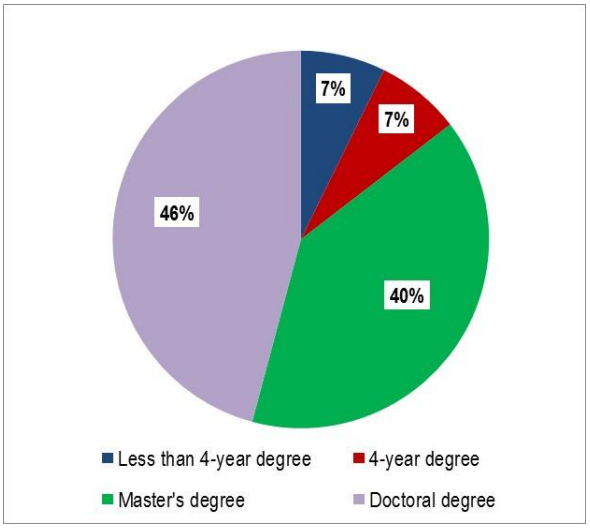
Funding

The CDC-DVBD receives funding primarily from the Department of Health and Human Services, but the CDC-DVBD provides additional services to other agencies as reimbursable activities (e.g., the Department of Defense).

Employment and Occupations

The CDC-DVBD employed 101 full-time workers earning average salaries of $79,590, excluding benefits, in FY 2012. The facility also employed 10 work-study students and 67 contractors. Examining job titles at the CDC, it is estimated that occupations are comprised of 64% scientific functions (e.g., research biologist, mathematical statistician, research entomologist) and 36% administrative and business support functions (e.g., administrative officer, management analyst, senior public health advisor).

FIGURE 7: CDC-DVBD EMPLOYEE EDUCATION

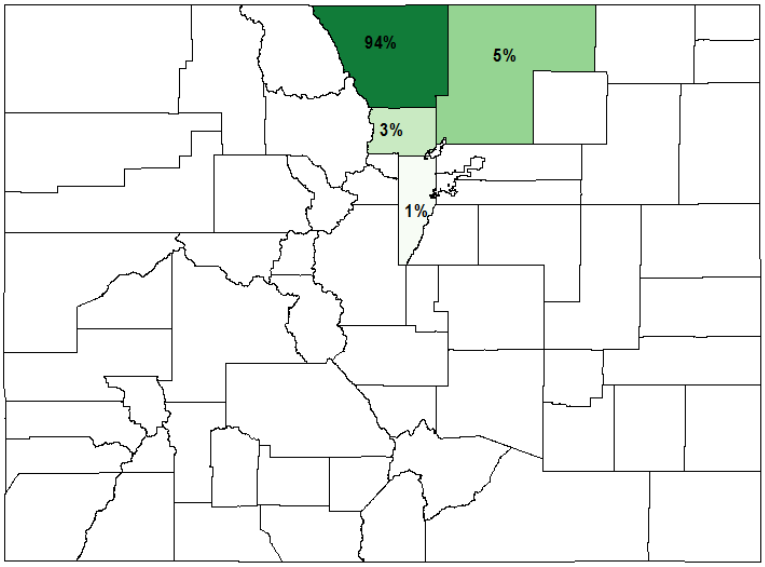


Education

The workforce of the Centers for Disease Control, Division of Vector-Borne Diseases was comprised of approximately 46% employees who have a doctorate and another 40% who have a master's degree. Individuals with a four-year degree and those with less than a four-year degree each accounted for 7% of the total workforce.

Educational attainment represents the highest degree earned. The educational attainment of the lab's workforce exceeds that of Larimer County, the lab's home county, and the state as a whole. At the CDC-DVBD, 86% of the employees hold a graduate or professional degree, compared to about 16% of Larimer County workers and roughly 13% of all Colorado workers. The proportion of the Larimer County population with a bachelor's degree as the highest degree earned was 27% and for the state it was 23%.

FIGURE 8: CDC-DVBD EMPLOYEE LABOR SHED



Located in Fort Collins, Colorado, most Centers for Disease Control, Division of Vector-Borne Diseases employees (91%) live in Larimer County, with another 8% commuting from directly adjacent Weld and Boulder counties. Nearly 98% of employees reside in Colorado's 2nd Congressional District.

Construction

The CDC-DVBD specified construction expenditures of $1.8 million in FY 2012.

Economic Impact

The economic impact of the CDC-DVBD on the state of Colorado was measured by examining various expenditure data on operations, construction, and employees, as well as their multiplier effects. In FY 2012, the CDC-DVBD contributed $54 million to the state economy and supported direct and indirect employment of 399 workers.

TABLE 14: CDC-DVBD, ECONOMIC AND FISCAL IMPACTS, FY 2011–FY 2012

Summary of Impacts	FY2011	FY2012
Operations		
Output (Millions)	$50.8	$50.6
Value Added (Millions)	$35.8	$35.8
Employment	371	371
Construction		
Output (Millions)	$0.0	$3.4
Value Added (Millions)	$0.0	$1.9
Employment	-	28
Total		
Output (Millions)	$50.8	$54.0
Value Added (Millions)	$35.8	$37.7
Employment	371	399

Note: FY 2013 data not available from the CDC-DVDB.

Intangible Benefits

Federal labs offer intangible and societal benefits that range from tech transfer and education to the impacts of employees on their communities. Among these, the CDC-DVBD described contributions by employees to the Combined Federal Campaign.

Cooperative Institute for Research in the Atmosphere (CIRA)
Colorado State University
CSU 1375 Campus Delivery
Fort Collins, CO 80523
www.cira.colostate.edu/

The Cooperative Institute for Research in the Atmosphere (CIRA) is a cooperative institute between NOAA and Colorado State University, similar in structure to that between CIRES and the University of Colorado.

CIRA conducts research concentrated in areas involving:

- Satellite Algorithm Development, Training and Education
- Regional to Global-scale Modeling Systems
- Data Assimilation
- Climate and Weather Processes
- Data Distribution
- Education/Outreach
- Societal and Economic Impact Studies

The vision of CIRA is to conduct interdisciplinary research in the atmospheric sciences by entraining skills beyond the meteorological disciplines; exploiting advances in engineering and computer science; facilitating transitional activity between pure and applied research; leveraging both national and international resources and partnerships; and assisting NOAA, Colorado State University, the State of Colorado, and the nation through the application of its research to areas of societal benefit. In addition to the relationship with NOAA, the National Park Service works with CIRA on air quality and visibility research, and NASA and the Department of Defense are also active sponsors. The Institute provides an interdisciplinary forum for research collaboration among university scientists, postdocs, staff, students, and several NOAA laboratories.

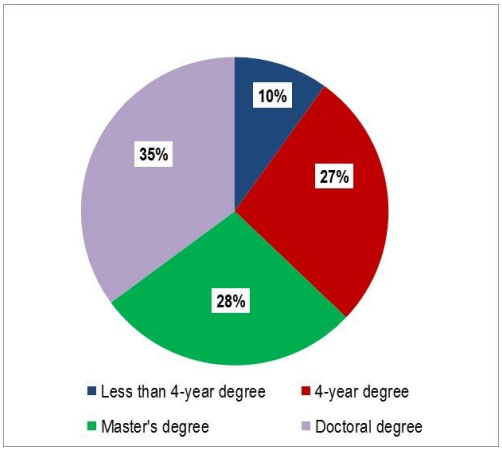
Funding

CIRA's budget totaled $17.1 million in FY 2011, growing to $17.3 million in FY 2012, and an estimated $18 million in FY 2013. CIRA receives the largest part of its funding from the Department of Commerce (73.7%), the National Science Foundation (9.6%), and the Department of the Interior (6.1%).

Employment and Occupations

CIRA employed 126 full-time workers in FY 2012. Average salary and benefits paid to these workers totaled $104,982. CIRA had 17 part-time workers averaging $20,447 in compensation and 4 student workers. Examining job titles at CIRA, it is estimated that CIRA occupations are comprised of 85% scientific functions (e.g., research scientist, research associate, postdoctoral fellow) and 15% administrative and business support functions (e.g., assistant director, associate manager, administrative officer).

FIGURE 9: CIRA EMPLOYEE EDUCATION

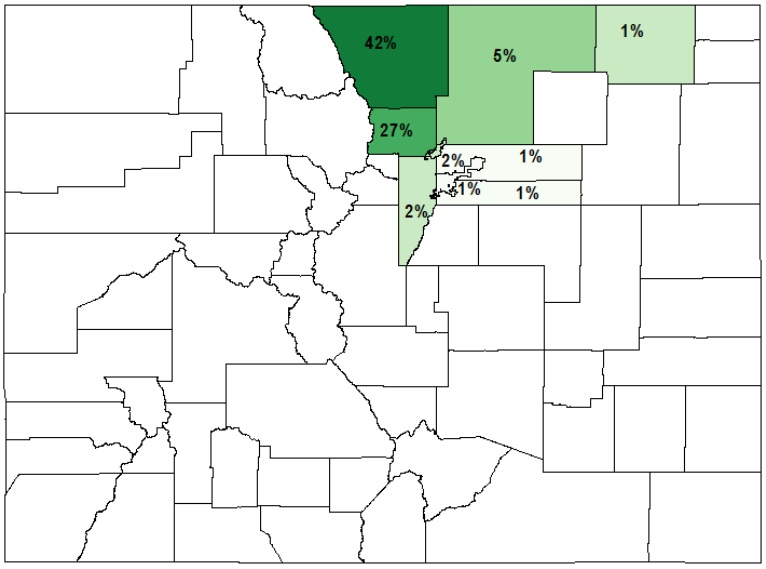


Education

In FY 2012, more than one-third of CIRA employees had a doctorate and another 28% had a master's degree. Twenty-seven percent had a four-year degree, while the remaining 10% did not have a four-year degree.

Educational attainment represents the highest degree earned. The educational attainment of the CIRA workforce exceeds that of Larimer County, the lab's home county, and the state as a whole. At CIRA, 63% of the employees hold a graduate or professional degree, compared to about 16% of Larimer County workers and roughly 13% of all Colorado workers. The proportion of the Larimer County population with a bachelor's degree as the highest degree earned was 27% and for the state it was 23%.

FIGURE 10: CIRA EMPLOYEE LABOR SHED



Located in Fort Collins, Colorado, 42% of Cooperative Institute for Research in the Atmosphere employees live in Larimer County, with another 32% commuting from directly adjacent Weld and Boulder counties. More than 75% of employees reside in Colorado's 2nd Congressional District.

Economic Impact

The economic impact of CIRA on the state of Colorado was measured by examining various expenditure data on operations and employees, as well as their multiplier effects. In FY 2012, CIRA contributed $28.6 million to the state economy and supported direct and indirect employment of 244 workers.[6]

[6]Given the interconnectedness of NOAA, CIRES, and CIRA funding, some workers are dually counted as NOAA employees and CIRES/CIRA employees. To account for the overlap, the aggregated statewide and county summaries removed the duplication.

TABLE 15: CIRA, ECONOMIC AND FISCAL IMPACTS, FY 2011–FY 2013

Summary of Impacts	FY2011	FY2012	FY2013*
Operations			
Output (Millions)	$27.8	$28.6	$30.5
Value Added (Millions)	$21.5	$22.1	$23.6
Employment	244	244	261
Construction			
Output (Millions)	$0.0	$0.0	$0.0
Value Added (Millions)	$0.0	$0.0	$0.0
Employment	-	-	-
Total			
Output (Millions)	$27.8	$28.6	$30.5
Value Added (Millions)	$21.5	$22.1	$23.6
Employment	244	244	261

*Estimated based on fiscal year-end projections.

Intangible Benefits

CIRA offers student fellowships to two students every other year to be advised jointly by Atmospheric Science faculty and CIRA research personnel.

CIRA has been widely recognized and honored for its work. CIRA Director, Dr. Christian Kummerow, is a Fellow of the American Meteorological Society and Director Emeritus Thomas H. Vonder Haar is a member of the National Academy of Engineering.

CIRA has an active education and outreach effort, including researchers giving Soaring Eagle Ecology Center talks and participating in the CSU Little Shop of Physics. CIRA is also part of the Community Collaborative Rain, Hail and Snow network (CoCoRaHS) that measures and maps precipitation. Each Poudre School District school that has a rain gauge and reports to CoCoRaHS has the opportunity to select two students to work with professionals in producing their monthly precipitation report.

CIRA researchers prepare and conduct activities for an after-school weather club at an elementary school in Fort Collins. The lab is also taking the lead in assisting the district with several weather-, climate-, and renewable energy-related programs. Additionally, researchers are involved with the Renewable Energy Institute.

Cooperative Institute for Research in Environmental Sciences (CIRES)
University of Colorado Boulder
CIRES Building, Room 318
Boulder, CO 80309-0216
http://cires.colorado.edu/

At the Cooperative Institute for Research in Environmental Sciences (CIRES), hundreds of environmental scientists conduct innovative research that advances our understanding of the global, regional, and local environments, and the human relationship with those environments, for the benefit of society.

CIRES is a joint institute of NOAA and the University of Colorado Boulder. The Institute, NOAA's oldest and CU-Boulder's largest, was founded in 1967 and has become a global leader in environmental science and teaching. In collaboration with researchers around the world, CIRES scientists conduct research in disciplines that include environmental chemistry and biology, atmospheric and climate dynamics, cryospheric and polar processes, and dynamics of the Earth's crust. Research topics range from glacial melting and rising sea levels to hurricane forecasting. CIRES supports four research centers: (1) the Center for Limnology, which studies inland aquatic ecosystems, such as lakes, streams, and wetlands; (2) the Center for Science and Technology Policy Research, which analyzes the relationship between scientific and technological advances and formation of public policy; (3) the Earth Science and Observation Center, which is dedicated to the understanding of the Earth System through the use of satellite and airborne remote sensing techniques; and (4) the National Snow and Ice Data Center, which manages and collects data that support analysis of the Earth system. As a research unit of University of Colorado, CIRES brings together government and university researchers and students from 11 university departments and the NOAA laboratories in Boulder.

CIRES provides the tools, interdisciplinary environment, collaboration environment, and leadership to conduct research and education that improves our understanding of the Earth system. CIRES is also dedicated to communicating scientific findings to the global research community, to decision makers, and to the public.

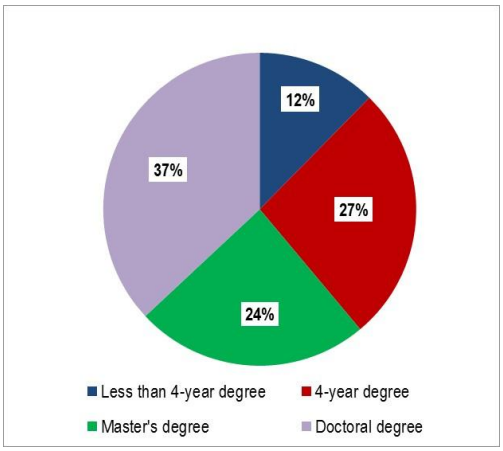
Funding

The CIRES budget totaled $58.7 million in FY 2011, growing to $66.7 million in FY 2012, and an estimated $69.5 million in FY 2013. CIRES receives the largest portion of its funding from the National Oceanic and Atmospheric Administration (NOAA), which is part of the Department of Commerce (47.4%), the National Aeronautics and Space Administration (16%), and the National Science Foundation (8.9%).

Employment and Occupations

CIRES employed 400 full-time workers in FY 2012. Average salary and benefits paid to these workers totaled $101,585. CIRES had 107 part-time workers averaging $58,550 in compensation and 117 student workers with earnings just under $20,000. Examining job titles at CIRES, nearly 76% of workers are research associates and professional research assistants.

FIGURE 11: CIRES EMPLOYEE EDUCATION

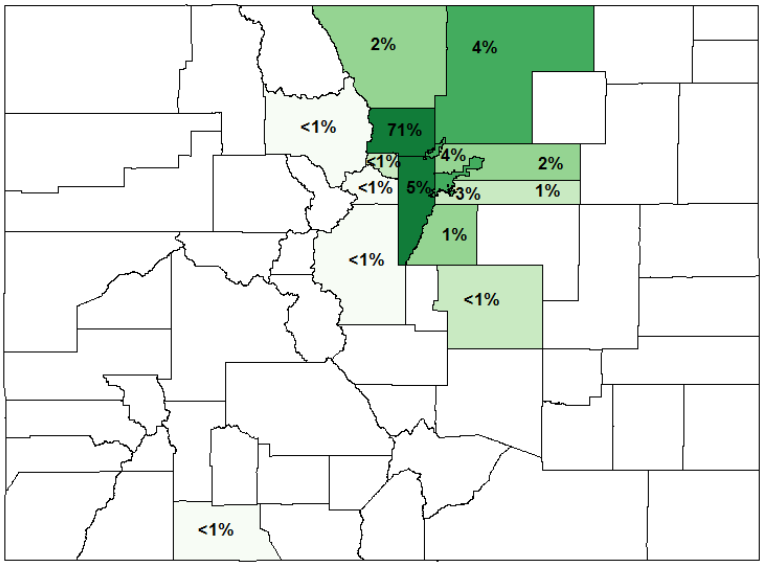


Education

In FY 2012, more than one-third (37%) of the CIRES workforce had a doctorate. Approximately one-quarter (24%) had a master's degree, and 27% had a four-year degree. The remaining workers (12%) had less than a four-year degree.

Educational attainment represents the highest degree earned. Educational attainment of the CIRES workforce exceeds that of Boulder, the lab's home county, and the state as a whole. At CIRES, 61% of the employees hold a graduate or professional degree, compared to almost 26% of Boulder workers and roughly 13% of all Colorado workers. The proportion of the Boulder County population with a bachelor's degree as the highest degree earned was 33% and for the state it was 23%.

FIGURE 12: CIRES EMPLOYEE LABOR SHED



Located in Boulder, Colorado, most Cooperative Institute for Research in Environmental Sciences employees (71%) live in Boulder County, with another 16% commuting from directly adjacent counties. More than 83% of employees reside in Colorado's 2nd Congressional District.

Construction

In FY 2011, CIRES built the NSF-funded Green Data Center at its National Snow and Ice Data Center with an innovative redesign that slashed energy consumption for data center cooling by more than 90% and won the Colorado 2011 Governor's Award for High-Impact Research. FY 2011 construction expenditures were estimated at $584,000, and FY 2012 expenditures were $71,000.

Economic Impact

The economic impact of CIRES on the state of Colorado was measured by examining various expenditure data on operations, construction, and employees, as well as their multiplier effects. In FY 2012, CIRES

contributed $111.8 million to the state economy and supported direct and indirect employment of 996 workers.[7]

TABLE 16: CIRES, ECONOMIC AND FISCAL IMPACTS, FY 2011–FY 2013

Summary of Impacts	FY2011	FY2012	FY2013*
Operations			
Output (Millions)	$110.3	$111.7	$117.2
Value Added (Millions)	$87.7	$89.0	$92.8
Employment	1,006	994	1,017
Construction			
Output (Millions)	$1.1	$0.2	$0.1
Value Added (Millions)	$0.6	$0.1	$0.1
Employment	10	2	1
Total			
Output (Millions)	$111.5	$111.8	$117.4
Value Added (Millions)	$88.4	$89.1	$92.9
Employment	1,015	996	1,018

*Estimated based on fiscal year-end projections.

Intangible Benefits

CIRES partners with dozens of other scientific institutions around the world, many of them in Colorado, and also fosters relationships with for-profit institutions in the state and beyond. The institute encourages technology transfer, and for years, CIRES scientists have been involved in research resulting in patents, spin-off companies, and product lines.

For example, CIRES Fellow and former Director Robert Sievers is CEO and President of Aktiv-Dry, LLC, which produces stable, fine dry powders for use in vaccine, pharmaceutical, and other biotechnology industries. The company is part of a global team awarded nearly $20 million by the National Institutes of Health to support development of an inhalable aerosol measles vaccine.

CIRES scientists also helped develop the now-patented and deployed snow-level radars, critical for determining the rain-snow line in areas such as the Sierra Mountains. The altitude of that line can mean the difference between life-threatening floods and long-term water storage in snowpack. CIRES scientists helped in the development of wind profiling radars now commercialized by Scintec of Germany.

CIRES's intangible impacts also include improving the environmental literacy of the public, from school-age students to seniors. In Colorado, the institute regularly hosts free public workshops, seminars, and panel conversations with renowned scientists and communicators. During one, James Balog, the subject of the award-winning 2012 documentary film *Chasing Ice*, discussed his stunning glacial photography and other artistic work to communicate climate change. In another, former and current presidential science advisors talked about their work inside the White House, linking science and policy. Earth

[7]Given the interconnectedness of NOAA, CIRES, and CIRA funding, some workers are dually counted as NOAA employees and CIRES/CIRA employees. To account for the overlap, the aggregated statewide and county summaries removed the duplication.

Explorers, a local video production program that targets students from groups underrepresented in the sciences, profiles CIRES scientists most years, with the voluntary assistance of CIRES communicators.

Beyond Colorado, CIRES improves the visibility of Earth system science—and Colorado's role in studying it—through high-profile media coverage of its science and scientists. CIRES Fellows and other scientists have won or shared in prizes that include the 2007 Nobel Peace Prize (as members of the IPCC climate report team); the Volvo Environment Prize; the French Grande Medaille; the Blue Planet Prize; the Partners in Conservation Award from the Department of Interior; and the Colorado Governor's Impact Award. CIRES Director Waleed Abdalati served for two years as NASA's chief scientist.

Finally, CIRES offers a variety of development opportunities for staff and collaborators that reach far into the Colorado community. These include graduate research fellowships for promising Ph.D. students; a robust Visiting Fellows program that draws in scientists from around the world for productive collaborations; and an Innovative Research Program, which encourages novel, unconventional, or fundamental research that might otherwise be difficult to fund.

Department of the Interior North Central Climate Science Center (NC CSC)
Colorado State University – Fort Collins
1476 Campus Delivery
Fort Collins, CO 80523-1476
www.doi.gov/csc/northcentral/index.cfm

Established in 2011 and officially opened in October 2012, the North Central Climate Science Center (NC CSC) is part of a network of eight climate science centers (CSCs) created by the Department of the Interior to provide scientific information, tools, and techniques that managers and other parties interested in land, water, wildlife, and cultural resources can use to anticipate, monitor, and adapt to climate change. The NC CSC is hosted by a consortium of nine institutions: Colorado State University - Fort Collins, University of Colorado, Colorado School of Mines, University of Nebraska - Lincoln, Montana State University, University of Wyoming, University of Montana, Kansas State University, and Iowa State University. In addition to the host institutions, the NC CSC also includes partner institutions, which provide expertise in climate science, ecology, impacts assessment, modeling, urban environments, and advanced information technology.

The NC CSC is focusing on three foundational science areas: (1) Regional Extreme Climate Events: Gaining Understanding Through Past and Present Observations and Modeling; (2) Vulnerability Assessment of Ecological Systems and Species to Climate and Land Use Change within the North Central Climate Science Center and Partner Landscape Conservation Cooperatives; and (3) Adaptive Capacity and Decision Making Framework.

Since the North Central Climate Science Center opened in late 2012, it did not provide data for this study; thus, facility economic impacts were not estimated.

Federal Railroad Administration Transportation Technology Center (TTC)
55500 DOT Road
PO Box 11130
Pueblo, CO 81001
http://www.fra.dot.gov/Page/P0153

The Federal Railroad Administration's (FRA) Transportation Technology Center (TTC) sits on 52 square miles of land in Pueblo, Colorado. Since its dedication as the High Speed Ground Test Center in 1971, it has played an important part in the research, development, and testing of rail infrastructure and equipment. There are approximately 50 miles of test track at TTC. The short High Tonnage Loop is used primarily to test track components under heavy axle load freight cars, while the 13.5-mile Railroad Test Track is used for high-speed testing up to 165 mph. The Transit Test Track is equipped with third rail electrification and a maximum speed of 90 mph, and various other test tracks are used to evaluate vehicle performance over a range of extreme track conditions. The Security and Emergency Response Training Center at TTC has also been training first responders to handle hazardous materials accidents. Recently, the Transportation Security Administration created the Surface Technology Security Training Center at TTC as well, providing training to Department of Homeland Security inspectors and other federal, state and local security partners. TTC is managed under a unique Care, Custody, and Control contract with Transportation Technology Center, Inc. (TTCI). TTCI is a subsidiary of the Association of American Railroads (AAR) and serves member railroads through the AAR's technology research program.

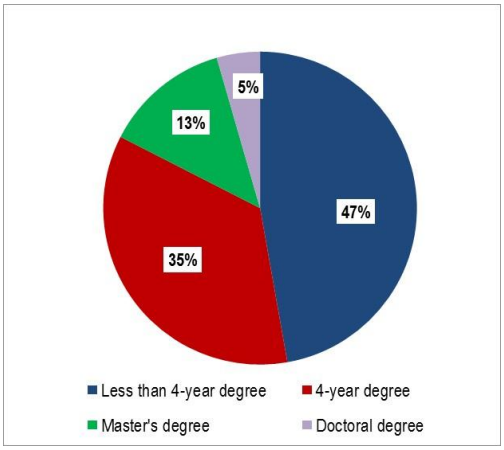
Funding

The TTC provided data on government funding and expenditures. The TTC reported a budget of $15.3 million in government funding in FY 2011, increasing to $16.3 million in FY 2012, but falling to $14.4 million in FY 2013—a decline of 12%. The largest part of TTC government funding is from the Department of Transportation (87.2%) and the Department of Homeland Security (10.4%).

Employment and Occupations

The TTC employed 66 full-time workers in FY 2012. Average salary and benefits paid to these workers totaled $112,121. The TTC also reported 3 part-time workers in FY 2012, as well as 3 student workers. Examining job titles at the TTC, it is estimated that TTC occupations are comprised of 70% scientific functions (e.g., locomotive electrician, senior trackman) and 30% administrative and business support functions (e.g., accounting clerk, marketing assistant).

FIGURE 13: TTC EMPLOYEE EDUCATION

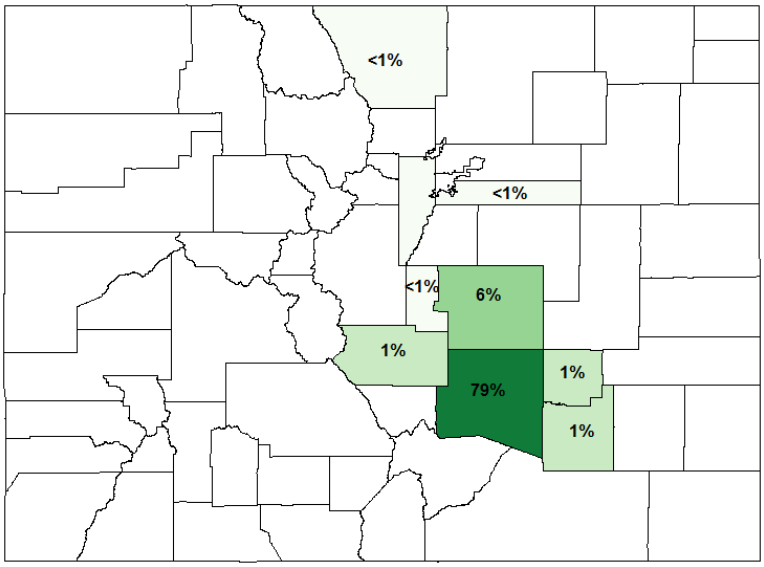


Education

In FY 2012, nearly half of TTC employees (47%) had less than a four-year degree and another 35% had a four-year degree. Those individuals with master's degrees accounted for 13% of the workforce, and those with doctorates accounted for the remaining 5%.

Educational attainment represents the highest degree earned. The educational attainment of the TTC workforce exceeds that of Pueblo County, the lab's home county, and the state as a whole. At the TTC, 18% of the employees hold a graduate or professional degree, compared to roughly 8% of Pueblo County workers and nearly 13% of all Colorado workers. The proportion of the Pueblo County population with a bachelor's degree as the highest degree earned was 15% and for the state it was 23%.

FIGURE 14: TTC EMPLOYEE LABOR SHED



Located in Pueblo, Colorado, most TTC employees (79%) live in Pueblo County, with another 9% commuting from directly adjacent counties (Crowley, El Paso, Fremont, and Otero). More than 79% of employees reside in Colorado's 2nd Congressional District and 7% in Colorado's 5th Congressional District.

Economic Impact

The economic impact of TTC on the state of Colorado was measured by examining various expenditure data on operations, construction, and employees, as well as their multiplier effects. In FY 2012, the government-funded portion of the TTC contributed $28.4 million to the state economy and supported direct and indirect employment of 183 workers. It should be noted that the TTC is operated for the Department of Transportation under a Care, Custody and Control Contract by Transportation Technology Center, Inc. (TTCI), a wholly owned for-profit subsidiary of the Association of American Railroads. TTCI conducts commercial research, testing, training, and consulting at TTC in addition to the government funding detailed above. Total site revenue, employment, and costs are three to four times that shown above. Detailed TTCI proprietary commercial data have been withheld.

TABLE 17: TTC, ECONOMIC AND FISCAL IMPACTS, FY 2011–FY 2013

Summary of Impacts	FY2011	FY2012	FY2013*
Operations			
Output (Millions)	$22.2	$28.4	$27.8
Value Added (Millions)	$12.9	$17.7	$17.8
Employment	154	183	195
Construction			
Output (Millions)	$0.0	$0.0	$3.8
Value Added (Millions)	$0.0	$0.0	$2.1
Employment	-	-	31
Total			
Output (Millions)	$22.2	$28.4	$31.6
Value Added (Millions)	$12.9	$17.7	$19.9
Employment	154	183	226

*Estimated based on fiscal year-end projections.

Intangible Benefits

Among TTC's licensed technologies are: the Automated Train Inspection System, the Integrated Railway Information System, 8 to 10 specialized software programs for simulating train/vehicle performance, and the Trackside Acoustic Bearing Detection System.

The laboratory has a charitable contribution line item in its annual budget. Employees also participate in the United Way. Additionally, researchers make presentations to local university classes.

TTC researchers have been awarded numerous honors, including the UIC Global Rail Research & Innovation Award, the RTA Award of Merit, the ASNT Fellow Award, and the ASCE 2013 Pankow Award for Innovation.

JILA
A partnership between NIST and University of Colorado Boulder
440 UCB
Boulder, CO 80309-0440
http://jila.colorado.edu/

JILA is a joint institute of the University of Colorado Boulder and the National Institute of Standards and Technology. It supports an eclectic and innovative research program that fosters creative collaborations among the institute's scientists. The wide-ranging interests of the scientists have made JILA one of the nation's leading research institutes in the physical sciences. Research topics range from the small, frigid world governed by the laws of quantum mechanics through the physics of biological and chemical systems to the processes that shape the stars and galaxies. JILA science encompasses seven broad categories: astrophysics, atomic and molecular physics, biophysics, chemical physics, nanoscience, optical physics, and precision measurement.

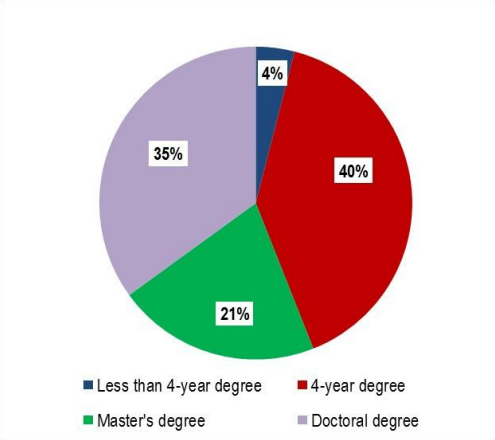
Funding

JILA's budget totaled $24.3 million in FY 2011, growing to $26.1 million in FY 2012 and an estimated $26.3 million in FY 2013. JILA receives the largest part of its funding from the Department of Commerce (39%), the Department of Defense (15%), and the National Science Foundation (17%).

Employment and Occupations

JILA employed 303 full-time workers in FY 2012. Average salary and benefits paid to these workers totaled $49,850. JILA had 16 part-time workers averaging $8,415 in compensation and 76 student workers. Examining job titles at JILA, it is estimated that JILA occupations are comprised of 84% scientific functions (e.g., senior research associate, fellow adjoint) and 16% administrative and business support functions (e.g., supply/procurement, chief of operations, award administration).

FIGURE 15: JILA EMPLOYEE EDUCATION



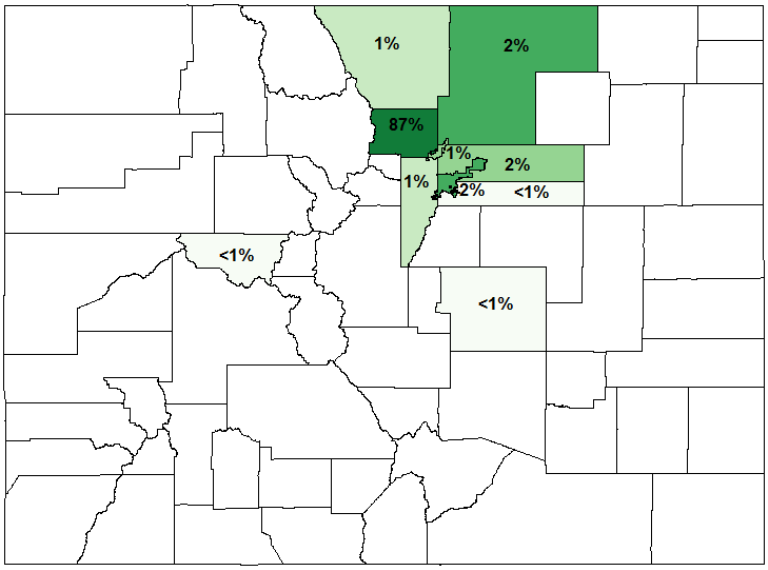
Education

According to data from FY 2007, 40% of JILA employees had a four-year degree and 35% had a doctorate. Just under one-quarter had earned a master's degree, and only 4% of the workforce did not have a four-year degree.

Educational attainment represents the highest degree earned. The educational attainment of the JILA workforce exceeds that of Boulder, the lab's home county, and the state as a whole. At JILA, 56% of the employees hold a graduate or professional degree, compared to almost 26% of Boulder workers and roughly 13% of all Colorado workers. The proportion of the Boulder County population with a bachelor's degree as the highest degree earned was 33% and for the state it was 23%.

FIGURE 16: JILA EMPLOYEE LABOR SHED

Located in Boulder, Colorado, most JILA employees (87%) live in Boulder County, with another 5% commuting from directly adjacent counties. More than 91% of employees reside in Colorado's 2nd Congressional District.



Economic Impact

The economic impact of JILA on the state of Colorado was measured by examining various expenditure data on operations, construction, and employees, as well as their multiplier effects. In FY 2012, JILA contributed $51.8 million to the state economy and supported direct and indirect employment of 581 workers.[8]

TABLE 18: JILA, ECONOMIC AND FISCAL IMPACTS, FY 2011–FY 2013

Summary of Impacts	FY2011	FY2012	FY2013*
Operations			
Output (Millions)	$45.7	$46.7	$40.1
Value Added (Millions)	$32.1	$33.5	$30.2
Employment	529	543	506
Construction			
Output (Millions)	$5.0	$5.1	$6.1
Value Added (Millions)	$3.0	$3.0	$3.7
Employment	39	38	45
Total			
Output (Millions)	$50.7	$51.8	$46.2
Value Added (Millions)	$35.1	$36.5	$33.9
Employment	567	581	551

*Estimated based on fiscal year-end projections.

[8]Given the interconnectedness of NIST and JILA funding, some workers are dually counted as NIST employees and JILA employees. To account for the overlap, the aggregated statewide and county summaries removed the duplication.

Intangible Benefits

Several private business use JILA's clean room and the Keck Metrology Lab. Additionally, JILA participates in a variety of research projects that includes subcontracts to private businesses. The lab currently has at least two Small Business Technology Transfer (STTR) projects.

Several firms have been formed as spinoffs from JILA research, including BiOptix (formerly AlphaSniffer), ColdQuanta, High Precision Devices, KM Labs, Micro-g-Lacoste, Precision Photonics, Stable Laser Systems (formerly Hall Stable Lasers), Vescent Photonics, Winters Electro-Optics, and Beam Imaging.

JILA conducts tours and supports an outreach program for area schools that involves tutoring and mentoring students who are interested in the sciences. Fellow Jan Hall (Nobel Laureate) regularly offers a program to elementary schools. Fellow David Nesbitt coordinates the CU Wizards program, which presents free monthly shows that entertain and inform children about the wonders of science.

Graduate students and postdoctoral fellows at JILA receive unique training in science and technology making them very valuable to other Boulder County employers paying good salaries for skilled professional positions. For example, more than 100 people who were trained as graduate students or postdocs at JILA currently work as scientists at the National Institute of Standards and Technology (NIST) in Boulder, performing cutting-edge research and measurements to support U.S. innovation. The average salary of such scientists at NIST is more than $100,000 per year. The majority of NIST scientists live in Boulder County, significantly contributing to the local economy. JILA-trained scientists also work in many Boulder County high-technology companies.

Aside from the large number of graduate student workers currently furthering their education, the lab promotes continuing professional development. It has a state-recognized apprenticeship program in its instrument shop.

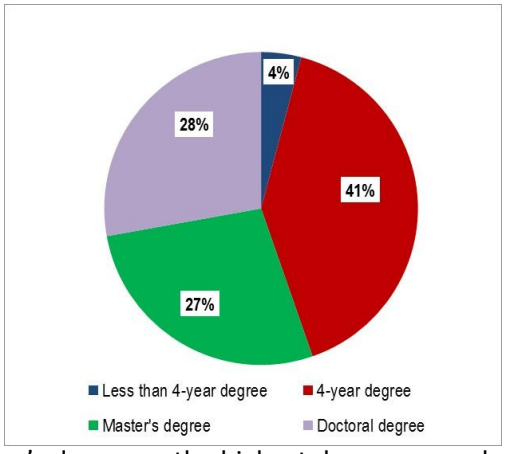
Laboratory for Atmospheric and Space Physics (LASP)
Laboratory for Atmospheric and Space Physics at University of Colorado
1234 Innovation Drive
Boulder, CO 80303
http://lasp.colorado.edu/

LASP is a research institute within the University of Colorado whose primary focus is in four major groups: solar influences, planetary physics, atmospheric science, and space physics. LASP is one of only a handful of institutions capable of implementing entire space missions, including design, fabrication, and operations of both individual instruments as well as entire spacecraft. CU students have made very significant contributions to most of these accomplishments. The areas of emphasis include UV and EUV observations of planetary atmospheres, monitoring the Sun and solar corona, observations of planetary rings, and development of UV and EUV instrumentation.

Employment and Occupations

LASP employed 342 full-time workers in FY 2012. Average salary and benefits paid to these workers totaled $118,521. Additionally, LASP employed 127 student workers earning $22,400 on average. Examining job titles at LASP, it is estimated that LASP occupations are comprised of 88% scientific functions (e.g., engineer, scientist) and 12% administrative and business support functions.

FIGURE 17: LASP EMPLOYEE EDUCATION



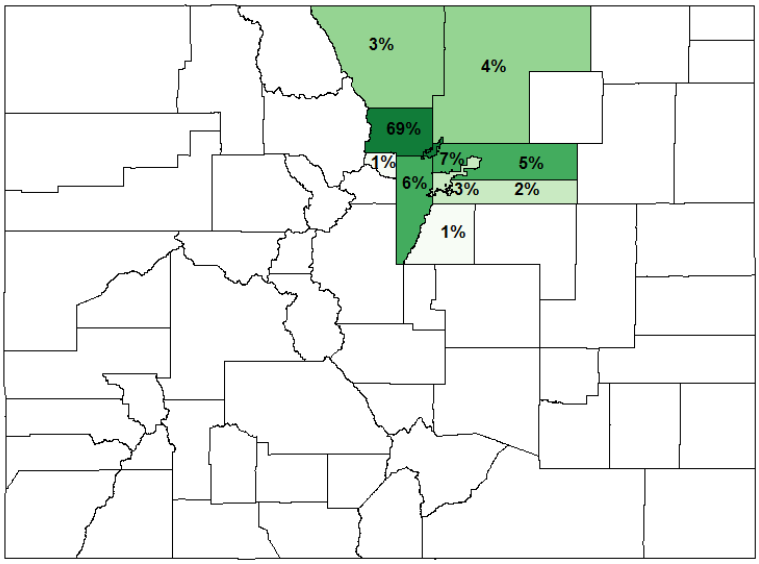
Education

In FY 2012, a total of 41% of LASP workforce had a four-year degree and another 28% had earned a doctoral degree. Twenty-seven percent had a master's degree, whereas 4% did not have a four-year degree.

Educational attainment represents the highest degree earned. The educational attainment of the LASP workforce exceeds that of Boulder, the lab's home county, and the state as a whole. At LASP, 55% of the employees hold a graduate or professional degree, compared to almost 26% of Boulder workers and roughly 13% of all Colorado workers. The proportion of the Boulder County population with a bachelor's degree as the highest degree earned was 33% and for the state it was 23%.

FIGURE 18: LASP EMPLOYEE LABOR SHED

Located in Boulder, Colorado, most of LASP's employees (69%) live in Boulder County, with another 20% commuting from directly adjacent counties. More than 85% of employees reside in Colorado's 2nd Congressional District and 5% each in Colorado's 1st and 4th Congressional Districts.



Economic Impact

The economic impact of LASP on the state of Colorado was measured by examining various expenditure data on operations, construction, and employees, as well as their multiplier effects. In FY 2012, LASP contributed $159.3 million to the state economy and supported direct and indirect employment of 1,183 workers.

TABLE 19: LASP, ECONOMIC AND FISCAL IMPACTS, FY 2011–FY 2013

Summary of Impacts	FY2011	FY2012	FY2013*
Operations			
Output (Millions)	$59.4	$159.3	$138.9
Value Added (Millions)	$35.9	$112.6	$101.1
Employment	456	1,183	1,012
Construction			
Output (Millions)	$0.0	$0.0	$0.0
Value Added (Millions)	$0.0	$0.0	$0.0
Employment	-	-	-
Total			
Output (Millions)	$59.4	$159.3	$138.9
Value Added (Millions)	$35.9	$112.6	$101.1
Employment	456	1,183	1,012

*Estimated based on fiscal year-end projections.

Intangible Benefits

LASP is active in the local community. In 2011 and 2012, tours were offered to more than 1,700 individuals. Over 500 students participated in class presentations by LASP researchers, and 385 teachers were trained during outreach events.

LASP employees have been the recipients of several awards, including lectureships, the NASA Group Achievement Award, fellowships, and endowed chairs.

National Ecological Observatory Network (NEON)
1685 38th Street, Suite 100
Boulder, CO 80301
www.neoninc.org

The National Ecological Observatory Network (NEON) is a continental-scale observatory designed to gather and provide 30 years of ecological data on the impacts of climate change, land use change, and invasive species on natural resources and biodiversity. NEON is a project of the National Science Foundation, with many other U.S. agencies and nongovernmental organizations cooperating.

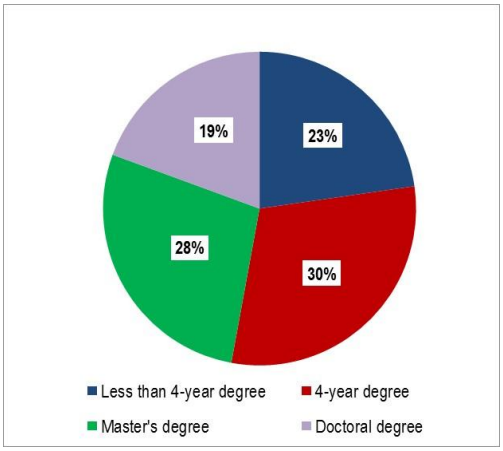
Funding

NEON reported a budget of $28.3 million in FY 2011, increasing to $39.8 million in FY 2012 (a budget estimate for FY 2013 was not provided). NEON is solely funded by the National Science Foundation.

Employment and Occupations

NEON employed 182 full-time workers in FY 2012. Average salary and benefits paid to these workers totaled $88,235. Examining job titles at NEON, it is estimated that NEON occupations are comprised of 58% scientific functions (e.g., senior science technician, test engineer) and 42% administrative and business support functions (e.g., chief financial officer, accountant).

FIGURE 19: NEON EMPLOYEE EDUCATION

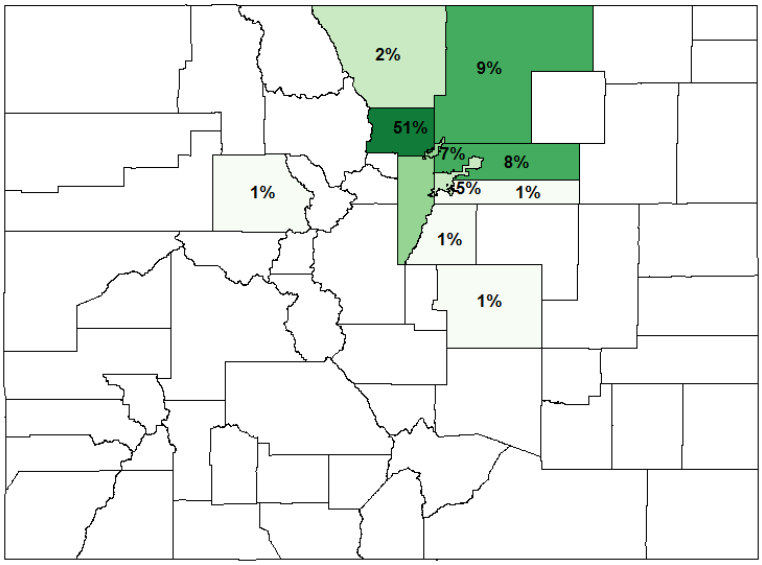


Education

The composition of NEON's employment by level of education was fairly diversified in FY 2012. Nineteen percent of workers had a doctorate as their highest level of education and 28% had a master's degree. Nearly one-third of workers had a four-year degree, while 23% had less than a four-year degree.

Educational attainment represents the highest degree earned. The educational attainment of the NEON workforce exceeds that of Boulder, the lab's home county, and the state as a whole. At NEON, 47% of the employees hold a graduate or professional degree, compared to almost 26% of Boulder workers and roughly 13% of all Colorado workers. The proportion of the Boulder County population with a bachelor's degree as the highest degree earned was 33% and for the state it was 23%.

FIGURE 20: NEON EMPLOYEE LABOR SHED



Located in Boulder, Colorado, the majority of NEON's employees (51%) live in Boulder County, with another 18% commuting from directly adjacent counties. More than 69% of employees reside in Colorado's 2nd Congressional District.

Economic Impact

The economic impact of NEON on the state of Colorado was measured by examining various expenditure data on operations, construction, and employees, as well as their multiplier effects. In FY 2012, NEON contributed $44.4 million to the state economy and supported direct and indirect employment of 389 workers.

TABLE 20: NEON, ECONOMIC AND FISCAL IMPACTS, FY 2011–FY 2013

Summary of Impacts	FY2011	FY2012	FY2013*
Operations			
Output (Millions)	$35.1	$44.4	$47.7
Value Added (Millions)	$26.8	$33.9	$33.4
Employment	298	389	508
Construction			
Output (Millions)	$0.0	$0.0	$0.0
Value Added (Millions)	$0.0	$0.0	$0.0
Employment	-	-	-
Total			
Output (Millions)	$35.1	$44.4	$47.7
Value Added (Millions)	$26.8	$33.9	$33.4
Employment	298	389	508

*Estimated based on fiscal year-end projections.

Intangible Benefits

While federal labs offer intangible and societal benefits that range from tech transfer and education to the impacts of employees on their communities, NEON did not provide specific examples of intangible benefits for this 2013 study.

National Institute of Standards and Technology (NIST)
National Institute for Standards and Technology, Boulder Labs
Department of Commerce
325 Broadway
Boulder, CO 80305
www.nist.gov

The National Institute of Standards and Technology (NIST), founded in 1901, is a nonregulatory agency within the U.S. Department of Commerce. NIST's mission is to promote U.S. innovation and industrial competitiveness by advancing measurement science, standards, and technology in ways that enhance economic security and improve our quality of life. The agency has a 100-plus-year track record of serving U.S. industry, science, and the public with a mission and approach unlike any other agency of government. Two principal research installations are operated by NIST—the headquarters facility in Gaithersburg, Maryland, and NIST Boulder in Boulder, Colorado, which was dedicated in 1954.

The laboratories conduct world-class measurement science research, often in close collaboration with industry, in a wide range of areas, including time and frequency metrology, electromagnetics, optoelectronics and photonics, quantum information, advanced communications, advanced chemical and materials properties, and atomic physics. NIST Boulder maintains unique facilities and capabilities for microfabrication, in particular superconducting electronics and microelectromechanical systems. NIST also participates in a joint institute, JILA, with the University of Colorado Boulder. JILA has become one of the nation's leading research institutes in atomic, molecular, and optical physics.

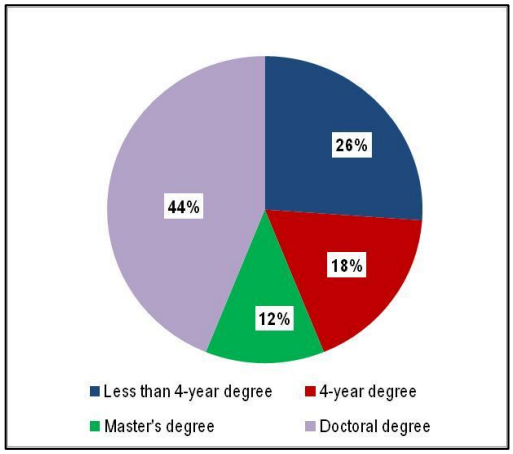
Funding

NIST Boulder reported a budget of $150.6 million in funding in FY 2011, decreasing to $115.4 million in FY 2012. These figures include construction activities. The estimated budget for FY 2013 is $118.1 million. Apart from direct congressional appropriations, the largest part of FY 2012 NIST Boulder's funding came from the Department of Defense (42.7%), the National Aeronautics and Space Administration (13.5%), the Department of State (7.8%), and the Department of Energy (6.2%).

Employment and Occupations

NIST Boulder employed 325 full-time federal workers in FY 2012. Average salary and benefits paid to these workers totaled $172,685. NIST Boulder also employs a similar number of visiting researchers, students, and contractors. NIST did not report any part-time labor in FY 2012. Examining job titles at NIST, it is estimated that NIST occupations are comprised of 71% scientific functions (e.g., materials engineer, physicist) and 29% administrative and business support functions (e.g., general facilities manager, public affairs specialist).

FIGURE 21: NIST EMPLOYEE EDUCATION



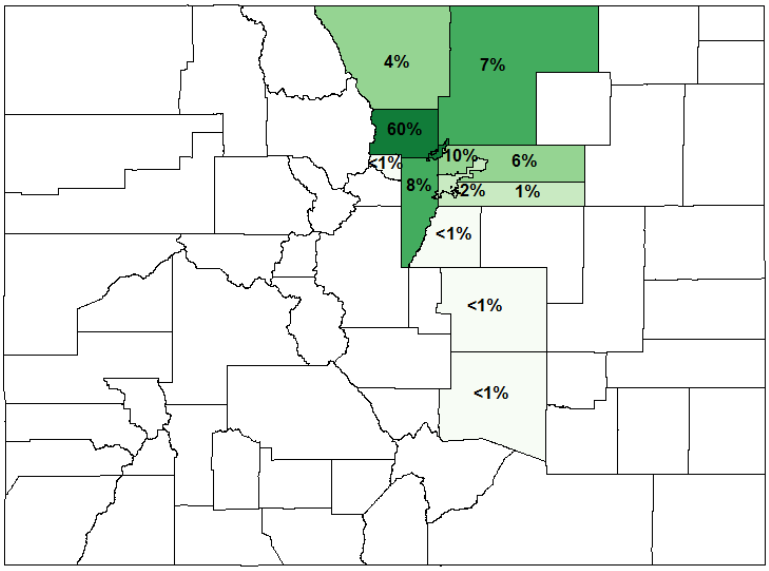
Education

NIST employed a high percentage of federal employees with doctorates (44%) in FY 2012. About 12% had a master's degree, and 18% had a four-year degree. The remaining 26% had less than a four-year degree, including an associate's degree.

Educational attainment represents the highest degree earned. The educational attainment of the NIST workforce exceeds that of Boulder, the lab's home county, and the state as a whole. At NIST, 56% of the employees hold a graduate or professional degree, compared to almost 26% of Boulder workers and roughly 13% of all Colorado workers. The proportion of the Boulder County population with a bachelor's degree as the highest degree earned was 33% and for the state it was 23%.

FIGURE 22: NIST EMPLOYEE LABOR SHED

Located in Boulder, Colorado, most NIST employees (60%) live in Boulder County, with another 29% commuting from directly adjacent counties. Nearly 81% of employees reside in Colorado's 2nd Congressional District.



Construction

NIST spent $49.8 million on construction activities in FY 2011. Activity decreased to $33.2 million in FY 2012, but was projected to total $39.9 million in FY 2013. While this activity included maintenance, repairs, and reconstruction of existing space, it also included the construction of the new Precision Measurement Laboratory.

Economic Impact

The economic impact of NIST on the state of Colorado was measured by examining various expenditure data on operations, construction, and employees, as well as their multiplier effects. In FY 2012, NIST

contributed $187.7 million to the state economy and supported direct and indirect employment of 1,325 workers.

TABLE 21: NIST, ECONOMIC AND FISCAL IMPACTS, FY 2011–FY 2013

Summary of Impacts	FY2011	FY2012	FY2013*
Operations			
Output (Millions)	$153.8	$145.8	$111.7
Value Added (Millions)	$120.8	$113.6	$86.2
Employment	1,060	983	822
Construction			
Output (Millions)	$66.4	$41.9	$51.8
Value Added (Millions)	$38.2	$24.0	$29.6
Employment	553	342	414
Total			
Output (Millions)	$220.3	$187.7	$163.4
Value Added (Millions)	$159.0	$137.6	$115.8
Employment	1,612	1,325	1,236

*Estimated based on fiscal year-end projections.

Intangible Benefits

Many NIST Boulder technologies and services are used by industry, the public, and other government agencies. NIST participates in the Combined Federal Campaign, hosts scientific conferences and workshops, and conducts tours of its Boulder facility. Lab researchers work as judges in science fairs.

NIST employment opportunities include the Professional Research Experience Program (PREP), designed by the NIST Boulder Laboratories to provide valuable laboratory experience and financial assistance to undergraduate, graduate, and postgraduate students. Fellowships are awarded to assure continued growth and progress of science and engineering in the United States. Other opportunities include the Summer Undergraduate Research Fellowship (SURF) program for students majoring in science, mathematics, and engineering; Pathways, a program that offers clear paths to federal internships for students from high school through postgraduate school and paths to careers for recent graduates; and meaningful training and career development opportunities for individuals who are beginning their federal service. Work study opportunities are also available.

NIST Boulder and JILA researchers received numerous awards in 2012, including the Nobel Prize in Physics, awarded to David J. Wineland; the NIST Gold Medal Award for Superior Federal Service; the Department of Commerce 2012 Energy and Environmental Stewardship Award, Renewable Energy category; and the L'Oreal-UNESCO Award for Women in Science given to Deborah Jin of JILA.

National Oceanic and Atmospheric Administration (NOAA)
Department of Commerce
325 Broadway
Boulder, CO 80305
www.noaa.gov

The National Oceanic and Atmospheric Administration (NOAA) is an agency that enriches life through science. Its reach goes from the surface of the sun to the depths of the ocean floor as it works to keep citizens informed of the changing environment around them. From daily weather forecasts, severe storm warnings, and climate monitoring to fisheries management, coastal restoration, and marine commerce support, NOAA's products and services provide economic vitality and influence more than one-third of U.S. gross domestic product. In Colorado, NOAA scientists are involved primarily in better understanding and predicting the atmosphere and oceans.

- NOAA's largest laboratory, the Earth System Research Laboratory (ESRL) observes and understands the Earth system to develop products that will advance NOAA's environmental information and services on global-to-local scales. In close collaboration with the University of Colorado, Colorado State University, and others, ESRL scientists study climate change, weather and weather forecasting, water resources, air quality, and other aspects of the chemistry and dynamics of the atmosphere.

- At NOAA's National Geophysical Data Center, experts provide long-term scientific data stewardship for the nation's geophysical data—ensuring quality, integrity, and accessibility.

- In the Paleoclimatology Branch of NOAA's climate data center, scientists collect and archive the critical data—from caves, ice cores, ocean sediment layers, and more—that helps them understand climate variability and change.

- A 24/7 operation, NOAA's Space Weather Prediction Center monitors and forecasts solar storms that can affect people and equipment working in the space environment, and power, communication, and navigation systems on Earth.

- Three of the National Weather Service's 122 weather forecast offices—in Boulder, Grand Junction, and Pueblo—also operate 24/7. Weather and water forecasters produce daily forecasts and issue watches and warnings of severe weather.

Colorado NOAA facilities include:

Space Weather Prediction Center. The Space Weather Prediction Center (SWPC) is one of the nine National Centers for Environmental Prediction within the NOAA National Weather Service (NWS) and is the nation's official source for space weather alerts, watches, and warnings. SWPC operates 24/7 in Boulder. As one of only four National Critical Systems in the NWS, it partners with the Air Force Weather Agency at Offutt AFB in Nebraska, which is responsible for supplying space weather guidance to the defense and intelligence community.

National Weather Service. The National Weather Service is a component of NOAA. The service provides weather, water, and climate data, forecasts, and warnings for the protection of life and property and enhancement of the national economy.

Office of Oceanic and Atmospheric Research. The Office of Oceanic and Atmospheric Research, or NOAA Research, provides the research foundation for understanding the complex systems that support our planet. Working in partnership with other organizational units of NOAA, a bureau of the Department of Commerce, NOAA Research enables better forecasts, earlier warnings for natural disasters, and a greater understanding of the Earth. Its role is to provide unbiased science to better manage the environment, nationally, and globally.

Earth System Research Laboratory. Scientists with the Earth System Research Laboratory (ESRL) study atmospheric and other processes that affect air quality, weather, and climate. By better understanding the dynamic Earth system, we can better understand what drives this afternoon's haze, next month's hurricanes, and next century's climate. Researchers monitor the atmosphere, study the physical and chemical processes that comprise the Earth system, and integrate those findings into environmental information products. The laboratory's work improves critical weather and climate tools for the public and private sectors, from hourly forecasts to international science assessments with policy-relevant findings.

National Environmental Satellite, Data, and Information Service. The National Environmental Satellite, Data, and Information Service (NESDIS) is dedicated to providing timely access to global environmental data from satellites, and other sources to promote, protect, and enhance the nation's economy, security, environment, and quality of life. To fulfill its responsibilities, NESDIS—informally known as the NOAA Satellite and Information Service—acquires and manages the nation's operational environmental satellite; operates the NOAA National Data Centers; provides data and information services, including Earth system monitoring; performs official assessments of the environment; and conducts related research.

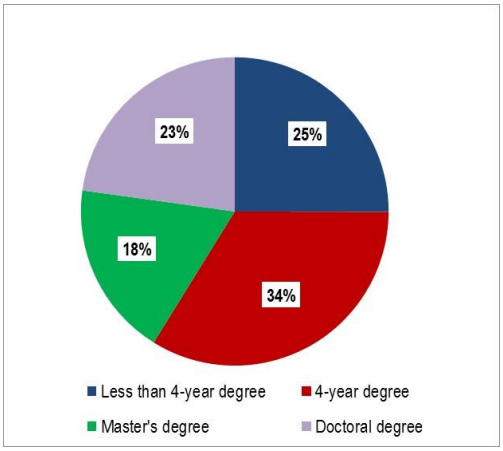
Funding

NOAA reported a budget of $132 million in funding in FY 2011, decreasing to $129 million in FY 2012. The estimated budget for FY 2013 is $116 million. Most of NOAA's funding is from the Department of Commerce.

Employment and Occupations

NOAA employed 867 full-time workers in FY 2012. Average salary and benefits paid to these workers totaled $106,086. NOAA had 24 part-time workers averaging $53,331 in compensation and 80 student workers in FY 2012. Some of the NOAA employees are appointed to other affiliated research laboratories, including CIRA and CIRES. Data were not available to examine NOAA's employment by occupation.

FIGURE 23: NOAA EMPLOYEE EDUCATION



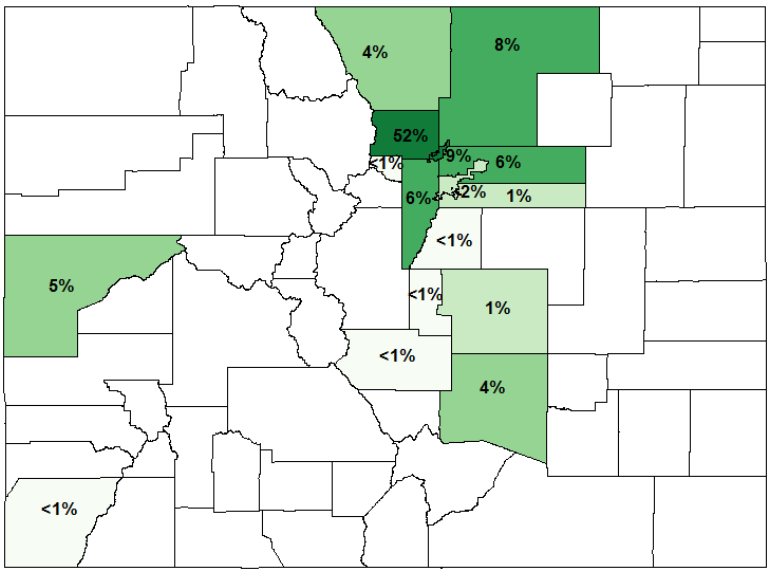
Education

A total of 23% of NOAA employees had a doctorate degree in FY 2012, and 18% of workers had a master's degree. More than one-third had a four-year college degree, and one-fifth had less than a four-year degree.

Educational attainment represents the highest degree earned. The educational attainment of the NOAA workforce exceeds that of Boulder, the lab's home county, and the state as a whole. At NOAA, 41% of the employees hold a graduate or professional degree, compared to almost 26% of Boulder workers and roughly 13% of all Colorado workers. The proportion of the Boulder County population with a bachelor's degree as the highest degree earned was 33% and for the state it was 23%.

FIGURE 24: NOAA EMPLOYEE LABOR SHED

Located in Boulder, Colorado, the majority of NOAA employees (52%) live in Boulder County, with another 21% commuting from directly adjacent counties. Nearly 73% of employees reside in Colorado's 2nd Congressional District.



Construction

NOAA spent $1.7 million on construction materials, soft costs, and related labor on various projects in FY 2011. Construction outlays dropped to $350,000 in FY 2012 and are estimated at $610,000 in FY 2013.

Economic Impact

The economic impact of NOAA on the state of Colorado was measured by examining various expenditure data on operations, construction, and employees, as well as their multiplier effects. In FY

2012, NOAA contributed $277.7 million to the state economy and supported direct and indirect employment of 2,101 workers.[9]

TABLE 22: NOAA, ECONOMIC AND FISCAL IMPACTS, FY 2011–FY 2013

Summary of Impacts	FY2011	FY2012	FY2013*
Operations			
Output (Millions)	$282.6	$277.1	$240.5
Value Added (Millions)	$204.6	$197.7	$164.5
Employment	2,240	2,095	1,863
Construction			
Output (Millions)	$3.1	$0.6	$1.1
Value Added (Millions)	$1.7	$0.4	$0.6
Employment	26	5	9
Total			
Output (Millions)	$285.7	$277.7	$241.6
Value Added (Millions)	$206.3	$198.0	$165.1
Employment	2,266	2,101	1,872

*Estimated based on fiscal year-end projections.

Intangible Benefits

Nearly 6,000 people tour the NOAA facility annually, many of them students and seniors. At least 12 NOAA scientists speak annually in classrooms.

In the last five years, NOAA Boulder employees have won: Nobel Peace Prizes (as members of the IPCC climate report team); Presidential Rank Awards; Service to America awards; the Department of Commerce Gold, Silver, and Bronze Medals; the Volvo Environment Prize; the French Grande Medaille; the Blue Planet Prize; and the Colorado Governor's Impact Award.

NOAA offers a variety of employee development opportunities, including the Leadership Competencies Development Program, the NOAA Leadership Seminar, and the NOAA Rotational Assignment Program (NRAP). A NOAA-wide employee initiative, NRAP offers employees the opportunity to compete for short-term rotational assignments in NOAA Line and Staff Offices.

[9]Given the interconnectedness of NOAA, CIRES, and CIRA funding, some workers are dually counted as NOAA employees and CIRES/CIRA employees. To account for the overlap, the aggregated statewide and county summaries removed the duplication.

National Renewable Energy Laboratory (NREL)
15013 Denver West Parkway
Golden, CO 80401-3393
www.nrel.gov

The National Renewable Energy Laboratory (NREL) is the U.S. Department of Energy's primary national laboratory for renewable energy and energy efficiency research and development. NREL develops renewable energy and energy efficiency technologies and practices, advances related science and engineering, and transfers knowledge and innovations to address the nation's energy and environmental goals. NREL is operated for the Energy Department by the Alliance for Sustainable Energy LLC.

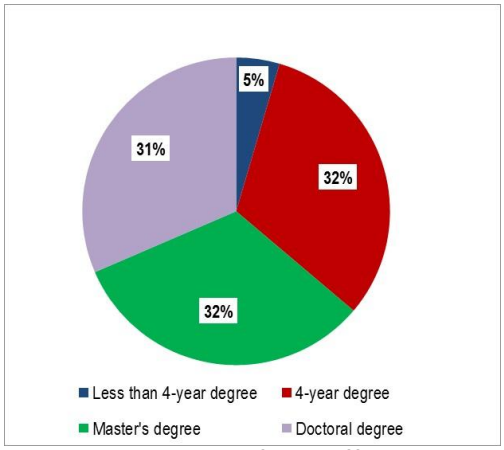
Funding

NREL reported annual costs of $521.1 million in funding in FY 2011, decreasing to $509 million in FY 2012. Most of NREL's funding is from the Department of Energy (84.5%).

Employment and Occupations

NREL employed 1,509 full-time workers in FY 2012. Average salary and benefits paid to these workers totaled $122,000. NREL had 122 part-time workers averaging $62,400 in compensation and 487 contract workers at $25,000, in addition to student workers. Examining job titles at NREL, it is estimated that NREL occupations are comprised of 54% scientific functions (e.g., postdoctoral researcher – electrical engineer, research technician, scientist – multidiscipline) and 46% administrative and business support functions (e.g., facilities tech, IT professional – business analyst).

FIGURE 25: NREL EMPLOYEE EDUCATION

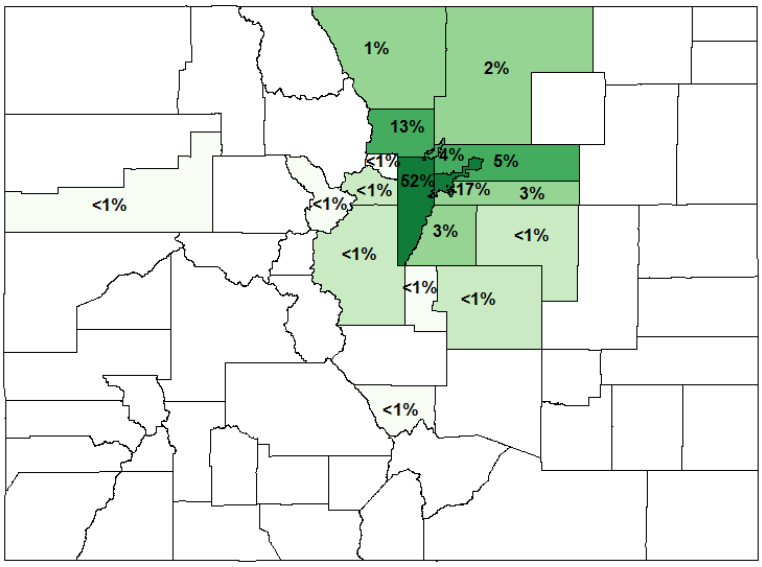


Education

In FY 2012, NREL's workforce was divided into fairly even shares for three of the four education groups. Roughly 31% had a doctoral degree, 32% had a master's degree, and 32% had a four-year degree. The remaining 5% had less than a four-year degree.

Educational attainment represents the highest degree earned. The educational attainment of the NREL workforce exceeds that of Jefferson County, the lab's home county, and the state as a whole. At NREL, 63% of the employees hold a graduate or professional degree, compared to nearly 14% of Jefferson County workers and roughly 13% of all Colorado workers. The proportion of the Jefferson County population with a bachelor's degree as the highest degree earned was 26% and for the state it was 23%.

FIGURE 26: NREL EMPLOYEE LABOR SHED



Located in Golden, Colorado, the majority of NREL employees (52%) live in Jefferson County, with another 46% commuting from directly adjacent counties. Nearly 47% of employees reside in Colorado's 2nd Congressional District and 29% in Colorado's 1st Congressional District.

Construction

NREL spent $1.1 million on construction materials, soft costs, and related labor on various projects in FY 2011. Construction outlays increased to $112.9 million in FY 2012 and are estimated at $19.3 million in FY 2013. Construction projects include the recently completed Phase II of NREL's Research Support Facility, with approximately 150,000 square feet and 540 staff; the Energy Systems Infrastructure Facility, with approximately 175,000 square feet and offices and laboratories for 200−250 staff; and ingress/egress and traffic capacity projects with five-story covered parking for 1,800 cars.

Economic Impact

The economic impact of NREL on the state of Colorado was measured by examining various expenditure data on operations, construction, and employees, as well as their multiplier effects. In FY 2012, NREL contributed $814.8 million to the state economy and supported direct and indirect employment of 6,151 workers.

TABLE 23: NREL, ECONOMIC AND FISCAL IMPACTS, FY 2011–FY 2013

Summary of Impacts	FY2011	FY2012	FY2013*
Operations			
Output (Millions)	$716.1	$687.9	$719.9
Value Added (Millions)	$485.5	$465.4	$501.3
Employment	5,569	5,258	5,349
Construction			
Output (Millions)	$118.6	$127.0	$22.2
Value Added (Millions)	$62.3	$66.3	$11.7
Employment	858	893	152
Total			
Output (Millions)	$834.8	$814.8	$742.0
Value Added (Millions)	$547.8	$531.7	$512.9
Employment	6,428	6,151	5,501

*Estimated based on fiscal year-end projections.

Intangible Benefits

NREL has more than 200 active partnerships with industry. Under several of its partnership agreements, NREL has granted site access to industry researchers so that both organizations can work collaboratively to develop technology. In these situations, industry scientists can use NREL facilities and equipment with the proper training and under NREL staff supervision. It has also participated in many collaborative research projects in which companies contribute personnel, equipment, or facilities to the effort.

NREL has an active technology transfer program. NREL has enabled more than two dozen clean tech start-up companies. NREL also hosts the annual Industry Growth Forums that provide clean energy entrepreneurs with an opportunity to present their business cases to an expert panel of investors and energy executives. Participating companies have raised more than $4 billion in growth financing.

NREL participates in an annual giving campaign of the Mile High United Way and Partnership for Colorado. The Alliance for Sustainable Energy, which manages NREL for the DOE, contributes an additional 10% for every dollar of the employee contribution for the total charitable giving. NREL has received several awards honoring its charitable giving.

NREL has garnered more than 200 awards and honors for its scientists and programs in recent years. The newly completed, ultra energy efficient Research Support Facility and its building and design teams received 40 awards from the building and architectural industry.

More than 200 undergraduate and graduate student internships are available annually through the Research Participation Program and Science Undergraduate Laboratory Internship Program. Postdoctoral researchers and research associates participate in the lab's research and establish ongoing collaborations via NREL's Research Participant Program. The NREL Director's Fellowship is designed for PhD students with outstanding talent and credentials and is awarded annually to staff.

National Telecommunications and Information Administration (NTIA)
Institute for Telecommunication Sciences
325 Broadway
Boulder, CO 80305-3328
www.its.bldrdoc.gov

The Institute for Telecommunication Sciences (ITS) supports the National Telecommunications and Information Administration (NTIA) in the development of telecommunications policy and the management of the spectrum. NTIA-ITS also provides specialized support to other federal agencies.

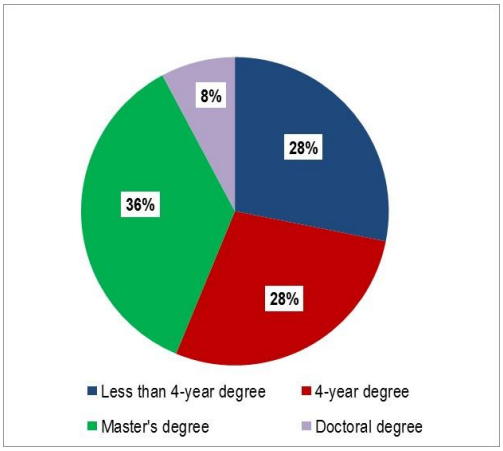
Funding

NTIA-ITS reported a budget of $26 million in funding in FY 2011, decreasing to $23 million in FY 2012. The estimated budget for FY 2013 is $22 million. NTIA-ITS received about one-quarter of its funding from the Department of Commerce in FY 2012, and the remaining funding was from reimbursable agreements with other agencies and private companies.

Employment and Occupations

NTIA-ITS employed 56 full-time workers in FY 2012. Average salary and benefits paid to these workers totaled $135,795. NTIA-ITS did not report any part-time workers for FY 2012, but did have 4 contract workers and 5 student workers. Examining job titles at NTIA-ITS, it is estimated that occupations are comprised of 81% scientific functions (e.g., electronics engineer, physicist) and 19% administrative and business support functions (e.g., executive officer, budget analyst).

FIGURE 27: NTIA-ITS EMPLOYEE EDUCATION

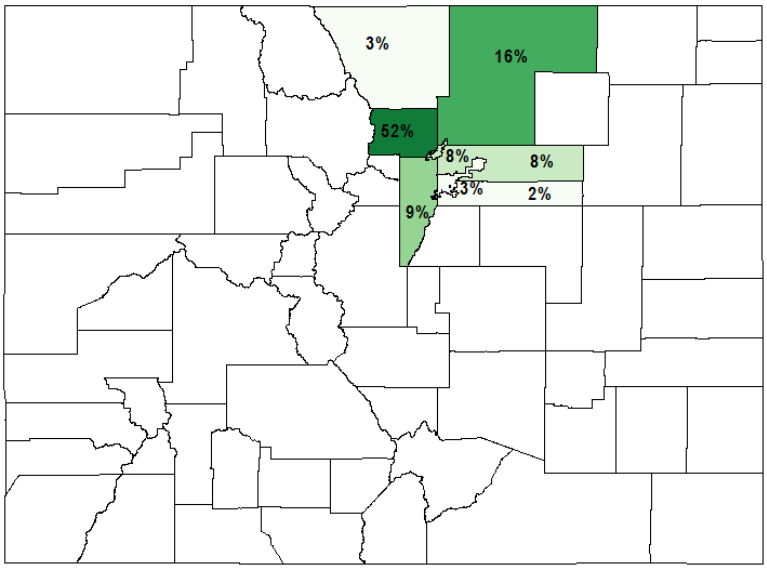


Education

More than one-third of the NTIA-ITS workforce in FY 2012 had a master's degree. Employees with four-year degrees and those with less than four-year degrees each accounted for 28% of NTIA-ITS's workforce. The remaining 8% had a doctorate.

Educational attainment represents the highest degree earned. The educational attainment of the NTIA-ITS workforce exceeds that of Boulder, the lab's home county, and the state as a whole. At NTIA-ITS, 44% of the employees hold a graduate or professional degree, compared to almost 26% of Boulder workers and roughly 13% of all Colorado workers. The proportion of the Boulder County population with a bachelor's degree as the highest degree earned was 33% and for the state it was 23%.

FIGURE 28: NTIA-ITS EMPLOYEE LABOR SHED



Located in Boulder, Colorado, most of NTIA-ITS's employees (52%) live in Boulder County, with another 27% commuting from the directly adjacent counties. More than 78% of employees reside in Colorado's 2nd Congressional District.

Economic Impact

The economic impact of NTIA-ITS on the state of Colorado was measured by examining various expenditure data on operations, construction, and employees, as well as their multiplier effects. In FY 2012, NTIA-ITS contributed $41.4 million to the state economy and supported direct and indirect employment of 236 workers.

TABLE 24: NTIA-ITS, ECONOMIC AND FISCAL IMPACTS, FY 2011–FY 2013

Summary of Impacts	FY2011	FY2012	FY2013*
Operations			
Output (Millions)	$44.7	$41.4	$40.0
Value Added (Millions)	$26.4	$24.2	$23.7
Employment	263	236	227
Construction			
Output (Millions)	$0.0	$0.0	$0.0
Value Added (Millions)	$0.0	$0.0	$0.0
Employment	-	-	-
Total			
Output (Millions)	$44.7	$41.4	$40.0
Value Added (Millions)	$26.4	$24.2	$23.7
Employment	263	236	227

*Estimated based on fiscal year-end projections.

Intangible Benefits

NTIA-ITS makes objective video quality metric software, propagation modeling software, and propagation measurement data sets for use in verifying propagation models available to researchers from other government agencies, industry, and academia on a royalty-free basis. NTIA-ITS participates annually in a science fair, and employees have several training opportunities. Additionally, interns are hired every year.

National Wildlife Research Center (NWRC)
United States Department of Agriculture, Animal and Plant Health Inspection Service
4101 LaPorte Avenue
Fort Collins, CO 80521
www.aphis.usda.gov/wildlife_damage/nwrc/

The mission of the National Wildlife Research Center (NWRC) is to apply scientific expertise to resolve human-wildlife conflicts while maintaining the quality of the environment shared with wildlife.

NWRC develops methods and information to address human-wildlife conflicts related to the following:

- Agriculture (crops, livestock, aquaculture, and timber),
- Human health and safety (wildlife disease, aviation),
- Property damage,
- Invasive species, and
- Threatened and endangered species.

The NWRC is made up of a 43-acre campus on the Colorado State University Foothills Campus. This campus includes 3 main office buildings with labs and animal holding rooms; a large warehouse; fabrication shop; and 24-acre outdoor animal research facility with approximately 20 pen structures. The center also includes 8 field stations located outside of Colorado.

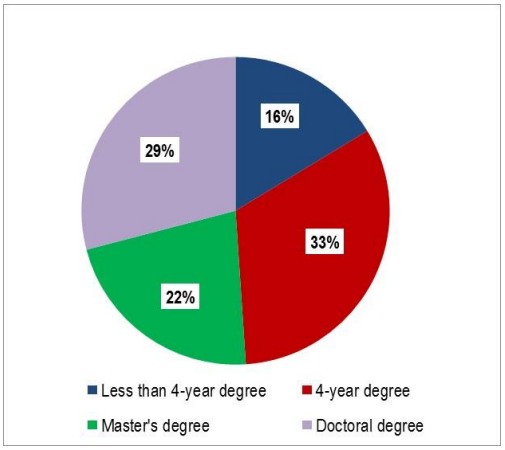
Funding

The NWRC reported a budget of $10.4 million in funding in FY 2011, increasing to $10.7 million in FY 2012. The estimated budget for FY 2013 is $11.1 million. The majority of funding is from the Department of Agriculture. In addition to the NWRC budget, lease payments are made directly by the USDA.

Employment and Occupations

The NWRC employed 87 full-time workers in FY 2012, including student workers. Average salary and benefits paid to these workers totaled $81,245. Reported part-time workers totaled 12 in FY 2012, earning $24,333 in average salary and benefits. The NWRC reported 27 contract workers. Examining job titles at the NWRC, it is estimated that NWRC occupations are comprised of 70.3% scientific functions (e.g., research wildlife biologist, physical science aid) and 29.7% administrative and business support functions (e.g., registration manager, assistant director).

FIGURE 29: NWRC EMPLOYEE EDUCATION



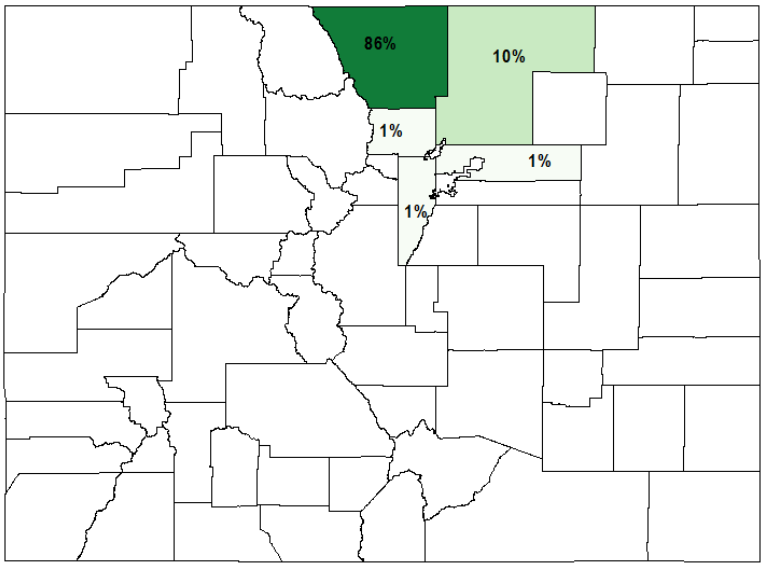
Education

Approximately one-third (33%) of the NWRC workforce in FY 2012 had a four-year degree, while another third (29%) had a doctorate. Twenty-two percent had a master's degree, and the remaining 16% had less than a four-year degree.

Educational attainment represents the highest degree earned. The educational attainment of the NWRC workforce exceeds that of Larimer County, the lab's home county, and the state as a whole. At the NWRC, 51% of the employees hold a graduate or professional degree, compared to about 16% of Larimer County workers and roughly 13% of all Colorado workers. The proportion of the Larimer County population with a bachelor's degree as the highest degree earned was 27% and for the state it was 23%.

FIGURE 30: NWRC EMPLOYEE LABOR SHED

Located in Fort Collins, Colorado, the majority of NWRC employees (86%) are from Larimer County, with another 12% commuting from directly adjacent counties. Nearly 94% of employees reside in Colorado's 2nd Congressional District.



Construction

The NWRC reported $300,000 is construction expenditures in FY 2011, growing to $500,000 in FY 2012. Construction is estimated at $100,000 for FY 2013.

Economic Impact

The economic impact of the NWRC on the state of Colorado was measured by examining various expenditure data on operations, construction, and employees, as well as their multiplier effects. In FY 2012, NWRC contributed $40.4 million to the state economy and supported direct and indirect employment of 320 workers.

TABLE 25: NWRC, ECONOMIC AND FISCAL IMPACTS, FY 2011–FY 2013

Summary of Impacts	FY2011	FY2012	FY2013*
Operations			
Output (Millions)	$32.7	$39.4	$39.3
Value Added (Millions)	$24.2	$23.5	$23.2
Employment	323	312	298
Construction			
Output (Millions)	$0.6	$1.0	$0.2
Value Added (Millions)	$0.3	$0.5	$0.1
Employment	5	8	2
Total			
Output (Millions)	$33.3	$40.4	$39.5
Value Added (Millions)	$24.5	$24.1	$23.3
Employment	327	320	300

*Estimated based on fiscal year-end projections.

Intangible Benefits

NWRC staff volunteer at local schools, participating in the Animal and Plant Health Inspection Service (APHIS) Partnership in Education Program.

Employees also participate in the Combined Federal Campaign and in the Salvation Army's Adopt-a-Family Program. Annually, the facility hosts approximately 1,800 visitors, and staff present more than 15 public seminars.

NWRC participates in the City of Fort Collins Climate Wise Program, which is dedicated to helping local business and the environment. The center was awarded the Governor's Award for High Impact Research in 2009 and 2010.

NWRC offers Colorado State University work study grants.

Rocky Mountain Research Station (RMRS)
U.S. Department of Agriculture
U.S. Forest Service
240 West Prospect
Fort Collins, CO 80526
www.fs.fed.us/rmrs/

The mission of the Rocky Mountain Research Station (RMRS) is to develop and deliver scientific knowledge and technology that will help people sustain our forests, rangelands, and grasslands.

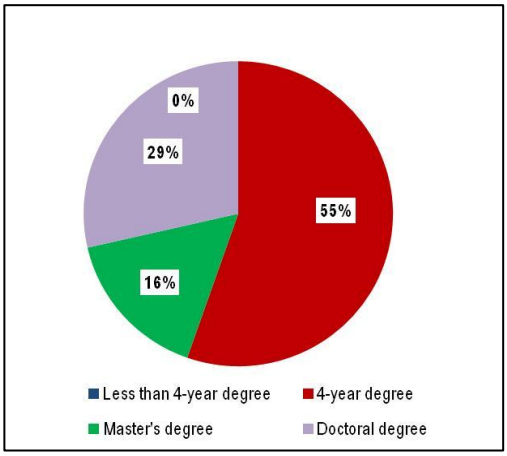
Funding

The RMRS reported a budget of $11.2 million in FY 2012, increasing to $12.2 million in FY 2013.[10] The largest part of the RMRS budget is from the Department of Agriculture (76%) and the U.S. Forest Service (8%).

Employment and Occupations

The RMRS employed 110 full-time workers in FY 2012, including student workers. Average salary and benefits paid to these workers totaled $89,348. Reported part-time workers totaled 10 in FY 2012, earning $20,400 in average salary and benefits. The RMRS reported 8 contract workers, as well as an undisclosed number of student workers. Examining job titles at the RMRS, it is estimated that RMRS occupations are comprised of 38% scientific functions (e.g., scientists, field technicians) and 62% administrative and business support functions (e.g., budget and procurements, administrative services).

FIGURE 31: RMRS EMPLOYEE EDUCATION



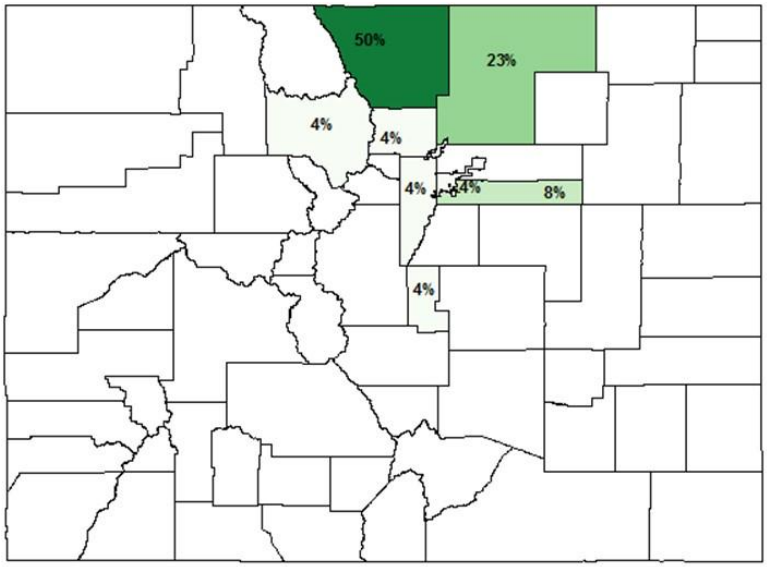
Education

In FY 2012, the educational attainment of RMRS employees was divided into three groups. Those individuals with doctorates accounted for 29%; master's degrees, 16%; and four-year degrees, 55%.

Educational attainment represents the highest degree earned. The educational attainment of the RMRS workforce exceeds that of Larimer County, the lab's home county, and the state. At the RMRS, 45% of the employees hold a graduate or professional degree, compared to about 16% of Larimer County workers and roughly 13% of all Colorado workers. The proportion of the Larimer County population with a bachelor's degree as the highest degree earned was 27% and for the state it was 23%.

[10] Budget and expenditure data were not explicitly provided for FY 2011 for this study, but prior CO-LABS studies had FY 2011 estimates for RMRS.

FIGURE 32: RMRS EMPLOYEE LABOR SHED



Located in Fort Collins, Colorado, half of RMRS employees live in Larimer County (50%), with another 31% commuting from directly adjacent counties (Weld, Boulder, and Grand). Nearly 94% of employees reside in Colorado's 2nd Congressional District.

Construction

The RMRS reported $2.8 million in construction expenditures in FY 2011 and $200,000 in FY 2012. No construction expenditures were estimated for FY 2013.

Economic Impact

The economic impact of the RMRS on the state of Colorado was measured by examining various expenditure data on operations, construction, and employees, as well as their multiplier effects. In FY 2012, RMRS contributed $25.5 million to the state economy and supported direct and indirect employment of 221 workers.

TABLE 26: RMRS, ECONOMIC AND FISCAL IMPACTS, FY 2011–FY 2013

Summary of Impacts	FY2011	FY2012	FY2013*
Operations			
Output (Millions)	$24.6	$25.1	$26.6
Value Added (Millions)	$19.3	$18.4	$17.5
Employment	224	217	209
Construction			
Output (Millions)	$5.3	$0.4	$0.0
Value Added (Millions)	$3.0	$0.2	$0.0
Employment	45	3	-
Total			
Output (Millions)	$29.9	$25.5	$26.6
Value Added (Millions)	$22.3	$18.6	$17.5
Employment	268	221	209

*Estimated based on fiscal year-end projections.

Intangible Benefits

RMRS licensed technologies include investigating open source licensing for Allometric Models for Natural Resource Management.

RMRS employees participate in the Secret Santa Program for children and nursing home residents, and also contribute to food drives.

Station researchers make presentations in schools, and station tours are provided.

Three local RMRS scientists were members of the team that won the Nobel Prize for their work in global climate change.

Employees are offered skill development through formal and informal education, including leadership training, special assignments, and continuing education.

United States Department of Agriculture – Agricultural Research Service (ARS)
2150 Centre Ave, Building D
Fort Collins, CO 80526
http://www.ars.usda.gov/Main/Main.htm

The Agricultural Research Service (ARS) conducts research to develop and transfer solutions to agricultural problems of high national priority and provide information access and dissemination to:

- Ensure high-quality, safe food, and other agricultural products;
- Assess the nutritional needs of Americans;
- Sustain a competitive agricultural economy;
- Enhance the natural resource base and the environment; and
- Provide economic opportunities for rural citizens, communities, and society as a whole.

The ARS vision is to lead America toward a better future through agricultural research and information.

In addition to the Central Great Plains Research Station in Akron (profiled separately in this report), the ARS includes the following units:

Natural Resource Research Center. The *Soil Plant Nutrient Research Unit* develops and evaluates new knowledge required to efficiently manage soil, fertilizer, and plant nutrient (emphasis on nitrogen) to achieve optimum crop yields, maximize farm profitability, maintain environmental quality, and sustain long-term productivity. The *Water Management Research Unit* develops water and weed management technologies and practices for irrigated agriculture in water deficit areas that use water efficiently, improve agricultural productivity, and sustainability, and reduce negative environmental impacts. The *Agricultural Systems Research Unit* develops and evaluates agricultural models for developing sustainable and adaptive integrated agricultural systems.

The ***Crops Research Laboratory*** is comprised of two units: the *Rangeland Resources Research Unit*, which is co-located in Fort Collins and Cheyenne, Wyoming, conducts research within conservation-production systems for semi-arid rangelands and global climate change; and the *Sugarbeet Research Unit*, which works to produce the highest-quality basic and applied research to meet the changing needs of the sugarbeet industry and its customers and stakeholders.

National Center for Genetic Resources Preservation. The mission of the National Center for Genetic Resources Preservation is to acquire, evaluate, preserve, and provide a national collection of genetic resources to secure the biological diversity that underpins a sustainable U.S. agricultural economy through diligent stewardship, research, and communication. The *Plant and Animal Genetic Resources Preservation Research Unit* provides secure long-term preservation and documentation of diverse genetic resources for agriculture economy and food security. The *Plant Germplasm Preservation Research Unit* develops strategies and technologies that improve the efficiency and expands the potential uses of genebanks.

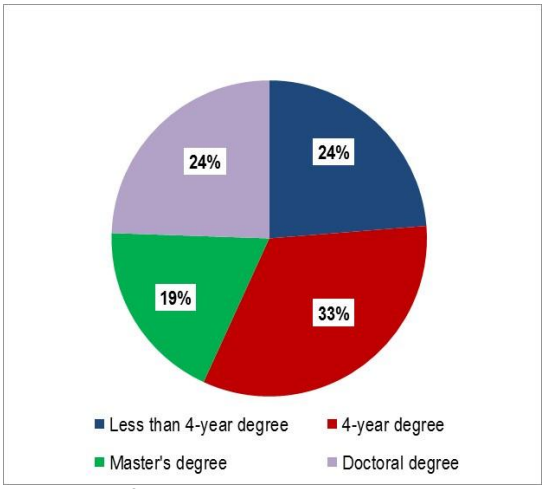
Funding

The USDA-ARS in Fort Collins reported a budget of $16.5 million in FY 2011, decreasing to $16.2 million in FY 2012. The estimated FY 2013 budget fell to $14.3 million, a decline of 11.5%. The USDA-ARS is entirely funded by the U.S. Department of Agriculture.

Employment and Occupations

USDA-ARS in Fort Collins employed a total of 125 full-time workers earning average salaries and benefits of $92,451. The facility also reported 8 part-time workers in FY 2012, with average salaries and benefits totaling $45,421, as well as 89 student workers and 4 contractors. Examining job titles at the USDA-ARS, it is estimated that USDA-ARS occupations are comprised of 69% scientific functions (e.g., animal scientist, plant physiologist) and 31% administrative and business support functions (e.g., budget analyst, area director, administrative officer).

FIGURE 33: USDA-ARS EMPLOYEE EDUCATION

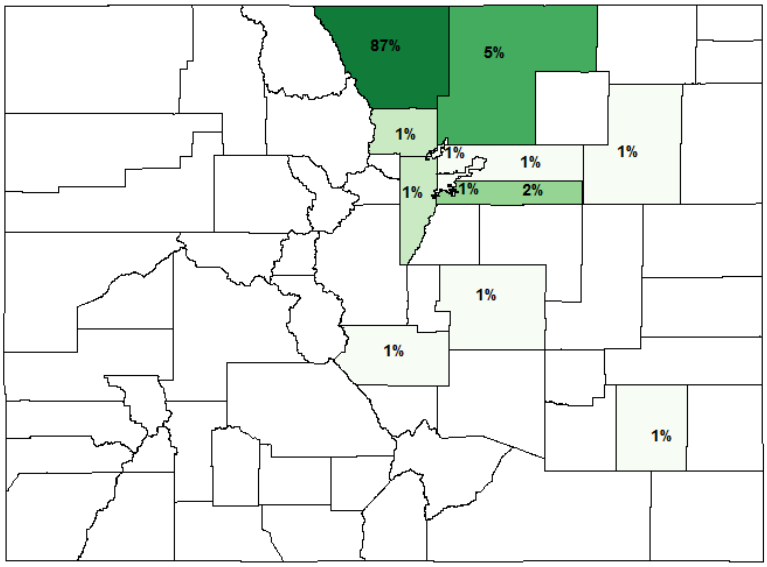


Education

One-third of USDA-ARS employees in FY 2012 had a four-year degree. The share of the workforce with a doctorate and the share with less than a four-year degree each represented 24% of USDA-ARS employees. Those with master's degrees totaled 19%.

Educational attainment represents the highest degree earned. The educational attainment of the USDA-ARS workforce in Fort Collins exceeds that of Larimer County, the lab's home county, and the state as a whole. At the USDA-ARS in Fort Collins, 43% of the employees hold a graduate or professional degree, compared to about 16% of Larimer County workers and nearly 13% of all Colorado workers. The proportion of the Larimer County population with a bachelor's degree as the highest degree earned was 27% and for the state it was 23%.

FIGURE 34: USDA-ARS FORT COLLINS EMPLOYEE LABOR SHED



Located in Fort Collins, Colorado, most of the USDA-ARS employees (87%) are residents of Larimer County, with another 6% commuting from directly adjacent Weld and Boulder counties. Nearly 92% of employees reside in Colorado's 2nd Congressional District and 4% in Colorado's 4th Congressional District.

Construction

USDA-ARS facilities reported construction spending of $5,000 in FY 2011, $160,000 in FY 2012, and an estimated $28,200 in FY 2013.

Economic Impact

The economic impact of USDA-ARS in Fort Collins on the state of Colorado was measured by examining various expenditure data on operations, construction, and employees, as well as their multiplier effects. In FY 2012, the USDA-ARS in Fort Collins contributed $35.3 million to the state economy and supported direct and indirect employment of 311 workers.

TABLE 27: USDA-ARS, ECONOMIC, FY 2011–FY 2013

Summary of Impacts	FY2011	FY2012	FY2013*
Operations			
Output (Millions)	$35.2	$35.0	$35.4
Value Added (Millions)	$27.4	$26.8	$27.6
Employment	307	308	305
Construction			
Output (Millions)	$0.0	$0.3	$0.1
Value Added (Millions)	$0.0	$0.2	$0.0
Employment	0	3	0
Total			
Output (Millions)	$35.2	$35.3	$35.5
Value Added (Millions)	$27.4	$26.9	$27.7
Employment	307	311	305

*Estimated based on fiscal year-end projections.

Intangible Benefits

The ARS lab in Fort Collins shares equipment and office and laboratory space with private businesses through officially approved agreements.

ARS researchers support and participate in numerous community activities and organizations, including the Boys and Girls Clubs, the People's Garden, and Bike to Work Day. Tours are conducted of various labs, and presentations are made throughout the year on different research topics to numerous local and regional groups.

Employees have been the recipients of many awards, including the following: CO-LAB's Annual Awards, ARS Mentor of the Year, Awards of Excellence, ARS Senior Research Scientist of the Year, ARS Early Career Research Scientist of the Year, Outstanding Research Awards from various national scientific societies, the Fort Collins Environmental Management System Team Award, and the Environmental Quality Research Award.

U.S. Department of Agriculture – Agricultural Research Service
Central Great Plains Research Station
40335 County Road GG
Akron, CO 80720
http://www.ars.usda.gov/main/site_main.htm?modecode=54-07-30-00

The mission of the Central Plains Resource Management Unit is to enhance the economic and environmental well-being of agriculture by development of integrated cropping systems and technologies for maximum utilization of soil and water resources. Emphasis is on the efficient use of plant nutrients, pesticides, and water and soil conservation/preservation.

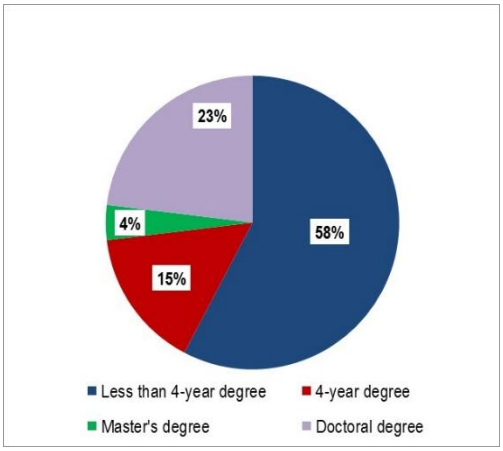
Funding

The USDA-ARS in Akron reported a budget of $2.1 million in government funding in FY 2011, decreasing to $2 million in FY 2012. The FY 2013 estimated budget is $1.9 million, with all funding provided by the Department of Agriculture.

Employment and Occupations

The USDA-ARS in Akron employed a total of 29 full-time and part-time workers in FY 2012. Average salary and benefits paid to full-time staff totaled $81,374. Examining job titles at the USDA-ARS, it is estimated that USDA-ARS occupations are comprised of 88% scientific functions (e.g., research soil scientist, biological science) and 12% administrative and business support functions (e.g., administrative officer).

FIGURE 35: USDA-ARS EMPLOYEE EDUCATION

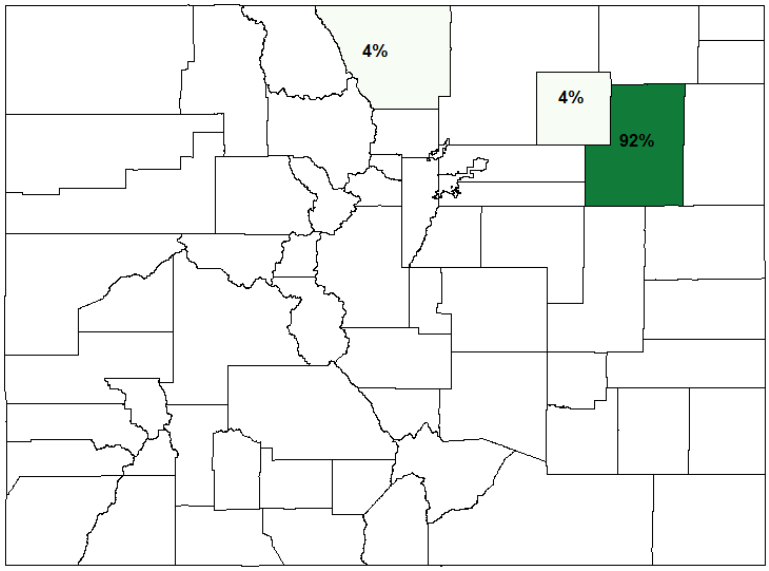


Education

Nearly 58% of USDA-ARS employees in Akron had less than a four-year degree in FY 2012 and another 15% had a four-year degree. The share of the workforce with a master's degree totaled 4%, while those with a doctorate comprised 23% of the Akron facility's workforce.

Educational attainment represents the highest degree earned. The educational attainment of the USDA-ARS workforce in Akron exceeds that of the state as a whole. At the USDA-ARS in Akron, 27% of the employees hold a graduate or professional degree, compared to roughly 13% of all Colorado workers. The proportion of the state's population with a bachelor's degree as the highest degree earned was 23%.

FIGURE 36: USDA-ARS AKRON EMPLOYEE LABOR SHED



For the ARS in Akron, Colorado, nearly all employees (96%) live in Washington County. They are predominately represented by Colorado's 4th Congressional District.

Economic Impact

The economic impact of USDA-ARS in Akron on the state of Colorado was measured by examining various expenditure data on operations, construction, and employees, as well as their multiplier effects. In FY 2012, USDA-ARS in Akron contributed $4.8 million to the state economy and supported direct and indirect employment of 52 workers.

TABLE 28: USDA-ARS AKRON, ECONOMIC IMPACTS, FY 2011–FY 2013

Summary of Impacts	FY2011	FY2012	FY2013*
Operations			
Output (Millions)	$4.7	$4.6	$4.0
Value Added (Millions)	$3.5	$3.4	$3.1
Employment	51	50	44
Construction			
Output (Millions)	$0.2	$0.2	$0.2
Value Added (Millions)	$0.1	$0.1	$0.1
Employment	1	1	1
Total			
Output (Millions)	$4.8	$4.8	$4.1
Value Added (Millions)	$3.6	$3.5	$3.1
Employment	53	52	45

*Estimated based on fiscal year-end projections.

Intangible Benefits

Staff members participate in community food drives and as judges at science fairs. They conduct mock job interviews with students and make classroom presentations at local schools. Employees' educational opportunities include AgLearn, the USDA's department-wide system for managing training records and activity at USDA, and USDA Grad School.

U.S. Geological Survey (USGS)
Denver Federal Center Building
Lakewood, CO 80225
www.usgs.gov

The U.S. Geological Survey (USGS) provides reliable scientific information to describe and understand the Earth; minimize loss of life and property from natural disasters; manage water, biological, energy, and mineral resources; and enhance our quality of life. It is the nation's largest water, earth, biological science, and civilian mapping agency, and specializes in being an independent fact-finding agency that provides unbiased and impartial information that is valuable on a planet where natural resources are in increasing demand. Researchers collect, monitor, analyze, and provide scientific understanding about natural resource conditions and issues. A Department of the Interior bureau, the USGS was founded in 1879. It is headquartered in Reston, Virginia, with seven regional offices, including one located in Denver. Some divisions of the USGS are the Colorado Water Science Center, the Energy Resources Science Center, the Fort Collins Biological Science Center, the Geologic Hazards Science Center, the Mineral and Environmental Resources Science Center, the Geosciences and Environmental Change Science Center, the Special Applications Science Center, the National Research Program–Central States, and the National Water Quality Laboratory. Other research facilities at the Denver Federal Center include the TRIGA Nuclear Reactor, the Ice Core Laboratory, and the Earth Core Laboratory. The USGS also has facilities in Fort Collins, Golden, Boulder, Grand Junction, and Pueblo.

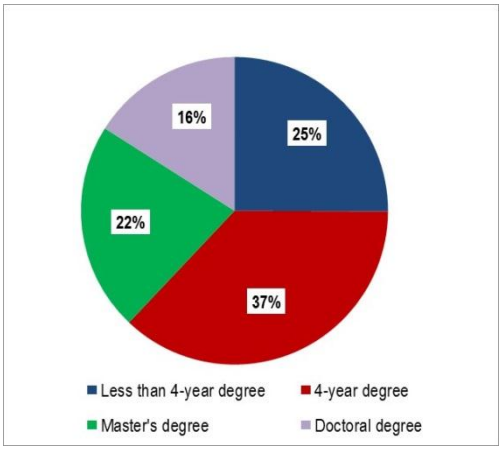
Funding

The USGS reported a budget of $308.2 million in FY 2011, increasing to $321.6 million in FY 2012. Estimates for the FY 2013 budget were not provided, nor were the sources of funding by agency. The USGS is an agency of the Department of Interior, which is the primary funding agency of the USGS.

Employment and Occupations

The USGS employed 1,160 full-time workers in FY 2012. Average salary and benefits paid to these workers totaled $112,121. The USGS also reported 150 part-time workers in FY 2012, earning $48,288 on average, and 118 contract workers at $101,083 each. The USGS employs 134 student workers as well, nested in the previous numbers. Examining job titles at the USGS, it is estimated that occupations are comprised of 76% scientific functions (e.g., hydrologist, geologist) and 24% administrative and business support functions (e.g., budget, HR specialist).

FIGURE 37: USGS EMPLOYEE EDUCATION

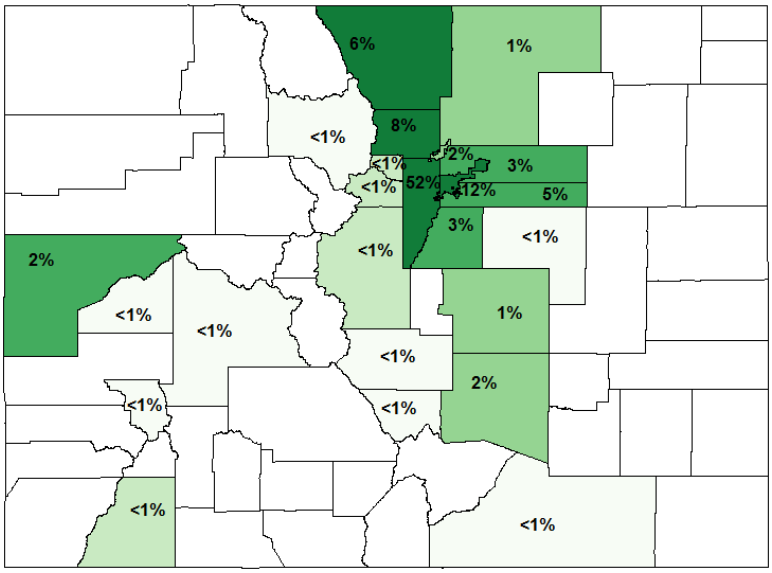


Education

Thirty-seven percent of the USGS workforce in FY 2012 had a four-year degree, whereas just over one-quarter had less than a four-year degree. Twenty-two percent had a master's degree, and 16% had a doctorate.

Educational attainment represents the highest degree earned. The educational attainment of the USGS workforce exceeds that of Jefferson County and the state. At the USGS, 38% of the employees hold a graduate or professional degree, compared to nearly 14% of Jefferson County workers and roughly 13% of all Colorado workers. The proportion of the Jefferson County population with a bachelor's degree as the highest degree earned was 26% and for the state it was 23%.

FIGURE 38: USGS EMPLOYEE LABOR SHED



Located primarily at the Denver Federal Center in Jefferson County, Colorado, most USGS employees (52%) live in Jefferson County, with another 34% commuting from directly adjacent counties. More than 42% of employees reside in Colorado's 2nd Congressional District, 30% in Colorado's 1st Congressional District, and 14% in Colorado's 7th Congressional District.

Construction

Construction in FY 2011 and FY 2012 each totaled $500,000. Construction activity grew to an estimated $1.4 million in FY 2013. Most of the construction was related to laboratory renovations, consolidations, and updates at the Denver Federal Center site.

Economic Impact

The economic impact of the USGS on the state of Colorado was measured by examining various expenditure data on operations, construction, and employees, as well as their multiplier effects. In FY 2012, the USGS contributed $346.3 million to the state economy and supported direct and indirect employment of 3,056 workers.

TABLE 29: USGS, ECONOMIC AND FISCAL IMPACTS, FY 2011–FY 2012

Summary of Impacts	FY2011	FY2012
Operations		
Output (Millions)	$355.9	$345.4
Value Added (Millions)	$271.4	$262.6
Employment	3,169	3,048
Construction		
Output (Millions)	$1.0	$1.0
Value Added (Millions)	$0.5	$0.5
Employment	8	8
Total		
Output (Millions)	$356.9	$346.3
Value Added (Millions)	$271.9	$263.1
Employment	3,177	3,056

Note: FY 2013 data not available from the USGS.

Intangible Benefits

While federal labs offer intangible and societal benefits that range from tech transfer and education to the impacts of employees on their communities, USGS did not provide specific examples of intangible benefits for this 2013 study.

University Corporation for Atmospheric Research (UCAR)
3090 Center Green Drive
PO Box 3000
Boulder, CO 80301
www2.ucar.edu

The mission of the University Corporation for Atmospheric Research (UCAR) is to support, enhance, and extend the capabilities of the university community, nationally and internationally; understand the behavior of the atmosphere and related systems and the global environment; and foster the transfer of knowledge and technology for the betterment of life on Earth.

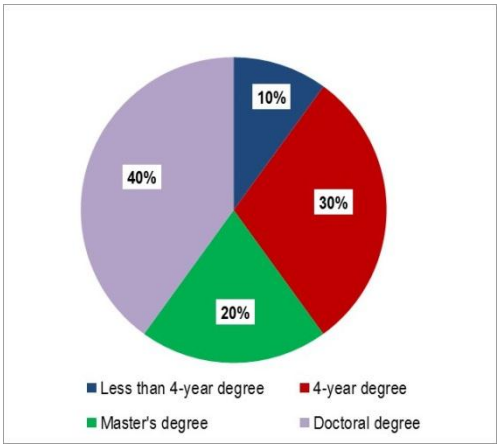
Funding

UCAR reported a budget of $264 million in FY 2011, decreasing to $246.9 million in FY 2012 and $230.8 million in FY 2013—a decline of 6.5% each year. The largest part of UCAR funding is from the National Science Foundation (56%), the Department of Commerce (13%), and the National Aeronautics and Space Administration (9%). Other funding organizations include the Department of Defense, the Department of Energy, the Federal Aviation Administration, and other state and local governments and private entities.

Employment and Occupations

UCAR employed 1,202 full-time workers in FY 2012. Average salary and benefits paid to these workers totaled $125,138. UCAR also employed 27 contract workers at an average of $36,607 per worker, as well as part-time workers and student employees. Examining job titles at UCAR, it is estimated that UCAR occupations are comprised of 57% scientific functions (e.g., associate scientist, research engineer) and 43% administrative and business support functions (e.g., accountant, deputy lab director).

FIGURE 39: UCAR EMPLOYEE EDUCATION

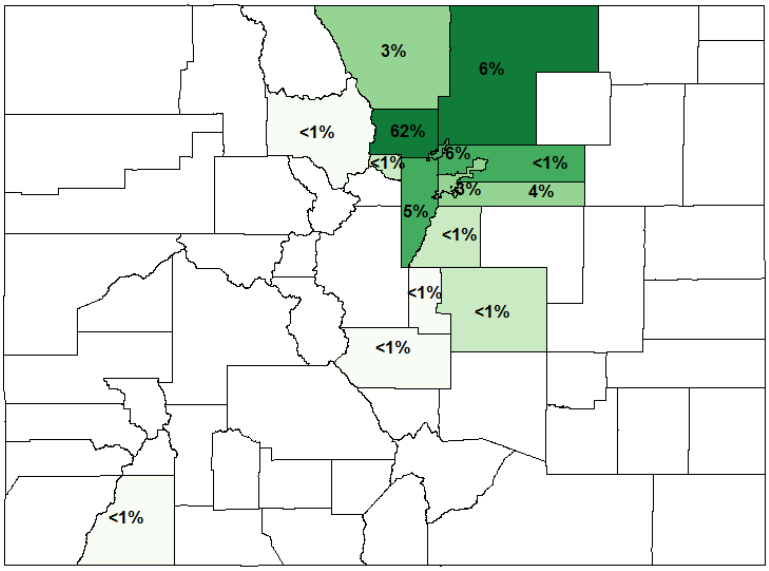


Education

A total of 40% of the UCAR workforce in FY 2012 had a doctoral degree, and another 30% had earned a four-year degree. Twenty percent had a master's degree, whereas 10% did not have a four-year degree.

Educational attainment represents the highest degree earned. The educational attainment of the UCAR workforce exceeds that of Boulder, the lab's home county, and the state as a whole. At UCAR, 60% of the employees hold a graduate or professional degree, compared to almost 26% of Boulder County workers and roughly 13% of all Colorado workers. The proportion of the Boulder County population with a bachelor's degree as the highest degree earned was 33% and for the state it was 23%.

FIGURE 40: UCAR EMPLOYEE LABOR SHED



Located in Boulder, Colorado, most UCAR employees (62%) live in Boulder County, with another 20% commuting from directly adjacent counties. More than 73% of employees reside in Colorado's 2nd Congressional District and 6.5% in Colorado's 4th Congressional District.

Construction

UCAR reported construction expenditures that included remodeling of buildings in Boulder, Colorado; building repair in Jefferson County, Colorado; and construction of a supercomputer facility in Cheyenne, Wyoming. Although the facility is located in Cheyenne, its construction had economic impacts on the Colorado economy. Total construction expenditures were $43.3 million in FY 2011, $13.7 million in FY 2012, and $2.1 million in FY 2013. The three major contractors used have significant presence in Colorado.

Economic Impact

The economic impact of UCAR on the state of Colorado was measured by examining various expenditure data on operations, construction, and employees, as well as their multiplier effects. In FY 2012, UCAR contributed $421.3 million to the state economy and supported direct and indirect employment of 3,156 workers.

TABLE 30: UCAR, ECONOMIC AND FISCAL IMPACTS, FY 2011–FY 2013

Summary of Impacts	FY2011	FY2012	FY2013*
Operations			
Output (Millions)	$373.9	$404.9	$370.5
Value Added (Millions)	$291.6	$299.0	$288.0
Employment	2,995	3,020	2,873
Construction			
Output (Millions)	$19.7	$16.5	$3.6
Value Added (Millions)	$11.0	$9.2	$2.0
Employment	166	136	29
Total			
Output (Millions)	$393.6	$421.3	$374.1
Value Added (Millions)	$302.6	$308.2	$290.0
Employment	3,161	3,156	2,902

*Estimated based on fiscal year-end projections.

Intangible Benefits

Spin-off companies from UCAR's technology include STAR, ARC, and PEAK. Staff members participate in the UCAR Employee Charitable Campaign, and NCAR's science exhibit is visited by 60,000 people annually, including 7,000 students on field trips. UCAR creates and disseminates educational materials related to weather and climate that are used internationally.

The U.N. Intergovernmental Panel on Climate Change (IPCC) was awarded the 2007 Nobel Peace Prize, together with former U.S. Vice President Al Gore. Sharing the IPCC recognition were scores of NCAR scientists who have served as authors or reviewers for the four assessment reports issued by the IPCC since 1990. Several NCAR scientists have played IPCC leadership roles, and UCAR technical staff members have provided considerable administrative support. Research using the NCAR-based Community Climate System Model was cited heavily in the IPCC's 2007 report. Numerous honors have been awarded to NCAR and UCAR researchers for individual achievement from the National Academy of Sciences, the National Academy of Engineering, the American Geophysical Union, the American Meteorological Society (AMS), and the American Association for the Advancement of Science (AAAS). Eleven presidents of the AMS have been drawn from UCAR staff, 17 have been elected fellows of the AAAS, 21 are fellows of the AGU, and more than 50 have been made fellows of the AMS.
UCAR offers internships, fellowships, and opportunities to postdoctoral graduate, undergraduate, and high school students.

UNAVCO Inc.
6350 Nautilus Drive
Boulder, CO 80301-5394
303-381-7500
www.unavco.org

UNAVCO was established as the University NAVSTAR Consortium in 1984 within the Cooperative Institute for Research in Environmental Sciences (CIRES) at the University of Colorado Boulder. In 2001, UNAVCO, Inc., became an independent 501(c)(3) organization. The UNAVCO consortium consists of more than 100 U.S. academic members and over 75 associate members (domestic and international). UNAVCO operates and supports geodetic networks, geophysical and meteorological instruments, a free and open data archive, software tools for data access and processing, cyberinfrastructure management, technological developments, technical support, geophysical training, and education and outreach in the geosciences.

Geodetic research supported by UNAVCO defines the terrestrial reference frame, and quantifies changes in the properties of Earth's surface and subsurface, ice sheets and glaciers, and oceans and atmosphere. Geodesy's broader benefits include help with preparedness for and mitigation of hazards, and foundational support for space-based operations, navigation, communications, surveying, resource management, and national security.

UNAVCO was added to the list of Colorado facilities in August 2013. UNAVCO did not provide data for this study, thus, facility economic impacts were not estimated.

CONCLUSION

Federal research facilities and their university affiliates have a positive economic impacts on the state of Colorado, totaling an estimated $2.3 billion in FY 2011 and in FY 2012 and declining to an estimated $2.0 billion in FY 2013 as reported operating and construction budgets decrease. Boulder, Jefferson, and Larimer counties were the primary beneficiaries of the research facilities due to their physical location in these counties, as well as the residences of a majority of the facilities' employees. Economic benefits in Boulder, Jefferson, and Larimer counties totaled an estimated $743.2 million, $733.3 million, and $148.2 million, respectively, in FY 2012.

Employment at these facilities accounted for 7,966 full-time, part-time, student, and contract jobs in Colorado, as well as an additional 7,716 indirect employees in the community. These individuals provide goods and services to the research operations and to employees off-site.

The facilities occupy 6.3 million square feet of leased and owned real estate in Colorado. Construction at the studied facilities topped $173 million in FY 2012, resulting in more than 2,500 total construction-related jobs over the three-year period.

Beyond the numbers, research and information are delivered to many constituents through outreach to schools, seminars, and public and private research collaborations. Colorado businesses and residents are among the beneficiaries of research conducted at these facilities. Companies that locate in Colorado to be near federal and academic research centers also benefit. Federal labs facilitate business through technology transfer, spin-off companies, and technology assistance.

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APPENDIX 1: LITERATURE REVIEW

Argonne National Laboratory, Illinois
(Anderson Economic Group, LLC 2011)

In 2011, Anderson Economic Group, LLC published an economic analysis of the Argonne National Laboratory for the University of Chicago. Notable parts of the report include:

- Argonne is responsible for almost 5,000 new jobs in Illinois.
- Argonne has generated almost $700 million in net new earnings for households and businesses in 2010.
- The laboratory supports U.S. science by hosting important science infrastructure and contributing to the pipeline of future scientists and engineers.

Berkeley Lab, Economic Impact Study
(CBRE Consulting 2010)

In 2010, CBRE Consulting was commissioned to conduct an economic impact analysis demonstrating the benefits of Lawrence Berkeley National Laboratory (LBNL) to the Cities of Berkeley, Emeryville, and Walnut Creek, the Bay Area region, the State of California, and the United States. LBNL operates a campus in each of the cities chosen. CBRE Consulting focused on job generation, wages, and local and regional spending. The study determined that during FY 2009, which spans from October 1, 2008, through September 30, 2009, Berkeley Lab contributed approximately $501.0 million directly to the Bay Area economy through the lab's spending. Including indirect and induced spending, the contribution rises to approximately $690.1 million. Of this total, about $236.1 million occurred in Berkeley, Emeryville, and Walnut Creek. The total spending impacts on California for the same period were estimated at $794.5 million, and Berkeley Lab's gross economic impact on the U.S. economy was estimated to be nearly $1.6 billion.

Brookhaven National Laboratory Economic Impact Report
(Appleseed, Inc. 2009)

In 2009, Appleseed Inc. published an economic analysis of the Brookhaven National Laboratory. Findings include:

- In FY 2009, $704 million in economic impact was generated by the lab and its visitors.
- In FY 2009, 5,400 jobs were created throughout New York State.
- In FY 2009, of the 3,000 employees, 98% were living on Long Island.
- In FY 2009, of the more than 3,000 visiting researchers from university, corporate, and government institutions, nearly 700 were from New York State.
- Employment grew 12% from 2006 to 2009.
- In FY 2009, 2 million in goods and services were purchased from New York State companies, including $62.7 million from Long Island companies.
- A total of $45.1 million was paid to New York State contractors, including $34.9 million to Long Island-based contractors.

Economic Contribution of the Department of the Navy Technology Transfer Program
(Slaper 2010)

This study by the Indiana Business Research Center at Indiana University's Kelley School of Business, titled *The Economic Contribution of the Department of the Navy Technology Transfer Program*, highlights the economic impact of a sample of technology transfer agreements implemented between Navy labs and various partners between 2005 and 2009. Specifically, the study focused on 103 of 620 technology transfer agreements during that period, and found that overall, the 103 agreements were directly responsible for 670 civilian jobs and indirectly responsible for approximately 2,600 jobs. Compensation for these jobs averaged more than $79,000 per year, and tax receipts at all levels of government from the economic activity generated by these agreements totaled roughly $60 million. Overall, the estimated direct economic output associated with these agreements totaled $200 million, with an additional $345 million in indirect activity, for a total of over half a billion dollars in economic impact. Cooperative Research and Development Agreements (CRADAs) accounted for 64% of the 103 agreements and 30% were patent licensing agreements (PLAs). On average, CRADAs supported 8 jobs each, while PLAs supported 10.

Economic Impact Assessment, Sandia Science & Technology Park
(Watkins and Sussman 2012)

In May 2012, the Mid-Region Council of Governments published an economic impact assessment of the Sandia Science and Technology Park located in southeast Albuquerque. Highlights include:

- The average annual salary across all industries in the park is more than $70,000, about $30,000 higher than in the Albuquerque area. This average salary includes Sandia National Laboratory employees, who represent about 42% of all employees in the SS&TP and earn about $90,000 per year on average.
- In addition to nearly 2,500 direct jobs at the end of 2011, the analysis indicates that for every job within the SS&TP, 1.7 additional jobs were created in the region.
- Because most of the impacts from the SS&TP are the result of employment and wages, the secondary benefits are expected to be sustained.
- The park represents a viable and attractive location for other high-tech companies.

Economic Impact of the National Energy Laboratory Hawaii Authority Tenants on the State of Hawai'i
(The Economic Research Organization at the University of Hawai'i 2012)

In 2012, the Economic Research Organization at the University of Hawai'i (UHERO) published an economic impact of the NELHA Ocean Science and Technology Park located in Kailua-Kona, Hawaii. Report highlights include:

- Total expenditures from businesses at NELHA in 2010 were $81.0 million, of which about $50 million was paid to Hawaii entities.
- In 2011, NELHA generated 583 jobs in Hawai'i.
- UHERO estimated the total economic output to the greater Hawaii economy was $87.7 million, which generated $4.5 million in state tax revenue in 2010.

Federal Laboratory Technology Transfer, Fiscal Year 2010, Summary Report to the President and the Congress
(U.S. Department of Commerce, National Institute of Standards and Technology 2012)

According to the *Federal Laboratory Technology Transfer, Fiscal Year 2010, Summary Report to the President and Congress*, prepared by the National Institute of Standards and Technology within the Department of Commerce, federal technology transfer programs across 11 agencies produced more than 3,100 new Cooperative Research and Development Agreements (CRADAs) in 2010. Federal labs also disclosed nearly 4,800 new inventions, filed over 1,800 new patents, managed more than 13,500 active licenses, and generated nearly $143 million total income on all active licenses. These activities helped to support such vital national interests as tsunami training and readiness, diagnostic testing for avian flu, energy efficiency, and high-tech infrastructure development. The Departments of Defense and Commerce had the highest number of active CRADAs, with 3,248 and 2,399, respectively, while NASA and the Department of Energy disclosed the greatest number of new inventions, at 1,722 and 1,616, respectively. Combined, the Department of Energy, NASA, and the Department of Health and Human Services were responsible for the most active licenses, 89% of all licensing. In general, these figures suggest that the return on the U.S.'s investment in research and development at federal labs remained a bright spot despite the struggling economic recovery in 2010.

Intellectual Property and the U.S. Economy: Industries in Focus
(Economic and Statistics Administration and the United States Patent and Trademark Office 2012)

This report identifies and analyzes 75 intellectual property-intensive industries and examines trends within these industries and their contribution to the broader U.S. economy. Together, these industries supported more than 40 million jobs (direct and indirect) and contributed over $5 trillion to U.S. gross domestic product (GDP) in 2010. The intellectual property (IP) industries accounted for more than one-quarter of all jobs in the United States and over one-third of total GDP in sectors, including computers, audio and video equipment manufacturing, newspaper and book publishing, pharmaceuticals and medicines, and semiconductors, among others. While overall employment in IP-intensive industries has lagged other industries over the past two decades due mainly to losses in the manufacturing sector, IP-intensive employment grew 1.6% in 2010 and 2011. Average weekly wages for IP-intensive industries were $1,156 in 2010, or 42% higher than the $815 average weekly wage in other nonintensive private industries. Additionally, patent- and copyright-intensive industries wages recorded strong growth in recent years, with the wage premium in patent-intensive industries increasing from 66% in 2005 to 73% in 2010 and the premium in copyright-intensive industries rising from 65% to 77%. The comparatively high wages in IP-intensive industries correspond to the fact that these businesses rely heavily on educated workers.

National Economic Impacts from DoD License Agreements with U.S. Industry
(TechLink and Bureau of Business and Economic Research, University of Montana)

Approximately 500 active licensing agreements between the Department of Defense (DOD) and U.S. industry partners were responsible for creating or sustaining more than 163,000 jobs with an average annual wage of $65,000 during the period 2000−2011. Nearly half of the companies associated with those licenses reported over $13.4 billion in total sales and $1.3 billion in military sales (in 2011 dollars), collectively. These are some of the findings of a study commissioned by the U.S. Air Force to assess the

"extent to which [all DOD licensing agreements with U.S. industry] (1) contributed to new economic activity and job creation in the United States, and (2) resulted in the transition of new technology to U.S. military use." The study authors contacted 505 companies with active licensing agreements with the DOD during the study period, reflecting 602 licenses (some had multiple licenses) with 60 different DOD facilities. Participants were asked about total sales of new products and services directly related to their DOD license agreements, as well any license-related sales to the military. Total economic impacts related to these identified sales were then extrapolated using IMPLAN impact-assessment software. That assessment focused on total economic output, value added, employment, labor income, and tax revenues. The study reports that total economy-wide sales, as measured by output, were estimated at $36.3 billion. Value added was estimated to be $17.4 billion, representing new wealth creation in the economy. Employment impacts included 163,067 jobs with an average wage of $65,000. Labor income in 2011 was estimated at $10.6 billion. The $13.4 billion in sales and its economy-wide effects generated about $2.3 billion in federal tax revenues and over $1.3 billion in state and local tax revenues.

"Nearly $1 Billion in Economic Activity in California Generated by Sandia National Laboratories in 2010"
(Center for Economic Development, California State University-Chico)

According to this study conducted by the Center for Economic Development at California State University-Chico, the Sandia National Laboratories generated nearly $1 billion in both direct and indirect economic output in California in 2010. Nearly half came from the San Francisco Bay area. This economic output included $163 million in purchases and contracts to California businesses, $155 million in employee compensation and benefits, and $1.4 million in state corporate tax revenue. Combined, these three components totaled $319 million, the total direct injection into the California economy. Indirectly, impacts of Sandia's spending were responsible for an additional $24 million in revenue to California's state government and $612 million in additional revenue to other businesses and organizations in the state. The total output impact was roughly $955 million. About half of Sandia's economic impact in California occurs in the San Francisco Bay area. According to the report, California households saw $497 million in financial benefits, including direct employee compensation plus $342 million in payroll, self-employment, and other household income paid by other California businesses and organizations. The household income benefit supports more than 4,800 California jobs.

NIH, CDC, NSF, and AHRQ Funding by State, 2012
(Research!America)

TABLE 31: SELECTED AGENCY FUNDING IN COLORADO, 2012

Agency	Funding (in thousands)	State Rank
National Institutes of Health	$303,804	20
Centers for Disease Control & Prevention	99,074	21
National Science Foundation	364,733	5
Agency for Healthcare Research & Quality	2,166	-
Total Funding	$767,614	14
Total Employment (2011)	3,200,028	23
Total Population (2011)	5,116,796	22

Sources: Research!America and Bureau of Economic Analysis.

NETL [National Energy Technology Laboratory] 2009 Economic Impacts Methodology Report
(U.S. Department of Energy 2011)

In 2011, the U.S. Department of Energy published an economic impact assessment of NETL in 2009 on Oregon, Pennsylvania, and West Virginia, as well as the nation as a whole. Using an input-output model, highlights of the report include:

- In FY 2009, 689 jobs were created in the United States, as well as more than 300 in both Pennsylvania and West Virginia, and 57 in Oregon.
- In FY 2009, $81 million was paid in federal wages and salaries to the United States, including more than $30 million in both Pennsylvania and West Virginia, and over $7 million in Oregon.
- In FY 2009, the total direct impact on the United States was $1.2 million.

Sandia National Laboratories Economic Impact on the State of New Mexico
(Sandia National Laboratories 2011)

In 2011, an economic impact analysis of the Sandia National Laboratory on the state of New Mexico was conducted. Notable findings include:

- In FY 2011, out of 1,658 new hires, 584 graduated from a New Mexico university and 457 students were participating in year-round internships.
- In FY 2011, of the $920.8 million paid in total contract-related payments, 42% or $386.6 million was directly paid to New Mexico businesses.
- Of the FY 2011 total contract-related payments in New Mexico, 77%, or $296.1 million, was paid to small businesses.
- In FY 2011, more than $1.4 billion was paid in labor and noncontract-related payments.

Science and Engineering Indicators 2012
(National Science Foundation 2012)

The National Science Foundation's *Science and Engineering Indicators 2012* highlights major developments in international and U.S. science and technology with an emphasis on broad trends in areas such as education, workforce, and R&D expenditures. Over the past decade, the report provides that global R&D expenditures have grown faster than global GDP, rising from approximately $522 billion in 1996 to nearly $1.3 trillion in 2009.

The United States remains the single-largest R&D performing country, with a total of $404 billion expended in 2009, $407 billion in 2010, and $414 billion in 2011. The business sector still accounts for most of the U.S. R&D performance and funding, performing an estimated $282 billion in R&D in 2009, or 71% of the U.S. total, and funding an estimated $243 billion. Industry performed $279 billion in R&D in 2010 and $284 billion in 2011, and funded $245 billion each year.

The academic sector is the second-largest performer of U.S. R&D, accounting for an estimated $57 billion in 2009, $60 billion in 2010, and $63 billion in 2011. The federal government is the second-largest funding source of U.S. R&D, providing $127 billion in 2009, or just under one-third of the total. This number remained at $127 billion in 2010, and grew to $133 billion in 2011.

Technology Transfer and Commercialization Landscape of the Federal Laboratories
(Hughes et al. 2011)

The U.S. government has founded close to 1,000 federal laboratories since the establishment of the first laboratory in 1846. Approximately one-third of the $103.7 billion in FY 2008 federal research and development (R&D) expenditures was devoted to intramural R&D performed by federal laboratories (including federally funded research and development centers). The definition of what constitutes a federal laboratory is not straightforward. The federal laboratories substantially vary from one another in terms of mission, agency, research portfolio, and budget. Federal laboratories include both government-owned, government-operated (GOGO) and government-owned, contractor-operated (GOCO) laboratories. Contractors who operate laboratories for the government include for-profit companies, nonprofit companies, and universities both singly and in consortia. GOGO and GOCO laboratories have different legislative authorities.

Table A-1. Characteristics of Selected Agencies

Agency	Year Established	Number of Laboratories	Intramural R&D ($M FY 2008)[a]	Year Technology Transfer Program Established
DHS	2002	5	$372	2008
DOC NOAA	1970	—	$447	—
DOD	1947	67	$16,185	1995
DOD ONR	1946	—	$5907[b]	—
DOE	1977	21[c]	$6,077	2005/2007[d]
DOI USGS	1879	35[e]	$490	—
EPA	1970	14	$395	—
HHS FDA	1927[f]	8	$108	1995[g]
HHS NIH	1930	21	$5,2483	1989[g]
NASA	1958	10	$2,280	1958
USDA	1862	100+	$1,448	—
VA	1930	89	$442	2000

[a]National Science Foundation/Division of Science Resources Statistics, preliminary federal obligations (including intramural, industry FFRDC, university FFRDC, and nonprofit FFRDC) for research and development, by agency and performer, FY 2008.
[b]Includes all Department of Navy.
[c]The DOE cites that they have 21 federal laboratories and technology centers. See http://www.energy.gov/organization/labs-techcenters.htm. They also cite that they have 17 federal laboratories. See http://science.energy.gov/laboratories/.
[d]Established following the Energy Policy Act of 2005; staffed in 2007.
[e]The USGS says it has 35 major laboratories and 100s of field offices.
[f]Formed in 1927 and transferred to Department of Health, Education and Welfare (now HHS) in 1953. See http://www.fda.gov/AboutFDA/WhatWeDo/History/Origin/ucm124403.htm.
[g]The FDA Technology Transfer Program manages the patenting and licensing portion of its activities through an interagency agreement with the NIH Office of Technology Transfer, because FDA does not have the staff to carry out the processing.

World Intellectual Property Indicators – 2012 Edition
(World Intellectual Property Organization)

Despite a global economy that continues to underperform, intellectual property (IP) protection filings grew significantly in 2011. As the 2012 annual report from the World Intellectual Property Organization

indicates, the total number of patent applications filed exceeded 2 million for the first time (1.36 million resident and 0.78 million nonresident) in 2011, reflecting a 7.8% growth rate. China led the way in patent applications, with 526,412, followed by the United States with 503,582 and Japan with 342,610. From these applications, nearly 1 million patents were granted worldwide in 2011 (606,800 issued to residents and 390,000 issued to nonresidents), showing a growth rate of 9.7%. The number of total patents in force also grew in 2011 by 6.9%, to an estimated 7.9 million. With 2.1 million patents already in force, the United States Patent and Trademark Office had the largest number, followed by its Japanese counterpart, with more than 1.5 million. The number of trademark applications doubled between 2005 and 2011, from roughly 2 million to 4.2 million, with China accounting for almost 62% of this growth.

APPENDIX 2: RELATED NEWS ARTICLES

"Colorado renewable energy collaboration lands $37 million in funds" (Jaffe 2012)

The Colorado Renewable Energy Collaboratory—a partnership between industry and the state's top research institutions—has generated $37 million in federal and private research funds since 2007, according to a report to the legislature. According to the Colorado Renewable Energy Administration's 2012 report to the legislature, the collaboratory has had a string of successes, including funding 66 research projects. This money has created research centers focused on biofuels, solar energy, and wind power that brought together the University of Colorado Boulder, Colorado State University, the Colorado School of Mines, and the National Renewable Energy Laboratory in Golden. Those centers, in turn, attracted big name companies to the program including Chevron and ConocoPhillips in the biofuels program, Total in solar, and RES Americas and Vestas in wind. The centers share their research with other members and conduct specific contracted research for outside companies.

"CU-Boulder selected by NOAA to continue study of climate change" (Pankratz 2012)

NOAA selected the University of Colorado Boulder to continue a federal/academic partnership that extends NOAA's ability to study climate change, improve weather models, and predict how solar storms can disrupt communication. In the announcement, NOAA said that the selection means the lab will continue funding the Cooperative Institute for Environmental Sciences (CIRES), which was established at the University of Colorado in 1967, for at least 5 and up to 10 more years. Although the amount of the award is contingent on the availability of funding in the federal budget, NOAA anticipates that up to $32 million may be available annually.

"Evonik Industries Selects OPX Biotech for Joint Development of Bio-Based Chemicals" (PR Newswire 2013)

OPX Biotechnologies, Inc. (OPXBIO), a start-up leader in sustainable chemical engineering, and Evonik Industries AG, a global specialty chemical company, announced that the two companies have entered into an agreement to jointly develop certain bio-based specialty chemicals. The joint-development agreement calls for OPXBIO to use its proprietary Efficiency Directed Genome Engineering (EDGE technology to help advance Evonik's specialty biochemicals for growing markets. According to the agreement, OPXBIO will also be able to market bio-based products resulting from the Evonik collaboration. Founded in 2007, OPXBIO, which employs about 65 people, is the result of innovative research and technology transfer efforts at the University of Colorado Boulder, and today is largely financed by leading venture capital investors.

"Global Weather Corp. delivers cost-saving wind forecast service to Xcel Energy" (Thompson 2012)

Global Weather Corp. announced completion of the first full-year operational deployment of its WindWX energy forecast service with Xcel Energy. This follows a multiyear R&D collaboration to develop the core technology, involving Xcel Energy and the National Center for Atmospheric Research (NCAR). With WindWX, Xcel Energy estimates that it has saved $17 million and has reduced its forecasting error by approximately 28% since 2009. Forecasts for a 168-hour period are provided every 15 minutes for all

of Xcel Energy's service territory using real-time turbine-level operating data. The system applies sophisticated algorithms to forecast the amount of wind power that will be produced. WindWX forecasts are available worldwide and are designed to help utilities make decisions about powering down less-efficient power plants when sufficient winds are forecasted, and to optimize allocation of wind resources in the energy market.

"New patent office to be in downtown Denver" (Raabe 2012)

Downtown Denver will get a jolt of prestige and economic benefit as the site of a new U.S. Patent and Trademark Office. The office will be in the Byron G. Rogers federal office building and will employ about 130 workers initially, with employment projected to grow to as high as 595 after five years. Economists have projected its total economic impact at $439 million over five years.

"NIST Official: Businesses May Need Tax Breaks, Immunity to Adopt Cyber-standards" (Wooten 2013)

Work is progressing on implementing an executive order from President Obama calling for voluntary cyber-security standards, but according to top officials at the National Institute of Standards and Technology (NIST), legislation may be needed to entice industry to go along. Signed in February, the executive order directs NIST to lead the development of a framework of voluntary cyber-security standards for critical infrastructure, such as utility, manufacturing, and telecommunications data networks. It allows for the creation of incentives for the private sector to participate in the program, such as tax exemptions, liability immunity, and grants, and NIST is now encouraging Congress to pursue these options to help further implementation.

"NREL pursues greater efficiency for solar panels" (Jaffe 2013)

Researchers at the Golden-based National Renewable Energy Laboratory have come up with an innovative solution for improving the efficiency of solar panels. To help resolve the inefficiencies created when solar panels reflect sunlight, researchers discovered that peppering a cell with trillions of tiny holes can dramatically increase the amount of light captured. This technique, referred to as "dark solar," has been licensed to Red Bank, New Jersey-based Natcore Technology Inc., which is combining it with its own low-cost solar-cell-manufacturing process. U.S. solar-panel makers have been under pressure as prices have dropped more than 50% in the past five years because of a flood of inexpensive Chinese solar panels. These types of technological advancements are U.S. manufacturers' attempt to maintain competitiveness and viability.

APPENDIX 3: ECONOMIC AND DEMOGRAPHIC OVERVIEW OF AREA

This appendix contains data on taxes and the economy. These indicators were relevant for estimating the fiscal impacts of the laboratories, and to provide economic context of the areas in Colorado where federal labs reside.

Income Taxes

Colorado income tax rates are 4.63% of taxable income. However, adjusted gross income reduces the effective tax rate, which is estimated at less than 3% in Colorado.

TABLE 32: COLORADO INDIVIDUAL STATISTICS OF INCOME, ADJUSTED GROSS INCOME TAX, 2009

Minimum	Maximum	Midpoint	Number of Returns	Colorado Gross Tax (Millions)	Colorado Net Tax (Millions)	Colorado Gross Tax per Return	Colorado Net Tax per Return	Estimated Colorado Gross Tax Rate	Estimated Colorado Net Tax Rate
(Negative Income)		NA	33,536	$0.35	$0.69	$10.29	$20.44	NA	NA
$0	$5,000	$2,500	82,340	$0.36	$0.36	$4.35	$2.77	0.17%	0.11%
$5,001	$10,000	$7,501	119,531	$0.54	$0.55	$4.50	$5.25	0.06%	0.07%
$10,001	$15,000	$12,501	139,504	$9.76	$9.70	$69.95	$77.99	0.56%	0.62%
$15,001	$20,000	$17,501	143,006	$26.29	$26.12	$183.84	$197.51	1.05%	1.13%
$20,001	$25,000	$22,501	139,626	$44.87	$44.57	$321.33	$344.36	1.43%	1.53%
$25,001	$35,000	$30,001	245,832	$137.91	$137.11	$561.00	$583.73	1.87%	1.95%
$35,001	$50,000	$42,501	278,767	$269.18	$266.90	$965.61	$978.80	2.27%	2.30%
$50,001	$75,000	$62,501	311,321	$496.14	$489.77	$1,593.66	$1,580.76	2.55%	2.53%
$75,001	$100,000	$87,501	199,941	$499.73	$491.69	$2,499.37	$2,459.06	2.86%	2.81%
$100,000	$250,000	$175,000	278,924	$1,328.31	$1,296.23	$4,762.27	$4,593.61	2.72%	2.62%
$250,000	> $250,000	$250,000	40,897	$1,035.75	$920.63	$25,325.84	$19,913.01	NA	NA
Total			**2,013,225**	**$3,849.17**	**$3,684.31**	**$1,911.94**	**$1,799.96**	**NA**	**NA**

Source: Colorado Department of Revenue, Office of Research and Analysis, Federal AGI and Tax, All Full-Year Resident Returns.

Property Taxes

Colorado federal labs reported occupying 6.3 million square feet of leased and owned real estate in Colorado in FY 2012. Given the tax exempt status of federal properties, the bulk of property taxes derive from employees' home property taxes.

The Department of Local Affairs, Division of Property Taxation's *2011 Annual Report*[11] provides a summary of county, average municipal, average school, and average special property levies in *Section XI: Assessed Valuation, Revenue, and Average Levies by County* (see appendix). Taking the weighted average of property tax by the stated residences of Colorado federal lab employees provided weighted average mill levies for the state.

[11] http://dola.colorado.gov/dpt/publications/docs/2011_Annual_Report/SECXI.pdf, retrieved June 11, 2013.

TABLE 33: PROPERTY TAX LEVIES, 2011

County	Assessed Valuation	Total Revenue	County Mill Levy	Average Municipal Levy[a]	Average School Levy	Average Special Levy[b]	Total Average County Levy[c]
Adams	$4,572,463,290	$486,881,412	26.806	7.259	56.272	3.598	106.481
Arapahoe	7,428,089,170	745,516,612	17.316	8.001	53.817	3.311	100.365
Boulder	5,627,815,998	485,032,312	24.645	12.057	45.521	1.651	86.185
Broomfield	1,057,183,430	114,594,120	17.511	11.457	52.466	6.696	108.396
Denver	10,937,453,830	819,805,987	28.419	N/A	42.265	1.968	74.954
Douglas	4,504,735,760	475,795,574	19.774	1.854	48.788	4.882	105.621
Jefferson	6,997,605,972	672,425,610	24.346	4.992	48.721	3.659	96.094
Larimer	4,111,602,863	361,665,245	22.472	9.503	47.197	2.392	87.962
Washington	120,080,929	7,858,193	30.251	55.466	28.599	0.874	65.441
Weld	5,421,862,840	383,330,046	16.804	13.444	28.990	3.085	70.701
Colorado labs weighted average[d]	-	-	23.858	8.863	46.454	2.716	89.747
Colorado	$87,817,088,245	$6,612,073,967	18.947	7.745	37.627	2.918	75.294

[a]Municipal revenues are divided by the sum of municipal assessed valuation.
[b]Special district revenues are divided by the sum of special district assessed valuation.
[c]Average will not add to the total average county levy because denominators (assessed valuation) are not common to all.
[d]Average weighted by stated residence of 97% of Colorado lab employees.
Source: http://dola.colorado.gov/dpt/publications/docs/2011_Annual_Report/SECXI.pdf, retrieved June 11, 2013.

Sales Taxes

State, city, and county tax rates, which are published on the Colorado Department of Revenue website, show the variations in taxation by location.

TABLE 34: COUNTY SALES TAX RATES

County	County Rate	RTD	Scientific and Cultural Facilities	Total County
Adams	0.75%	1.00%	0.10%	1.85%
Arapahoe	0.25	1.00	0.10	1.35
Boulder	0.80	1.00	0.10	1.90
Broomfield[a]	4.15	1.00	0.10	5.25
Denver[a]	3.62	1.00	0.10	4.72
Douglas	1.00	1.00	0.10	2.10
Jefferson	0.50	1.00	0.10	1.60
Larimer	0.60	0.00	0.00	0.60
Washington	1.50	0.00	0.00	1.50
Weld	0.00	0.00	0.00	0.00
Colorado labs weighted[b]	1.04	0.87	0.09	1.99
Colorado	2.90	0.00	0.00	2.90

Note: Does not include local improvement districts in dispersed areas of the counties.
[a]County and city tax rates are combined in Broomfield and Denver.
[b]Average weighted by stated residence of 97% of Colorado lab employees.
Source: http://www.colorado.gov/cms/forms/dor-tax/dr1002.pdf, retrieved June 11, 2013.

TABLE 35: CITY TAX RATES

City	City Rate	City	City Rate	City	City Rate
Arvada	3.46%	Erie	3.50	Longmont	3.28
Aurora	3.75	Evergreen	NA	Louisville	3.50
Berthoud	3.00	Fort Collins[a]	3.85	Loveland	3.00
Boulder	3.41	Golden	3.00	Lyons	3.00
Brighton	3.75	Lafayette	3.50	Nederland	3.75
Broomfield	4.15	Lakewood	3.00	Westminster	3.85
Denver[a]	3.62	Littleton	3.00	Colorado labs weighted	3.43

[a]Denver has an alternative tax on food and liquor for immediate consumption (4%); Fort Collins has an alternative tax on food for home consumption (2.25%).
Source: http://www.colorado.gov/cms/forms/dor-tax/dr1002.pdf, retrieved June 11, 2013.

Population

In 2010, the State Demography Office estimated the total population of Boulder, Jefferson, and Larimer counties at more than 1.1 million, representing 22.4% of Colorado's population.[12] During the period 1970−2000, population growth in the primary research counties was slightly higher than the state as a whole (2.8% compound annual growth rate [CAGR], compared to 2.2% for the state). This growth rate slowed in the 2000s, with the state outpacing the primary research counties.

Since 2000, this trend has reversed, with population growth in the three-county region increasing at 0.7% annually, compared to 1.6% compound annual growth for the state. Larimer County grew at 1.6% annually, Boulder County increased 0.3% per year, and Jefferson County continued modest annual growth of 0.2%.

TABLE 36: HISTORICAL POPULATION COMPARISON

Location	1970	1980	1990	2000	*CAGR 1970-2000*	2010	*CAGR 2000-2010*
Boulder County*	131,889	189,625	225,339	291,288	*2.7%*	300,532	*0.3%*
Boulder (City)	66,870	76,685	83,312	94,673	*1.2*	97,385	*0.3*
Jefferson County*	235,368	371,753	38,430	527,056	*2.7*	535,651	*0.2*
Golden	9,817	12,237	13,116	17,159	*1.9*	18,935	*1.0*
Lakewood	92,743	113,808	126,481	144,126	*1.5*	143,206	*(0.1)*
Larimer County	89,900	149,184	186,136	251,494	*3.5*	295,605	*1.6*
Fort Collins	43,337	65,092	87,758	118,652	*3.4*	144,430	*2.0*
Colorado	2,209,596	2,889,733	3,294,394	4,301,261	*2.2*	5,049,717	*1.6*

Note: Broomfield became a county in November 2001, reducing Boulder County's population.

Source: State Demography Office, Colorado Division of Local Government, www.dola.state.co.us/dlg/demog/pop_cnty.html, as of July 14, 2013.

The educational attainment of residents in Boulder, Larimer, and Jefferson counties exceeded the educational attainment in the state of Colorado and in the nation in 2011. In Boulder County, 59% of

[12]State Demography Office, Colorado Division of Local Government, http://www.dola.state.co.us/dlg/demog/pop_cnty.html, as of July 14, 2013.

residents have a bachelor's degree or higher, compared to 42.8% in Larimer County and 39.6% in Jefferson County.

TABLE 37: EDUCATIONAL ATTAINMENT, PERCENTAGE OF POPULATION 25 YEARS AND OVER, 2011

Degree Earned	Boulder County	Jefferson County	Larimer County	Colorado	U.S.
Less than bachelor's degree	41.0%	60.4%	57.2%	63.3%	71.5%
Bachelor's degree	33.2	25.7	27.2	23.3	17.9
Graduate or professional degree	25.8	13.9	15.6	13.4	10.6

Source: 2011 American Community Survey, factfinder2.census.gov, retrieved June 17, 2013.

Per Capita Income

Per capita personal income in Boulder, Jefferson, and Larimer counties generally grew at a slower rate than both the state and the nation from 2005−2011. Per capita personal income in Boulder County and Jefferson County has consistently been higher than both the state average and the national average, while Larimer County is below the state and national average.

TABLE 38: PER CAPITA PERSONAL INCOME, 1995–2012

Area	1995	2000	2005	2010	2011	2012	*CAGR 2005–2011*	*Growth 2010–2011*
Boulder	$28,505	$41,074	$47,419	$50,031	$51,893	NA	*1.5%*	*3.7%*
Jefferson	26,722	38,759	43,908	44,017	45,179	NA	*0.5*	*2.6*
Larimer	22,283	30,802	35,008	38,109	39,767	NA	*2.1*	*4.4*
Denver-Aurora-Broomfield	27,441	38,404	43,634	46,969	48,980	NA	*1.9*	*4.3*
Colorado	24,575	33,986	38,795	42,107	44,053	45,135	*2.1*	*4.6*
United States	23,262	30,319	35,452	39,791	41,560	42,693	*2.7*	*4.4*

Source: Bureau of Economic Analysis, Local Area Personal Income.

Employment, Firms, and Wages

Employment

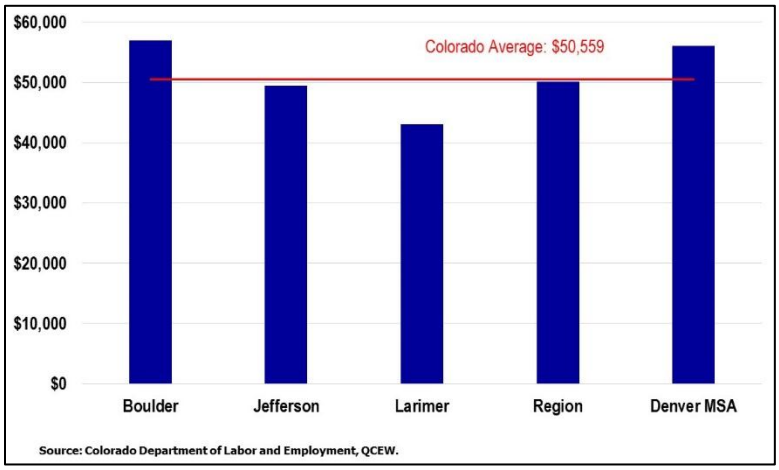
In 2012, more than 505,000 workers were employed at over 41,000 private and government establishments in the three-county research region, representing 22.3% of total Colorado employment. The average number of employees per establishment (12) closely resembled the state average (13 employees). Employee wages in this region totaled $25.3 billion in 2012, or 22.1% of total Colorado wages. This equates to an average annual wage of $50,152, compared to the state average of $50,559 and the Denver Metro average of $56,042.

TABLE 39: EMPLOYMENT SUMMARY, 2012

Area	Total Employees	Total Wages	Average Wages	Number of Firms
Boulder	160,697	$9,148,612,154	$56,931	13,148
Jefferson	211,874	10,481,502,499	49,470	17,925
Larimer	132,613	5,705,845,513	43,026	10,164
Region	505,184	25,335,960,166	50,152	41,237
Denver Metro	1,231,565	69,019,268,125	56,042	85,631
Colorado	2,266,539	114,592,961,178	50,559	172,300

Source: Colorado Department of Labor and Employment, Quarterly Census of Employment and Wages, http://www.colmigateway.com/, as of July 14, 2013.

FIGURE 41: AVERAGE ANNUAL WAGES, 2012



Primary employers are characterized by firms that export goods and services. A location quotient is a useful tool for identifying primary employers by analyzing an industry's clustering in a given geographical area. Literally, the location quotient is an industry's relative concentration in one area compared to the same industry in another area. Location quotients of 1.2 or greater are considered indicators of primary employment.[13] This means that the area has a relative concentration of employment 20% greater than the national concentration of employment.

Examining two-digit NAICS employment location quotients reveals high densities of sector employment in the study region. Boulder County shows primary employment in the Information and Professional and Technical Services sectors. Jefferson County has high densities in Construction, Professional and Technical Services, and federal government (related to the Federal Center). Larimer County shows concentrations in Construction and Accommodation and Food Services.

[13] Interview with Joseph Winter, Program Manager CES/LAUS Labor Market Information, Colorado Department of Labor and Employment, February 12, 2008.

TABLE 40: EMPLOYMENT LOCATION QUOTIENTS (U.S.), 2012

Sector	Boulder	Jefferson	Larimer	Region	Denver MSA	Colorado
Total All Industries	1.00	1.00	1.00	1.00	1.00	1.00
Private	0.99	1.00	0.97	0.99	1.02	0.99
Agriculture, Forestry, Fishing, Hunting	0.27	0.21	0.66	0.35	0.18	0.71
Mining	0.26	0.33	0.45	0.34	1.49	2.20
Utilities	0.33	0.94	0.42	0.61	0.69	0.85
Construction	0.58	1.22	1.34	1.05	1.19	1.20
Manufacturing	1.14	0.91	0.95	0.99	0.57	0.64
Wholesale Trade	0.76	0.73	0.60	0.71	1.20	0.97
Retail Trade	0.88	1.19	1.14	1.08	0.90	0.95
Transportation and Warehousing	0.24	0.36	0.51	0.36	1.06	0.84
Information	2.67	0.86	0.92	1.45	1.71	1.51
Finance and Insurance	0.70	0.84	0.58	0.72	1.28	1.04
Real Estate, Rental, and Leasing	0.91	1.10	1.13	1.05	1.29	1.25
Professional and Technical Services	2.42	1.58	1.14	1.73	1.46	1.31
Management of Companies and Enterprises	0.42	0.77	0.31	0.54	1.38	0.92
Administrative and Waste Services	0.68	0.91	1.03	0.87	1.20	1.06
Educational Services	0.64	0.67	0.48	0.61	0.85	0.70
Health Care and Social Assistance	0.92	1.06	1.02	1.00	0.83	0.85
Arts, Entertainment and Recreation	1.16	0.79	1.01	0.97	1.17	1.37
Accommodation and Food Services	1.08	1.09	1.32	1.15	1.04	1.15
Other Services	0.82	0.90	0.80	0.85	0.89	0.87
Nonclassifiable	0.09	0.04	0.15	0.09	0.08	0.24
Government	1.03	1.02	1.13	1.05	0.91	1.03
State	-	0.61	-	0.26	0.88	1.02
Local	0.91	0.96	0.97	0.95	0.88	1.02
Federal	0.59	1.95	0.89	1.24	1.07	1.12

Source: Colorado Department of Labor and Employment, Quarterly Census of Employment and Wages, http://www.colmigateway.com/, as of July 14, 2013.

TABLE 41: COMPOSITION OF EMPLOYMENT, PERCENTAGE, 2012

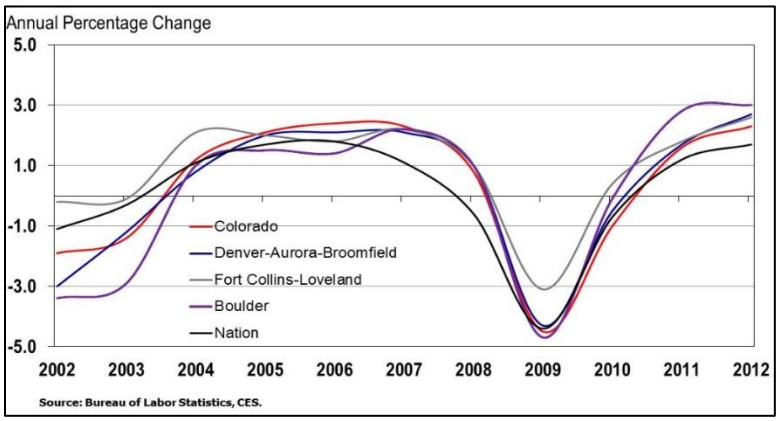
Sector	Boulder	Jefferson	Larimer	Region	Denver MSA	Colorado
Total All Industries	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Private	83.5	83.7	81.9	83.2	85.5	83.5
Agriculture, Forestry, Fishing, Hunting	0.2	0.2	0.6	0.3	0.2	0.6
Mining	0.2	0.2	0.3	0.2	0.9	1.3
Utilities	0.1	0.4	0.2	0.3	0.3	0.4
Construction	2.5	5.2	5.7	4.4	5.0	5.1
Manufacturing	10.3	8.2	8.6	9.0	5.1	5.8
Wholesale Trade	3.3	3.2	2.6	3.0	5.2	4.2
Retail Trade	10.0	13.4	12.9	12.2	10.2	10.8
Transportation and Warehousing	0.8	1.1	1.6	1.1	3.3	2.6
Information	5.4	1.8	1.9	3.0	3.5	3.1
Finance and Insurance	2.9	3.5	2.4	3.1	5.4	4.4
Real Estate, Rental, and Leasing	1.3	1.6	1.7	1.5	1.9	1.8
Professional and Technical Services	14.5	9.5	6.8	10.4	8.8	7.9
Management of Companies and Enterprises	0.6	1.2	0.5	0.8	2.1	1.4
Administrative and Waste Services	4.1	5.5	6.3	5.3	7.3	6.4
Educational Services	1.3	1.3	0.9	1.2	1.7	1.4
Health Care and Social Assistance	11.7	13.5	13.0	12.8	10.6	10.9
Arts, Entertainment and Recreation	1.7	1.2	1.5	1.5	1.7	2.1
Accommodation and Food Services	9.7	9.7	11.8	10.2	9.3	10.3
Other Services	2.8	3.1	2.7	2.9	3.1	3.0
Nonclassifiable	0.0	0.0	0.0	0.0	0.0	0.0
Government	16.5	16.3	18.1	16.8	14.5	16.5
State	0.0	2.1	0.0	0.9	3.0	3.5
Local	9.5	10.0	10.1	9.9	9.2	10.6
Federal	1.3	4.2	1.9	2.7	2.3	2.4

Source: Colorado Department of Labor and Employment, Quarterly Census of Employment and Wages, http://www.colmigateway.com/, as of July 14, 2013.

Employment Growth

Employment in the three-county region lagged the nation entering the recession and led the nation in the employment recovery. Current Employment Statistics (CES)[14] compiled by the Bureau of Labor Statistics show that local employment trends for the Boulder, Denver-Aurora-Broomfield, and Fort Collins–Loveland MSAs generally follow state and national patterns.

FIGURE 42: ANNUAL EMPLOYMENT GROWTH, PERCENTAGE, 2002–2012



Examining Quarterly Census of Employment and Wages (QCEW)[15] data from the Colorado Department of Labor and Employment provides greater industry detail than CES data. The 2007–2009 recession had lasting negative impacts on employment, with many sectors still below peak employment.

[14] CES data are revised, and often in cases of data fractures, the data are smoothed.
[15] QCEW data are not revised, and firm NAICS re-filing, or political boundary changes.

TABLE 42: EMPLOYMENT GROWTH BY SECTOR, COMPOUND ANNUAL GROWTH RATE, 2007–2012

Sector	Boulder	Jefferson	Larimer	Region	Denver MSA	Colorado
Total All Industries	0.4%	0.4%	1.8%	0.8%	1.7%	-1.1%
Private	-0.7	-0.3	1.2	0.0	0.7	-2.2
Agriculture, Forestry, Fishing, Hunting	10.6	41.2	9.6	16.6	23.6	-0.3
Mining	-71.9	-27.7	-10.9	-45.0	44.0	20.8
Utilities	-7.5	-1.0	-4.5	-2.8	1.7	1.1
Construction	-29.5	-27.7	-26.9	-27.7	-25.3	-31.0
Manufacturing	-7.3	-7.3	-4.7	-6.6	-11.2	-10.1
Wholesale Trade	-2.0	0.4	12.8	2.1	-3.7	-5.2
Retail Trade	-3.4	-6.3	-1.4	-4.2	-1.3	-3.9
Transportation and Warehousing	4.1	10.3	-4.3	3.2	-8.2	-6.6
Information	-4.9	-18.7	-2.9	-8.4	-10.3	-8.5
Finance and Insurance	-4.3	-7.1	-4.4	-5.7	-6.3	-7.7
Real Estate, Rental, and Leasing	-10.9	-19.1	-2.9	-12.7	-11.4	-12.5
Professional and Technical Services	4.2	15.2	-8.4	5.6	10.1	4.5
Mgmt of Companies and Enterprises	-36.3	-7.5	16.2	-14.5	14.1	11.8
Administrative and Waste Services	0.9	-13.4	14.6	-2.5	-0.6	-2.5
Educational Services	-1.6	10.1	17.0	7.2	18.5	16.8
Health Care and Social Assistance	13.2	42.3	19.6	26.4	20.2	17.3
Arts, Entertainment and Recreation	11.2	-15.6	2.6	-1.8	22.5	4.7
Accommodation and Food Services	6.3	-0.6	8.6	4.1	8.8	3.1
Other Services	6.8	2.9	7.5	5.2	5.8	1.4
Government	7.0	3.9	4.5	5.0	7.6	4.6
State	12.3	5.3	5.5	-77.9	14.4	12.7
Local	6.8	1.3	5.5	4.0	7.3	2.2
Federal	-11.1	9.9	3.7	4.9	0.7	4.8

Source: Colorado Department of Labor and Employment, QCEW, www.colmigateway.com/, as of July 14, 2013.

Unemployment

After peaking in 2010, unemployment rates have generally been on a steady decline in Colorado. Unemployment in the Denver-Aurora MSA was nearly on par with the state and lower than the nation. The Boulder and Fort Collins-Loveland MSAs fared markedly better than the state and the nation.

TABLE 43: UNEMPLOYMENT RATES, 2002–2012

Year	Boulder	Denver-Aurora	Fort Collins-Loveland	Colorado	United States
2002	5.80%	5.90%	4.70%	5.70%	5.80%
2003	5.8	6.4	5.1	6.1	6.0
2004	4.9	5.9	4.7	5.6	5.5
2005	4.5	5.2	4.5	5.1	5.1
2006	3.7	4.4	3.9	4.3	4.6
2007	3.3	3.9	3.4	3.8	4.6
2008	4.1	4.9	4.2	4.8	5.8
2009	6.8	8.3	7.0	8.1	9.3
2010	7.0	9.1	7.5	9.0	9.6
2011	6.4	8.6	6.9	8.6	8.9
2012	6.1	7.9	6.4	8.0	8.1

Note: Shading indicates peak unemployment from 2002–2012.
Source: Bureau of Labor Statistics, Local Area Unemployment Statistics, http://www.bls.gov/lau/home.htm, as of July 14, 2013.

Primary Employers

Table 44 through Table 49 present primary employers by selected region for location quotients greater than 1.2. These location quotients are sorted using the three-digit NAICS codes, and all use the nation as the employment base. Showing the percentage of employment alongside the location quotient displays the relative importance of the sector. If a sector has a high location quotient, but employs a small number of individuals, then it has a lower relative importance (e.g., in Table 44, compare Beverage and Tobacco Product Manufacturing to Professional and Technical Services).

TABLE 44: COLORADO PRIMARY EMPLOYERS, 2012

Subsector	Three-Digit NAICS	Location Quotient	Percentage of Employment
Animal Production	112	1.41	0.3%
Oil & Gas Extraction	211	2.83	0.4%
Mining, Except Oil & Gas	212	1.44	0.2%
Mining Support Activities	213	2.32	0.7%
Heavy & Civil Engineering Construction	237	1.22	0.8%
Specialty Trade Contractors	238	1.28	3.4%
Beverage & Tobacco Product Mfg	312	1.70	0.2%
Computer & Electronic Product Mfg	334	1.26	1.0%
Sporting Goods, Hobby, Book, Music Store	451	1.44	0.6%
Air Transportation	481	1.65	0.6%
Scenic & Sightseeing Transportation	487	1.25	0.0%
Publishing Industries, Except Internet	511	1.71	1.0%
Broadcasting, Except Internet	515	1.29	0.3%
Telecommunications	517	1.84	1.2%
Isps, Search Portals & Data Processing	518	1.78	0.3%
Real Estate	531	1.25	1.3%
Rental & Leasing Services	532	1.22	0.5%
Lessors Of Nonfinancial Intangible Asset	533	1.93	0.0%
Professional & Technical Services	541	1.31	7.9%
Amusements, Gambling & Recreation	713	1.51	1.6%
Accommodation	721	1.33	1.8%

Source: Colorado Department of Labor and Employment, Quarterly Census of Employment and Wages, http://www.coworkforce.com/lmi/es202/index.asp, as of July 13, 2013; Bureau of Labor Statistics, Quarterly Census of Employment and Wages, http://www.bls.gov/cew/, as of July 13, 2013.

TABLE 45: BOULDER COUNTY PRIMARY EMPLOYERS, 2012

Subsector	Three-Digit NAICS	Location Quotient	Percentage of Employment
Beverage & Tobacco Product Mfg	312	1.72	0.2%
Apparel Manufacturing	315	1.29	0.1%
Chemical Manufacturing	325	1.52	0.9%
Computer & Electronic Product Mfg	334	5.95	4.9%
Electrical Equipment & Appliances	335	1.21	0.3%
Miscellaneous Mfg	339	1.24	0.5%
Sporting Goods, Hobby, Book, Music Store	451	1.81	0.8%
Miscellaneous Store Retailers	453	1.20	0.7%
Nonstore Retailers	454	1.89	0.6%
Publishing Industries, Except Internet	511	6.79	3.8%
Isps, Search Portals & Data Processing	518	2.88	0.6%
Other Information Services	519	2.24	0.3%
Securities, Commodity Contracts, Investm	523	1.34	0.8%
Professional & Technical Services	541	2.42	14.5%
Amusements, Gambling & Recreation	713	1.24	1.4%
State	State	1.67	5.7%

Source: Colorado Department of Labor and Employment, Quarterly Census of Employment and Wages, http://www.coworkforce.com/lmi/es202/index.asp, as of July 13, 2013; Bureau of Labor Statistics, Quarterly Census of Employment and Wages, http://www.bls.gov/cew/, as of July 13, 2013.

TABLE 46: JEFFERSON COUNTY PRIMARY EMPLOYERS, 2012

Subsector	Three-Digit NAICS	Location Quotient	Percentage of Employment
Specialty Trade Contractors	238	1.44	3.8%
Nonmetallic Mineral Product Mfg	327	2.03	0.6%
Miscellaneous Mfg	339	3.19	1.4%
Electronics & Appliance Stores	443	1.23	0.5%
Building Material & Garden Supply Stores	444	1.35	1.2%
Food & Beverage Stores	445	1.24	2.7%
Sporting Goods, Hobby, Book, Music Store	451	1.78	0.8%
General Merchandise Stores	452	1.32	3.1%
Miscellaneous Store Retailers	453	1.50	0.9%
Pipeline Transportation	486	6.60	0.2%
Isps, Search Portals & Data Processing	518	2.98	0.6%
Lessors Of Nonfinancial Intangible Asset	533	3.27	0.1%
Professional & Technical Services	541	1.58	9.5%
Ambulatory Health Care Services	621	1.20	5.7%
Social Assistance	624	1.77	3.5%
Repair & Maintenance	811	1.26	1.1%
Federal	Federal	1.95	4.2%

Source: Colorado Department of Labor and Employment, Quarterly Census of Employment and Wages, http://www.coworkforce.com/lmi/es202/index.asp, as of July 13, 2013; Bureau of Labor Statistics, Quarterly Census of Employment and Wages, http://www.bls.gov/cew/, as of July 13, 2013.

TABLE 47: LARIMER COUNTY PRIMARY EMPLOYERS, 2012

Subsector	Three-Digit NAICS	Location Quotient	Percentage of Employment
Specialty Trade Contractors	238	1.58	4.2%
Beverage & Tobacco Product Mfg	312	5.42	0.8%
Plastics & Rubber Products Mfg	326	1.30	0.6%
Machinery Manufacturing	333	2.16	1.8%
Computer & Electronic Product Mfg	334	3.45	2.9%
Furniture & Home Furnishings Stores	442	1.23	0.4%
Building Material & Garden Supply Stores	444	1.26	1.1%
Clothing & Clothing Accessories Stores	448	1.28	1.4%
Sporting Goods, Hobby, Book, Music Store	451	2.43	1.1%
Miscellaneous Store Retailers	453	1.64	1.0%
Publishing Industries, Except Internet	511	1.67	0.9%
Isps, Search Portals & Data Processing	518	1.95	0.4%
Real Estate	531	1.27	1.4%
Performing Arts & Spectator Sports	711	1.36	0.4%
Accommodation	721	1.37	1.9%
Food Services & Drinking Places	722	1.31	9.9%
Repair & Maintenance	811	1.27	1.1%
State	State	1.78	6.1%

Source: Colorado Department of Labor and Employment, QCEW, www.coworkforce.com/lmi/es202/index.asp, as of July 13, 2013; Bureau of Labor Statistics, QCEW, http://www.bls.gov/cew/, as of July 13, 2013.

TABLE 48: DENVER MSA PRIMARY EMPLOYERS, 2012

Subsector	Three-Digit NAICS	Location Quotient	Percentage of Employment
Oil & Gas Extraction	211	3.57	0.5%
Specialty Trade Contractors	238	1.32	3.5%
Beverage & Tobacco Product Mfg	312	2.00	0.3%
Merchant Wholesalers, Durable Goods	423	1.38	3.0%
Furniture & Home Furnishings Stores	442	1.22	0.4%
Sporting Goods, Hobby, Book, Music Store	451	1.28	0.6%
Air Transportation	481	2.85	1.0%
Couriers & Messengers	492	1.26	0.5%
Publishing Industries, Except Internet	511	1.34	0.7%
Broadcasting, Except Internet	515	1.76	0.4%
Telecommunications	517	2.35	1.5%
Isps, Search Portals & Data Processing	518	2.40	0.5%
Securities, Commodity Contracts, Investm	523	1.50	0.9%
Insurance Carriers & Related Activities	524	1.23	1.9%
Real Estate	531	1.26	1.4%
Rental & Leasing Services	532	1.25	0.5%
Lessors Of Nonfinancial Intangible Asset	533	3.20	0.1%
Professional & Technical Services	541	1.46	8.8%
Management Of Companies & Enterprises	551	1.38	2.1%
Administrative & Support Services	561	1.20	7.0%
Museums, Historical Sites, Zoos, & Parks	712	1.43	0.1%

Source: Colorado Department of Labor and Employment, QCEW, http://www.coworkforce.com/lmi/es202/index.asp, as of July 13, 2013; Bureau of Labor Statistics, QCEW, http://www.bls.gov/cew/, as of July 13, 2013.

Firms

Table 49 shows the number of firms in each sector by county. Table 50 displays each sector's percentage of firms compared to the total for each county, and sectors with greater than 5% of the total area firms are shaded. While the industries with the greatest firm concentration are the same in the study areas, the relative concentrations vary.

TABLE 49: NUMBER OF FIRMS BY SECTOR AND COUNTY, 2012

Sector	Boulder	Jefferson	Larimer	Region	Denver MSA	Colorado
Total All Industries	13,148	17,925	10,164	41,237	85,631	172,300
Private	13,033	17,735	10,048	40,816	84,723	168,821
Agriculture, Forestry, Fishing, Hunting	50	47	74	171	186	1,429
Mining	29	96	44	169	621	1,611
Utilities	17	32	15	64	102	403
Construction	795	1,936	1,091	3,822	7,331	16,973
Manufacturing	558	496	434	1,488	2,422	5,280
Wholesale Trade	926	1,471	610	3,007	7,949	12,742
Retail Trade	1,109	1,769	1,149	4,027	7,774	17,261
Transportation and Warehousing	99	237	164	500	1,601	3,518
Information	341	275	169	785	1,594	3,101
Finance and Insurance	683	1,150	550	2,383	5,820	10,136
Real Estate, Rental and Leasing	630	828	497	1,955	4,353	9,091
Professional and Technical Services	3,428	3,693	1,777	8,898	16,777	30,436
Management of Companies and Enterprises	128	181	81	390	1,039	1,743
Administrative and Waste Services	670	1,058	581	2,309	5,140	9,947
Educational Services	258	265	148	671	1,334	2,444
Health Care and Social Assistance	1,285	1,520	895	3,700	6,989	14,253
Arts, Entertainment, and Recreation	230	226	178	634	1,012	2,553
Accommodation and Food Services	826	1,089	805	2,720	5,588	12,258
Other Services	956	1,355	775	3,086	7,004	12,983
Nonclassifiable	16	15	16	47	92	665
Government	115	190	116	421	908	3,479
State	17	24	21	24	169	711
Local	51	79	49	179	370	1,488
Federal	47	87	46	180	369	1,281

Source: Colorado Department of Labor and Employment, Quarterly Census of Employment and Wages, http://www.colmigateway.com/, as of July 14, 2013.

TABLE 50: PERCENTAGE OF AREA FIRMS BY SECTOR, 2012

Sector	Boulder	Jefferson	Larimer	Region	Denver MSA	Colorado
Total All Industries	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Private	99.1%	98.9%	98.9%	99.0%	98.9%	98.0%
Agriculture, Forestry, Fishing, Hunting	0.4%	0.3%	0.7%	0.4%	0.2%	0.8%
Mining	0.2%	0.5%	0.4%	0.4%	0.7%	0.9%
Utilities	0.1%	0.2%	0.1%	0.2%	0.1%	0.2%
Construction	6.0%	10.8%	10.7%	9.3%	8.6%	9.9%
Manufacturing	4.2%	2.8%	4.3%	3.6%	2.8%	3.1%
Wholesale Trade	7.0%	8.2%	6.0%	7.3%	9.3%	7.4%
Retail Trade	8.4%	9.9%	11.3%	9.8%	9.1%	10.0%
Transportation and Warehousing	0.8%	1.3%	1.6%	1.2%	1.9%	2.0%
Information	2.6%	1.5%	1.7%	1.9%	1.9%	1.8%
Finance and Insurance	5.2%	6.4%	5.4%	5.8%	6.8%	5.9%
Real Estate, Rental and Leasing	4.8%	4.6%	4.9%	4.7%	5.1%	5.3%
Professional and Technical Services	26.1%	20.6%	17.5%	21.6%	19.6%	17.7%
Management of Companies and Enterprises	1.0%	1.0%	0.8%	0.9%	1.2%	1.0%
Administrative and Waste Services	5.1%	5.9%	5.7%	5.6%	6.0%	5.8%
Educational Services	2.0%	1.5%	1.5%	1.6%	1.6%	1.4%
Health Care and Social Assistance	9.8%	8.5%	8.8%	9.0%	8.2%	8.3%
Arts, Entertainment, and Recreation	1.7%	1.3%	1.8%	1.5%	1.2%	1.5%
Accommodation and Food Services	6.3%	6.1%	7.9%	6.6%	6.5%	7.1%
Other Services	7.3%	7.6%	7.6%	7.5%	8.2%	7.5%
Nonclassifiable	0.1%	0.1%	0.2%	0.1%	0.1%	0.4%
Government	0.9%	1.1%	1.1%	1.0%	1.1%	2.0%
State	0.1%	0.1%	0.2%	0.1%	0.2%	0.4%
Local	0.4%	0.4%	0.5%	0.4%	0.4%	0.9%
Federal	0.4%	0.5%	0.5%	0.4%	0.4%	0.7%

Source: Colorado Department of Labor and Employment, Quarterly Census of Employment and Wages, http://www.colmigateway.com/, as of July 14, 2013.

Wages

Average wages vary substantially by sector and by location. Table 51 displays sector wages by county, with shaded cells indicating the average sector wages that are greater than area average wages. Wages in the Denver Metro region and in Boulder County were 11% and 13% higher, respectively, than the state average in 2012, and wages in the three-county research region were less than 1% lower than the state average. Federal wages, which include those for employees in many of the research facilities in this study, were between 39% and 77% higher than the average wages in their respective county or region.

TABLE 51: AVERAGE WAGE BY SECTOR, 2012

Sector	Boulder	Jefferson	Larimer	Region	Denver MSA	Colorado
Total All Industries	56,931	49,470	43,026	50,152	56,042	50,559
Private	58,072	48,862	42,135	50,066	56,415	50,915
Agriculture, Forestry, Fishing, Hunting	30,315	24,818	28,479	27,982	26,298	30,181
Mining	52,617	115,496	50,739	77,868	152,290	104,159
Utilities	86,341	106,711	68,535	96,283	101,543	97,269
Construction	45,707	50,280	48,464	48,864	52,540	50,151
Manufacturing	76,037	80,648	75,226	77,602	64,916	62,231
Wholesale Trade	84,090	88,556	60,465	80,777	77,314	73,376
Retail Trade	29,081	26,935	24,660	26,862	28,490	27,818
Transportation and Warehousing	39,367	54,595	38,128	45,225	46,970	45,512
Information	103,633	68,090	54,126	86,585	92,359	88,502
Finance and Insurance	79,985	62,441	58,999	67,098	86,348	77,594
Real Estate, Rental and Leasing	43,384	40,291	34,578	39,529	53,701	46,939
Professional and Technical Services	95,157	80,070	69,993	85,045	87,994	84,065
Mgmt of Companies and Enterprises	94,245	113,130	112,630	108,370	163,798	152,494
Administrative and Waste Services	33,865	35,829	30,810	33,779	37,013	35,487
Educational Services	31,271	33,199	27,470	31,383	41,165	38,650
Health Care and Social Assistance	46,760	42,020	46,728	44,658	47,974	45,698
Arts, Entertainment, and Recreation	20,324	20,394	17,038	19,444	40,465	31,027
Accommodation and Food Services	17,458	17,127	15,537	16,747	18,905	18,431
Other Services	36,034	32,955	29,675	33,098	35,855	34,714
Nonclassifiable	124,281	85,014	74,748	93,776	74,197	61,205
Government	51,147	52,593	47,049	50,575	53,841	48,760
State	56,519	49,476	48,043	51,918	58,255	52,496
Local	41,813	40,580	40,926	41,049	46,367	42,206
Federal	96,377	82,999	76,460	83,812	77,976	72,169

Source: Colorado Department of Labor and Employment, Quarterly Census of Employment and Wages, www.colmigateway.com/, as of July 14, 2013.

Retail Sales

Total retail sales in the three-county region exceeded $32.6 billion in 2012, or 20% of total retail sales in the state. This total accounted for 22% in 2002. Retail sales continued rebounding in 2012 in most areas, except Fort Collins, which experienced a modest decrease.

TABLE 52: RETAIL SALES

Location	2002	2011	2012	CAGR 2002–2012	Growth 2011–2012
Boulder	6,110,463,577	9,139,050,496	9,632,111,521	4.7%	5.4%
Boulder (city)	3,101,078,133	4,204,616,890	4,424,127,408	3.6%	5.2%
Jefferson	10,923,476,548	13,439,270,073	14,854,613,725	3.1%	10.5%
Golden	1,238,991,061	1,234,743,940	1,361,863,326	1.0%	10.3%
Lakewood	3,095,682,956	4,331,658,805	5,321,357,331	5.6%	22.8%
Larimer	5,661,033,391	7,909,838,866	8,119,592,478	3.7%	2.7%
Fort Collins	3,333,531,488	4,069,396,450	4,011,732,316	1.9%	-1.4%
Colorado	103,777,621,474	154,697,942,972	163,414,103,622	4.6%	5.6%

Source: Colorado Department of Revenue, Calendar Year City and County Summaries, http://www.colorado.gov/, retrieved July 8, 2013.

Building Permits

In 2012, a total of 4,173 residential building permits were issued in Boulder, Jefferson, and Larimer counties, an increase of more than 48% from 2011 but 40% below the 2004 total. This three-county market represented 17.9% of the total building permits issued in the state in 2012.

Within the region, Boulder County experienced the greatest increase in building permits from 2011 to 2012 (+96%). Larimer County and Jefferson County permits increased 57% and 5%, respectively. The City of Boulder increased by the greatest percentage, linked to multifamily housing. Colorado permits grew faster than the nation in 2012.

TABLE 53: TOTAL RESIDENTIAL BUILDING PERMITS, 2002–2012

Location	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Boulder Cnty	1,717	1,428	1,372	1,141	746	635	1,022	345	657	661	1,295
Boulder	293	163	216	184	179	140	532	119	453	115	415
Jefferson Cnty	1,924	1,426	2,344	2,094	2,044	218	589	379	577	958	1,010
Golden	206	72	56	20	18	42	12	78	33	63	2
Lakewood	287	289	236	321	481	170	186	59	200	116	325
Larimer Cnty	3,036	3,003	3,252	2,887	2,240	1,341	1,265	451	1,153	1,192	1,868
Fort Collins	1,262	1,051	1,058	1,112	719	611	786	233	246	714	1,144
Colorado (Ths.)	48	40	46	46	38	29	19	9	12	14	23
U.S. (Ths.)	1,748	1,889	2,070	2,155	1,839	1,398	905	583	605	624	830

Source: U.S. Census Bureau, http://www.census.gov/const, as of July 8, 2013.

The total value of residential construction in the three-county region was $784 million in 2012. This accounted for 17.6% of the total value of residential construction in the state.

TABLE 54: RESIDENTIAL VALUE OF CONSTRUCTION, 2002–2012, MILLIONS

Location	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Boulder Cnty	$262	$225	$257	$231	$172	$149	$205	$65	$127	$132	$200
Boulder	42	23	24	22	19	16	103	23	72	25	63
Jefferson Cnty	276	297	410	446	364	1,062	146	98	143	164	248
Golden	25	14	12	9	5	12	3	10	8	8	1
Lakewood	72	77	57	71	81	37	33	19	45	34	73
Larimer Cnty	398	431	559	499	386	297	212	92	183	212	336
Fort Collins	192	204	251	201	136	108	104	41	45	87	154
Colorado ($B)	6.4	6.3	8.1	8.8	7.8	6.1	4.0	2.1	2.6	2.9	4.4
U.S. ($B)	219.2	249.7	292.4	329.3	291.3	225.2	141.6	95.4	101.9	105.3	140.4

Source: U.S. Census Bureau, http://www.census.gov/const, as of July 8, 2013.

Costs of Living

From 1992 to 2002, the Denver-Boulder-Greeley CPI (All Items Index) exceeded the U.S. CPI, recording a CAGR of 3.6% compared to 2.5% for the nation. From 2002 through 2012 this trend reversed, with the Denver-Boulder-Greeley CPI falling below the national average (2% compared to 2.5%). Core inflation (all items minus food and energy) followed a similar trend, with prices increasing at a slower rate in the Denver-Boulder-Greeley region compared to the nation between 2002 and 2012.

TABLE 55: CONSUMER PRICE INDEX

	Denver-Boulder-Greeley CPI				U.S. CPI			
Year	All Items	Percent Change	Core	Percent Change	All Items	Percent Change	Core	Percent Change
1992	130.3	3.7%	135.1	4.2%	140.3	3.0%	147.3	3.7%
1993	135.8	4.2	141.9	5.0	144.5	3.0	152.2	3.3
1994	141.8	4.4	148.8	4.9	148.2	2.6	156.5	2.8
1995	147.9	4.3	155.8	4.7	152.4	2.8	161.2	3.0
1996	153.1	3.5	161.9	3.9	156.9	3.0	165.6	2.7
1997	158.1	3.3	166.8	3.0	160.5	2.3	169.5	2.4
1998	161.9	2.4	171.7	2.9	163.0	1.6	173.4	2.3
1999	166.6	2.9	176.6	2.9	166.6	2.2	177.0	2.1
2000	173.2	4.0	182.7	3.5	172.2	3.4	181.3	2.4
2001	181.3	4.7	190.5	4.3	177.1	2.8	186.1	2.6
2002	184.8	1.9	196.4	3.1	179.9	1.6	190.5	2.4
2003	186.8	1.1	196.7	0.2	184.0	2.3	193.2	1.4
2004	187.0	0.1	194.4	-1.2	188.9	2.7	196.6	1.8
2005	190.9	2.1	195.6	0.6	195.3	3.4	200.9	2.2
2006	197.7	3.6	203.5	4.0	201.6	3.2	205.9	2.5
2007	202.0	2.2	207.1	1.8	207.3	2.8	210.7	2.3
2008	209.9	3.9	212.8	2.8	215.3	3.8	215.6	2.3
2009	208.5	-0.6	216.4	1.7	214.5	-0.4	219.2	1.7
2010	212.4	1.9	219.4	1.4	218.1	1.6	221.3	1.0
2011	220.3	3.7	224.4	2.3	224.9	3.2	225.0	1.7
2012	224.6	1.9	228.9	2.0	229.6	2.1	229.8	2.1
CAGR 1992-02	3.6%	-	3.8%	-	2.5%	-	2.6%	-
2002-12	2.0%	-	1.5%	-	2.5%	-	1.9%	-

Note: 1982-84=100.

Source: Bureau of Labor Statistics, http://www.bls.gov/data/, retrieved July 8, 2013.

APPENDIX 4: ASSESSED VALUATION, REVENUE, AND AVERAGE LEVIES BY COUNTY

County	Assessed Valuation	Total Revenue	County Mill Levy	Average Municipal Levy (2)	Average School Levy	Average Special Levy (3)	Total Average County Levy
Adams*	$4,572,463,290	$486,881,412	26.806	7.259	56.272	3.598	106.481
Alamosa	$147,703,135	$12,080,578	25.238	6.734	41.666	2.671	81.79
Arapahoe*	$7,428,089,170	$745,516,612	17.316	8.001	53.817	3.311	100.365
Archuleta	$322,821,640	$19,407,492	18.233	1.583	22.819	3.435	60.118
Baca	$74,057,965	$4,713,196	24.539	27.714	24.099	3.729	63.642
Bent	$74,139,890	$4,974,317	30.596	39	24.279	2.006	67.094
Boulder*	$5,627,815,998	$485,032,312	24.645	12.057	45.521	1.651	86.185
Broomfield*	$1,057,183,430	$114,594,120	17.511	11.457	52.466	6.696	108.396
Chaffee	$364,982,847	$17,297,328	8.407	5.561	29.624	1.574	47.392
Cheyenne	$147,986,435	$6,257,791	18.16	36.249	15.706	1.291	42.286
Clear Creek	$561,745,350	$37,762,137	38.056	7.483	19.761	3.07	67.223
Conejos	$60,536,221	$3,923,016	24.797	19.081	24.168	2.744	64.804
Costilla	$129,534,537	$8,219,287	20.086	19.482	30.024	3.662	63.452
Crowley	$36,916,946	$2,371,015	41.743	23.055	17.231	0.835	64.226
Custer	$99,457,870	$5,920,688	20.245	4.25	27.306	2.81	59.53
Delta	$309,907,410	$17,140,682	14.487	2.06	27.55	1.542	55.309
Denver*	$10,937,453,830	$819,805,987	28.419	-	42.265	1.968	74.954
Dolores	$87,561,824	$5,013,752	28.013	23.477	19.52	1.472	57.26
Douglas*	$4,504,735,760	$475,795,574	19.774	1.854	48.788	4.882	105.621
Eagle*	$2,780,755,240	$170,330,781	8.499	6.065	22.831	3.278	61.253
Elbert	$256,371,700	$21,778,195	28.137	18.61	34.656	5.562	84.948
El Paso*	$6,321,760,160	$439,518,138	7.597	4.753	47.892	2.668	69.525
Fremont	$432,128,720	$26,514,882	12.966	5.292	33.551	2.771	61.359
Garfield*	$3,763,899,520	$164,161,496	13.655	5.539	14.685	2.105	43.615
Gilpin	$349,037,330	$14,211,414	9.84	1.19	16.867	5.904	40.716
Grand	$817,000,040	$46,331,542	15.155	5.931	20.729	3.406	56.709
Gunnison*	$700,809,690	$36,528,017	11.328	8.517	26.201	2.602	52.123
Hinsdale	$61,767,360	$2,820,675	17.252	3.381	18.484	1.828	45.666
Huerfano	$123,167,180	$8,291,649	20.927	8.568	29.088	2.907	67.32
Jackson	$38,503,020	$1,750,804	16.15	12.027	23.041	2.419	45.472
Jefferson*	$6,997,605,972	$672,425,610	24.346	4.992	48.721	3.659	96.094
Kiowa	$38,003,960	$3,278,085	46.553	40.86	22.696	3.697	86.256
Kit Carson	$132,357,283	$10,371,807	37.942	12.19	30.191	1.229	78.362

Lake	$116,726,627	$9,104,800	34.413	11.272	30.746	4.651	78.001
La Plata	$2,394,149,370	$77,144,555	8.5	2.755	15.161	1.739	32.222
Larimer*	$4,111,602,863	$361,665,245	22.472	9.503	47.197	2.392	87.962
Las Animas	$525,708,330	$15,993,903	8.43	17.001	13.309	1.931	30.424
Lincoln	$91,232,030	$6,357,253	33.5	21.058	28.784	1.111	69.682
Logan*	$266,906,100	$20,270,460	29.919	14.616	36.529	1.231	75.946
Mesa*	$2,032,061,070	$117,607,911	12.273	8.379	31.755	1.841	57.876
Mineral	$37,195,094	$2,116,452	26.291	11.181	22.353	3.172	56.901
Moffat	$487,067,917	$30,923,591	23.926	19.019	30.149	1.3	63.489
Montezuma	$589,743,730	$27,930,708	14.254	2.637	20.261	1.681	47.361
Montrose	$563,242,320	$32,339,411	16.879	0.664	23.706	3.015	57.417
Morgan	$410,323,350	$32,670,728	28.948	14.864	38.75	1.985	79.622
Otero*	$126,123,477	$7,945,119	21.948	10.05	32.275	1.259	62.995
Ouray	$182,571,600	$9,531,885	13.162	9.948	24.736	1.961	52.209
Park	$440,653,545	$24,453,653	17.955	12.591	22.852	3.333	55.494
Phillips	$56,488,730	$5,031,829	28.28	21.341	35.55	3.156	89.077
Pitkin	$2,768,117,000	$103,148,689	7.044	6.295	11.467	1.543	37.263
Prowers*	$125,454,890	$8,259,614	27.17	14.441	28.203	1.743	65.837
Pueblo*	$1,559,121,400	$139,559,048	31.639	15.62	36.167	3.108	89.511
Rio Blanco	$1,303,991,810	$54,109,318	9.05	8.398	8.695	2.798	41.495
Rio Grande	$174,910,113	$10,215,491	15.567	8.991	30.756	1.466	58.404
Routt*	$1,146,665,639	$56,005,947	14.955	0.916	21.038	1.737	48.842
Saguache	$64,221,838	$5,426,989	22.596	17.717	35.649	6.954	84.504
San Juan	$48,912,560	$1,955,944	19.641	10.56	12.981	1.523	39.989
San Miguel	$862,036,850	$35,183,593	10.12	10.424	10.461	2.289	40.814
Sedgwick	$56,148,860	$3,829,267	33.079	38.584	26.303	0.745	68.198
Summit	$1,601,896,850	$83,041,892	12.796	4.662	20.199	3.149	51.84
Teller*	$483,119,690	$28,005,813	14.663	10.855	27.119	4.155	57.969
Washington	$120,080,929	$7,858,193	30.251	55.466	28.599	0.874	65.441
Weld*	$5,421,862,840	$383,330,046	16.804	13.444	28.99	3.085	70.701
Yuma	$290,490,100	$20,036,227	21.786	25.063	29.467	1.968	68.974
Total:	$87,817,088,245	$6,612,073,967	18.947	7.745	37.627	2.918	75.294

(1) Average will not add to the Total Average County Levy because denominators (Assessed Valuation) are not common to all.
(2) Municipal Revenues are divided by the sum of Municipal Assessed Valuation.
(3) Special District Revenues are divided by the sum of Special District Assessed Valuation.
*These figures include tax increment valuation, and all tax revenues attributable to the increment are allocated to the increment financing authority only.
Source: Colorado Department of Local Affairs, http://dola.colorado.gov/dpt/publications/docs/2011_Annual_Report/SECXI.pdf, retrieved July 14, 2013.

APPENDIX 5: NCAR CASE STUDY

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NCAR: Forecasting Fire, Water, and the Renewable Energy Future

The National Center for Atmospheric Research (NCAR) seeks to develop and transfer knowledge and technology that contributes to the betterment of life on Earth. Guided by this mission, NCAR scientists study the behavior of the Earth system. Many of the phenomena studied by NCAR—wildfire, water, and production of renewable energies developed from wind and sun—have critical significance for Colorado. NCAR researchers' knowledge on atmospheric science, experience with technology transfer, and effectiveness at collaborating with decision makers, those in private industry, and scientists at other top research organizations uniquely qualifies the center to support our nation's efforts to better understand wildland fires and streamflow dynamics, as well as aid the transition toward renewable energy.

Wildfire

Colorado is no stranger to wildfires. As Colorado and many other parts of the western United States know all too well, such fires can adversely affect humans and ecosystems as well as water and air quality. The heat and smoke from fires also can influence nearby cloud systems and precipitation patterns. On average, the United States spends $2 billion per year on fire suppression but, according to economists, loses as much as 10 to 50 times that amount in timber and forage values, landscape rehabilitation, lost recreational opportunities, local business activity, and losses from flooding and mudslides in burn areas.

NCAR scientist Janice Coen has developed Earth system models to improve understanding and prediction of wildfire growth and dynamics. The Coupled Atmosphere-Wildland Fire Environment (CAWFE) model pairs an NCAR-developed weather prediction model with a wildland fire behavior model that represents how wildfires might propagate across a landscape. The weather model is one used to make daily weather predictions, while the wildland fire component shows how weather, topography, and fuels such as vegetation affect how fast a fire spreads. This fire modeling capability has also been added to the advanced research version of the Weather Research and Forecasting (WRF) model, a

forecasting model widely used around the world that is maintained and supported by NCAR and available in the public domain as WRF-Fire.

"Most models, including operational models used by firefighters, assume that environmental factors such as topography, fuel load, and weather independently influence wildfire characteristics and growth," explains Coen. "In reality, they interact in a complex way that is difficult to predict, which makes simplistic models less than ideal when trying to forecast wildfire behavior." For instance, precipitation patterns and long-term climate patterns like drought affect the moisture content in the vegetation fueling the fire. Steeper terrain brings flames into greater contact with available fuel. Additionally, Coen explains, fires create their own weather, with the heat and moisture created by the fire feeding back into the atmosphere to create intense winds that can drive a fire's behavior.

Simple operational tools used by firefighters estimate how fast the leading edge of the fire will move. However, in addition to predicting the extent of a fire as it changes over time, models like CAWFE or WRF-Fire predict aspects of a fire's shape, such as when it might split into two heading regions, and dynamics, such as when a fire might suddenly intensify or where dangerous fire whirls are likely to form. Because it contains a weather model, CAWFE can also show when cloud downdrafts might suddenly cause a fire to change direction or speed up, as occurred in the 2012 Waldo Canyon fire in Colorado Springs, and where terrain will make airflow accelerate, which commonly occurs during Front Range windstorms. Coen has been using CAWFE to analyze the 2012 High Park fire near Estes Park.

"Looking at the map of where the High Park fire traveled, I couldn't understand why the fire had traveled northeast before rushing east until I saw the airflow simulated by the model and where it drove the fire," says Coen. "Capturing how the mountains and mountain valleys shaped the winds during the fire was crucial in making that simulation a success."

CAWFE can be used to test how land management techniques such as tree thinning might affect future fire behavior. The model may also indicate wildfire effects on soil and water resources and storage.

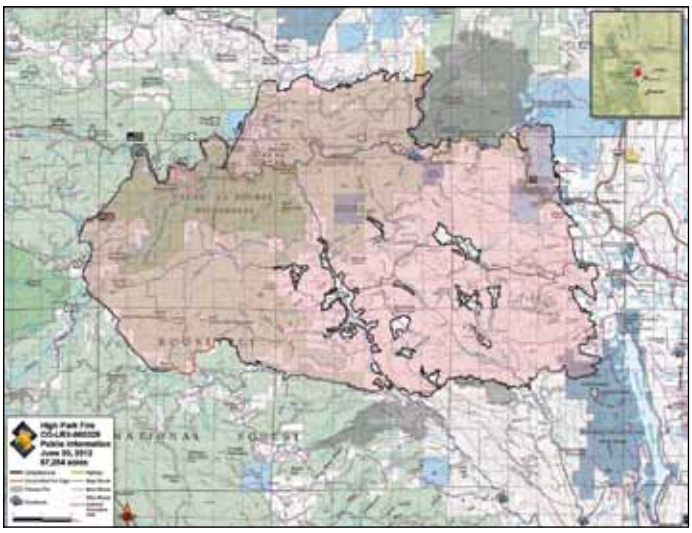

Photo credit: SunEdison & Zinn Photography

Coen's first goal with the models is to gain knowledge of the complex interactions and feedbacks between the atmosphere and fire behavior. Another is to develop decision support tools for fire managers, as well as land, water, and air quality managers and community officials. In addition to improving the ability to predict fire behavior, this technology could be leveraged for other goals: enhancing training, allowing stakeholders to explore a variety of cases, developing better awareness among responders of why large fire events unfold as they do, and mapping where conditions create a perfect storm for explosive fire growth.

Renewable Energy

Even with NCAR scientists' years of weather forecasting experience, solar irradiance (the amount of incoming solar energy) and wind remain among the most difficult weather variables to forecast. Topography, surface roughness, ground cover, temperature inversions, foliage, low-level jets, and clouds all affect wind and solar energy prediction skill. However, those making decisions about renewable energy—such as locating energy generation sites—need accurate knowledge of the state of the atmosphere.

Combining scientific and forecasting knowledge, expertise in technology transfer, and long-standing collaborations, NCAR scientists and engineers provide assessments of renewable resource capabilities and feasibility, along with forecasts of atmospheric conditions. These improve the operations and economics of incorporating wind and solar energy into the power mix, and provide the ability to characterize and quantify the variability of renewable resources.

"NCAR's expertise spans the gamut of forecasting requirements for renewables," says Sue Ellen Haupt, director of NCAR's Weather Systems and Assessment Program and lead researcher in NCAR's solar energy project. "We provide 'nowcasts' and forecasts out to several days of wind and solar energy production, helping it to be used efficiently and economically. We also have models that predict how changing climate may affect wind and solar resources and their variability. This allows for better planning of where to site energy-generating plants."

As wind and solar energy portfolios expand, the need for accurate forecasts is taking on new urgency, says Haupt. Errors in wind and solar energy forecasting may lead to substantial economic losses, constraining state and national expansion of renewable energy in the process, she adds.

NCAR is among the nation's leaders in taking on this research challenge. Working with Xcel Energy and the National Renewable Energy Laboratory, NCAR designed a highly detailed wind energy forecasting system that saved Xcel ratepayers roughly $22 million in a three-year period. The center is also creating advanced prediction capabilities to enable wind-farm developers to anticipate wind energy potential anywhere in the world. In addition to wind and solar power forecasting, NCAR provides decision makers with information about the effects of turbines on the nearby environment, as well as analyses of the effects (and likelihood) of icing of wind turbine blades, which is crucial for wind-energy operation.

The U.S. Department of Energy's Sunshot program, which partners NCAR, universities, national laboratories, and other energy and forecasting companies, will generate detailed predictions of clouds and atmospheric particles that can reduce incoming energy from the Sun. In the early stages of development, this system will forecast sunlight and resulting power every 15 minutes over specific solar facilities, enabling utilities to continuously anticipate the amount of available solar energy.

"As is the case with wind, utility managers have to know how much sunlight will reach solar energy plants so they can supply sufficient power when their customers need it," explains Haupt. "These detailed cloud and irradiance forecasts are a vital step in using more energy from the Sun and making the solar energy market more cost competitive."

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Water

Water is deeply connected to the identity and development of the western United States. Water demands and rights, and its sustainability and availability as a resource, have all been issues since the nineteenth century. These issues will likely continue to be of concern to those living in Colorado and the West for generations to come, particularly in the face of a changing climate. In part because of its strong influence on state interests, hydrologic research has been a particular focus for meeting water managers' and users' needs.

Scientists and resource managers rely on hydrologic models to estimate water flow, water storage, and related dynamics within and across drainage basins. Traditionally, these models make predictions of what is going on in a hydrologic system based on information, such as rainfall or streamflow, gathered at a series of unique locations over a period of time. Usually, the processes influencing hydrologic behavior get lumped together into one effective unit, such as a watershed, with the models often neglecting the details of the processes going on within watersheds—for example, the routing of water or sediments. Additionally, these traditionally "lumped" hydrologic models often do not factor in the large meteorological variations that occur over watersheds, such as rain, snow, wind, and temperature, all of which can have important effects on how a watershed behaves.

"Because it has been very difficult to see or observe streamflow as a continuum across the system, a level of predictability is lost," explains David Gochis, an NCAR scientist focused on hydrologic issues and modeling. "These gaps in our observing capacity may lead to surprises in terms of hydrologic dynamics, such as where water flow might be more or less than has been assumed. Such detail may have important repercussions for resource managers who require accurate information for planning and, in many cases, safety requirements."

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Models currently under development are in the process of making a transformative leap, allowing researchers to integrate hydrologic and weather information. Among these is WRF-Hydro. Released in April 2013, WRF-Hydro provides a framework that links weather forecasting models with hydrologic models, allowing users to visualize and integrate hydrologic model outputs with weather predictions. If it rains in a basin, for example, WRF-Hydro users can identify and predict the impacts of that precipitation continuously across the landscape through time.

In the next several years, says Gochis, more hydrologists expect to move past today's "lumped" and point-oriented descriptions of watersheds toward a future where useful information is available at all locations along water channel networks and across the landscape. In effect, WRF-Hydro and similar hydrologic modeling systems will be able to provide continuous information across space and time on the hydrologic responses occurring across river systems. For example, based on an afternoon's weather forecast and knowledge about past, present, and future environmental conditions, models may help predict precisely a wave of water that develops 10 or 20 minutes in the future, thereby benefiting flood-prediction and other water management capabilities.

While the technical ability to model the system as a whole is within reach, large areas of uncertainty exist and collaboration across sectors of the hydrological and meteorological communities is greatly needed to advance the process. Having experts working together to combine the best of the available models into a single, national hydrologic model would ensure a go-to, tested resource for water managers and researchers. As Gochis explains, "Exciting days for hydrologic modeling and the research community involved in this area exist ahead, but we have much to learn, with the first step being to develop a community framework for such a model. NCAR researchers look forward to being part of these ongoing and future efforts."

APPENDIX 6: NREL CASE STUDY #1

Public-Private Partnerships and Technology Transfer: NREL's New User Facility

In the last four years, solar generation in the United States has more than doubled, while at the same time the costs of photovoltaic (PV) systems have dropped 80%. As more and more solar power contributes to the U.S. energy mix, lower cost advanced solar inverters will help usher in an increasingly diverse electricity portfolio, while providing domestic consumers and businesses with reliable, affordable energy options. At least that's the intention of Colorado-based Advanced Energy Industries, the first private company partnering with the National Renewable Energy Laboratory (NREL) to start work at the lab's new Energy Systems Integration Facility (ESIF).

NREL, located in Golden, is the U.S. Department of Energy's primary national laboratory for renewable energy and energy efficiency research and development. Opened in 2013, ESIF significantly expanded the lab's overall capacity for incorporating large-scale hardware experimentation with advanced computations and simulations. Once fully outfitted, this 185,000 square foot, $135 million facility will house approximately 200 scientists and engineers, more than 15 laboratories, an advanced visualization center, control room, and multiple outdoor test beds.

ESIF is the only designated user facility in the nation specifically focused on helping both public- and private-sector researchers scale-up promising clean energy technologies—from solar modules and wind turbines to electric vehicles and efficient, interactive home appliances—and test how they interact with each other and the grid at utility-scale. It is the latest addition to the Energy Department's national network of user facilities that provides nearly 30,000 scientists and engineers each year with open access to some of the world's most state-of-the-art instruments and tools, including X-ray sources, accelerators, and supercomputers. The cost of accessing the facility varies depending on whether the user is willing to openly publish the results of the experiment or intends to keep the information proprietary.

Together, NREL and private partners, such as Advanced Energy, will be able to conduct fully integrated experiments of new technologies in a controlled setting that provides the ability to interact interface physically or virtually with elements of the system in which the new technology will be eventually deployed. This both furthers NREL's cutting-edge research and allows the companies to develop and test their products at full scale without having to absorb the enormous

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costs associated with creating their own large-scale lab settings. With ESIF's unique features and capabilities, NREL and its partners will be able to fully assess systems as a whole, offering the opportunity to conduct more realistic studies of the performance and reliability of new technologies before attempting to move them into the market.

Advanced Energy, for example, is testing its new solar PV inverter technology using ESIF's utility-scale grid simulators in a hardware-in-the-loop system configuration. Solar inverters are responsible for a number of critical functions within a solar PV system, including converting the direct current output into alternating current for the grid. Advanced Energy's inverters are designed to support a smarter grid that can handle two-way flows of power and communication while reducing hardware costs.

The unique, large-scale hardware-in-the-loop capabilities of ESIF provide private-sector partners the ability to evaluate early-stage prototype technologies at actual power and load levels in real-time simulation. By doing so, ESIF can reduce the risk and time associated with the transition from prototype to manufacturing product line.

These research and development assets, coupled with participation from utility companies, equipment manufacturers, universities, and other stakeholders, will help to accelerate a transformation of the nation's energy system into one that is cleaner, more secure, and more reliable.

Overall, with ESIF, NREL aims to advance highly integrated, flexible, and efficient systems that enable utilization of clean energy sources while maintaining system reliability at an affordable cost. A near-term focus is on the future of power systems with efforts aimed at overcoming generation, transmission, distribution, and end-use challenges, including research into next generation building technologies, microgrids, fuel cells, energy storage, and integration of renewable energy and electric vehicles at the distribution level. As the cost of clean technologies continues to decline, efficient grid integration enabled by technologies such as advanced inverters will make these new approaches affordable, while providing Americans more control over how they use energy in their homes and businesses.

With ESIF and all of its other facilities offering unique opportunities to further clean energy research and development, NREL continually strives to develop new partnerships with industry, academia, and other stakeholders to promote energy integration through a broad range of interrelated efforts. The lab's holistic and multidisciplinary approach to energy systems integration at ESIF, specifically, will provide economic, security, and environmental benefits to the nation and help meet the challenges of an increasingly complex energy future.

Photo credits: Dennis Schroeder / NREL

APPENDIX 7: NREL CASE STUDY #2

GE-PrimeStar & NREL: A Collaboration in Solar R&D

Renewable energy is a $240 billion per year market worldwide and continues to grow. As globalization intensifies competition over energy resources, the United States must promote research, development, and commercialization of cleaner, more efficient energy technologies. With its burgeoning renewable energy industry, Colorado is poised to take a central role in these efforts. One prominent example of the state's growing presence in the clean energy field is PrimeStar, an Arvada-based solar panel manufacturer that was founded on the use of commercialized technology developed at the National Renewable Energy Laboratory (NREL).

In February 2007, NREL and PrimeStar signed an $870,000 Cooperative Research and Development Agreement (CRADA) to begin work on transitioning NREL's leading cadmium telluride photovoltaic (PV) technology to commercial mass production. CRADAs are used by the U.S. Department of Energy's (DOE) national labs and private industry collaboration partners to promote technology transfer. Under these agreements, outside groups can benefit from NREL's research capabilities, technologies, or intellectual property to bolster an existing or start-up business.

Using NREL's cadmium telluride PV technology, PrimeStar developed thin-film solar panels that were certified by NREL as the most efficient of their kind, converting 12.8% of sunlight into electricity. Conventional solar panels, made of silicon, convert between 16% and 20% of the sunlight hitting the panel into electricity, but since the thin-film cadmium telluride panels use 99% less chemical material than conventional cells, they are often cited as one of the most affordable alternative solar technologies in the industry.

In addition to the technology transfer component, the CRADA also provided PrimeStar access to NREL's world-class PV scientists and state-of-the-art equipment and capabilities. At the time of the agreement, PrimeStar leased a 16,000 square foot facility near NREL in Golden to develop a pilot plant, as well as raised $6 million in private capital. The DOE later invested $3 million so NREL's solar incubator program could help PrimeStar develop the technology to pilot scale, and then in 2008, the largest energy company in the world, General Electric, invested $600 million in the technology.

GE announced in August 2013 that it was transferring PrimeStar's

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technology to Arizona-based First Solar in exchange for stock. GE and First Solar will continue to work on developing the technology in New York.

Despite these rough economic waters for the solar industry, the United States still leads the world in the research and scientific work that fuels solar innovations. China now has a 50% share in global solar equipment exports, in contrast to the United States's 7%, but innovations such as PrimeStar's that are more cost-and energy-efficient can make U.S. manufacturing an attractive alternative to shipping that work overseas moving forward. Companies like PrimeStar also enjoy a critical advantage over the competition when it comes to boosting global competitiveness: the opportunity to partner with government research organizations like NREL.

Whether it's licensing a pre-existing NREL technology, like the cadmium telluride PV technology, or utilizing NREL's world-class research facilities and experts, companies have unparalleled access to the key resources that are critical to the development of their technologies into fully marketable products. This access allows companies to avoid investing exorbitant amounts of money in facilities, infrastructure, and know-how of their own. One key resource, for example, is the opportunity to utilize the Process Development and Integration Laboratory (PDIL) that is run by the National Center for Photovoltaics within NREL.

The PDIL is a unique facility where universities and private companies can partner with NREL scientists to work collaboratively on a wide range of PV technologies and materials, from the traditional silicon to a variety of thin films, like PrimeStar's. The lab is designed to accelerate technological development through the use of advanced equipment, processing techniques, and device structures, all in an effort to facilitate greater integration among the tools, data, and materials that are involved in PV research. By the end of 2012, the National Center for Photovoltaics had ongoing partnerships with more than 90 academic, industrial, and other national laboratories and federal bodies, 27 of which were through CRADAs accounting for $15.6 million in activity.

Overall, NREL offers unique opportunities to build public-private partnerships that will continue to provide the resources and expertise needed for the lab to promote its state-of-the-art clean energy research and for U.S. businesses to further the nation's competitive edge globally.

Photo credits: Warren Gretz, NREL

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APPENDIX 8: CDC CASE STUDY

Protecting the Public: The CDC's Ongoing Battle Against Bunyaviruses

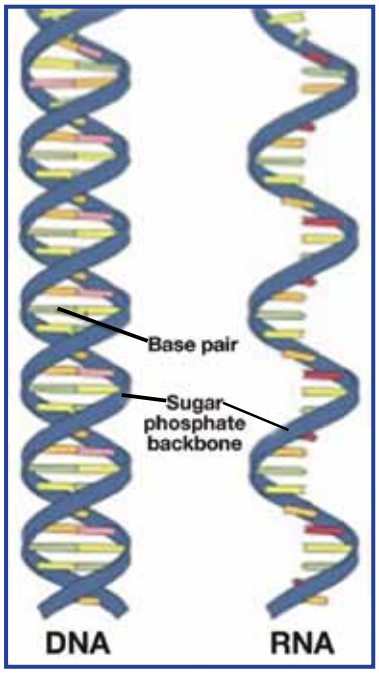
Amy Lambert is on the hunt for bunyaviruses. As a microbiologist in the Arboviral Diseases Branch of the Center for Disease Control and Prevention's (CDC) Division of Vector-Borne Diseases (DVBD), Dr. Lambert works on the molecular characterization and detection of bunyaviruses—one of the largest and least understood groups of viral pathogens. Her job is one of both discovery and description.

Bunyaviruses are transmitted by a variety of mechanisms to both animals and plants. The ones Lambert investigates are those are transmitted by arthropod vectors. Examples of such bunyaviruses are Rift Valley fever virus in Africa and Lacrosse virus in the United States, both transmitted by mosquitoes. Like influenza, the "bunyas" have segmented genomes that frequently reassort, resulting in mutants that are capable of being transmitted between animals and humans. Working from her laboratory in Fort Collins, Lambert is one of only a few scientists in the world focused on expanding knowledge of bunyavirus genetics.

Working with bunyaviruses is complicated by their nearly unparalleled level of diversity. "Many bunyaviruses have not been described at the nucleotide sequence level," Lambert explains. "This precludes the detection of novel viruses using most techniques. Basically, we would need to know what we're looking for and what it looks like before we can say that we've found it." The lack of descriptive data has made the development of diagnostic tools for these viruses very challenging.

"Next Generation Sequencing (NGS) has been a huge boon to my work because it isn't inherently selective and targeted in its approach, which allows for the generation of descriptive data from known bunyaviruses of diverse origin and limited description. These data ultimately support additional efforts to describe new and emerging viruses as well as the development of additional diagnostic tests for those viruses."

NGS refers to technologies that generate enormous volumes of DNA or RNA sequence in a non-target-specific fashion. Public health researchers like Lambert can now sequence the entire genomes of unknown or poorly characterized viruses at a speed, accuracy, and economy impossible only a few years ago. Relatively inexpensive NGS machines are democratizing a highly technical operation, transferring technical capacity to laboratories and freeing core facilities to tackle only the most demanding tasks.



"One specific instrument we have is the Ion Torrent Personal Genome Machine (PGM)," says Lambert. The PGM has a semiconductor chip that has been modified to contain millions of sequencing vessels that monitor and react to tiny changes in pH that occur when a strand of DNA grows. This technological simplicity, along with a relative ease of use and affordability helped guide the decision for DVBD to bring the PGM in-house.

This does not mean Lambert and her colleagues have not had to overcome challenges in using the PGM. The machine was designed to sequence DNA genomes, but Lambert works with RNA viruses. Because of the molecular and structural differences between DNA and RNA viruses, Lambert and other core users at DVBD have had to write many of their own protocols and codes for the machine in order to properly generate their data.

She points out that, "This technology, because it isn't inherently reliant upon a priori

knowledge of nucleotide sequence data, allows a researcher to generate much more data more quickly than traditional methods of sequencing." This has improved CDC's ability to stay current and deliver timely information to researchers around the world who are responding to infections caused by unknown bunyaviruses.

Ultimately, research into bunyavirus genetics, and more generally the identification of unknown pathogens using technology like the Ion Torrent machine, greatly supports CDC's public health mission—detect, control, and prevent exotic and domestic bacteria and viruses transmitted by mosquitoes, ticks, fleas, and other vectors. CDC will continue to monitor the emergence and epidemic potential of vector-borne pathogens that threaten the United States both domestically and abroad.

Next-generation sequencing solves regional health mystery

In 2009, two farmers in northwestern Missouri were hospitalized with suspected ehrlichiosis, a disease spread by ticks. Though ehrlichiosis is generally easily treated with antibiotics, in this case, despite following recommended treatment guidelines, both farmers didn't seem to be getting better. Unsure how to help his patients, their doctor turned to CDC's experts for help solving this medical mystery. The bacteria in the samples weren't acting quite like ehrlichia. Maybe it was a virus? To solve the mystery, CDC scientists turned to the Ion Torrent machine to help them find clues. Indeed, a virus was isolated as the the disease-causing culprit confirming that the infection was not ehrlichiosis. Instead, it showed that the farmers had contracted a completely unknown pathogen. The CDC team has named it "Heartland virus" after the Heartland Medical Center, where the two farmers were treated.

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