

October 2019

Labor Market

Analysis

Forest Fire Management



California
Community
Colleges



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Summary

This study conducted by the Central Valley/Mother Lode Center of Excellence examines labor market demand, wages, skills, and postsecondary supply for occupations related to forest fire management for Columbia College. Seven occupations were identified:

- Health and Safety Engineers, Except Mining Safety Engineers and Inspectors (SOC 17-2111)
- Foresters (SOC 19-1032)
- Forest and Conservation Technicians (SOC 19-4093)
- First-Line Supervisors of Fire Fighting and Prevention Workers (SOC 33-1021)
- Firefighters (SOC 33-2011)
- Fire Inspectors and Investigators (SOC 33-2021)
- Forest and Conservation Workers (SOC 45-4011)

Key findings:

- **Occupational demand** — In the North Central Valley/Northern Mother Lode subregion, 2,759 workers were employed in jobs related to forest fire management in 2018. The largest occupation is firefighters with 1,842 workers in 2018, a projected growth rate of 6% over the next five years, and 147 annual openings.
- **Wages** — The entry-level wages for six of the seven occupations exceed the average self-sufficiency wage and living wage for a single adult in the subregion. The entry-level wages of forest and conservation workers, however, fall below the subregion's living wage. The occupation earning the highest median wages is fire inspectors and investigators, \$46.53/hour in the subregion and \$47.12/hour in the region.
- **Employers** — Top employers in the region are Acrt Incorporated, Forest Service, and City of Stockton.
- **Job titles** — The most common occupational title in job postings is forest and conservation technicians. The most common job title is consulting utility forester.
- **Skills and certifications** — The top baseline skill is Microsoft Office, the top specialized skill is fire protection, and the top software skill is Microsoft Office. The most in-demand certification is a driver's license.
- **Education** — Five of the seven occupations are middle-skill occupations and are relevant to community college education. Two occupations typically require a bachelor's degree: health and safety engineers (except mining safety engineers and inspectors) and foresters.
- **Supply** — Analysis of postsecondary completions in the region shows that on average 71 awards were conferred in the Central Valley/Mother Lode region each year.

Based on a comparison of occupational demand and supply, there is an undersupply of 245 trained workers in the subregion and 531 workers in the region. The Center of Excellence recommends that Columbia College work with the regional director of Agriculture, Water and Environmental Technology, the college's advisory board, and local industry in the expansion of programs to address the shortage of forest fire management workers in the region.

Introduction

The Central Valley/Mother Lode Center of Excellence was asked by Columbia College to provide labor market information for forest fire management. The Taxonomy of Program (TOP) title-code provided for this analysis was Forestry-011400.

The geographical focus for this report is the North Central Valley/Northern Mother Lode (NCV/NML) region, but regional demand and supply data has been included for broader applicability and use. Analysis of the program and occupational data related to forest fire management resulted in the identification of seven applicable occupations. The Standard Occupational Classification (SOC) System titles and codes used in this report are:

- Health and Safety Engineers, Except Mining Safety Engineers and Inspectors (SOC 17-2111)
- Foresters (SOC 19-1032)
- Forest and Conservation Technicians (SOC 19-4093)
- First-Line Supervisors of Fire Fighting and Prevention Workers (SOC 33-1021)
- Firefighters (SOC 33-2011)
- Fire Inspectors and Investigators (SOC 33-2021)
- Forest and Conservation Workers (SOC 45-4011)

The SOC codes, occupational titles, job descriptions, sample job titles, and knowledge and skills from the Bureau of Labor Statistics and O*NET OnLine are shown in Exhibit 1. O*NET data was not available for Health and Safety Engineers, Except Mining Safety Engineers and Inspectors (SOC 17-2111); First-Line Supervisors of Fire Fighting and Prevention Workers (SOC 33-1021); Firefighters (SOC 33-2011); and Fire Inspectors and Investigators (SOC 33-2021).

Exhibit 1. SOC titles, job descriptions, sample job titles, and knowledge and skills for forest fire management

SOC Title & CODE	Description	Sample Job Titles	Knowledge & Skills
Foresters (SOC 19-1032)	Manage public and private forested lands for economic, recreational, and conservation purposes. May inventory the type, amount, and location of standing timber, appraise the timber's worth, negotiate the purchase, and draw up contracts for procurement. May determine how to conserve wildlife habitats, creek beds, water quality, and soil stability, and how best to comply with environmental regulations. May devise plans for planting and growing new	Area Forester, Chief Unit Forester, Environmental Protection Forester, Fire Prevention Forester, Forest Practices Field Coordinator, Forester, Regional Forester, Resource Forester, Silviculturist, Urban Forester	Knowledge
			Mathematics
			English Language
			Computers and Electronics
			Law and Government
			Customer and Personal Service
			Skills
			Monitoring
			Reading Comprehension
			Speaking
			Critical Thinking
			Judgment and Decision Making

SOC Title & CODE	Description	Sample Job Titles	Knowledge & Skills
	trees, monitor trees for healthy growth, and determine optimal harvesting schedules.		
Forest and Conservation Technicians (SOC 19-4093)	Provide technical assistance regarding the conservation of soil, water, forests, or related natural resources. May compile data pertaining to size, content, condition, and other characteristics of forest tracts, under the direction of foresters; or train and lead forest workers in forest propagation, fire prevention and suppression. May assist conservation scientists in managing, improving, and protecting rangelands and wildlife habitats.	Biological Science Aide, Conservationist, County Ranger, Forest Technician, Forestry Aide, Forestry Technician, Resource Manager, Resource Specialist, Resource Technician, Timber Appraiser	Knowledge <hr/> Public Safety and Security <hr/> English Language <hr/> Customer and Personal Service <hr/> Law and Government <hr/> Administration and Management <hr/> Skills <hr/> Active Listening <hr/> Critical Thinking <hr/> Reading Comprehension <hr/> Judgment and Decision Making <hr/> Speaking
Forest and Conservation Workers (SOC 45-4011)	Under supervision, perform manual labor necessary to develop, maintain, or protect areas such as forests, forested areas, woodlands, wetlands, and rangelands through such activities as raising and transporting seedlings; combating insects, pests, and diseases harmful to plant life; and building structures to control water, erosion, and leaching of soil. Includes forester aides, seedling pullers, and tree planters.	Conservation Officer, Crew Leader, Field Laborer, Foreman, Forest Resource Specialist, Forestry Support Specialist, Geographic Information Systems Coordinator (GIS Coordinator), Park Maintainer, Reforestation Worker, Tree Planter	Knowledge <hr/> Geography <hr/> English Language <hr/> Public Safety and Security <hr/> Clerical <hr/> Biology <hr/> Skills <hr/> Coordination <hr/> Speaking <hr/> Active Listening <hr/> Critical Thinking <hr/> Judgment and Decision Making

The 2014 average self-sufficiency wage for a single adult in the North Central Valley/Northern Mother Lode (NCV/NML) subregion is \$10.77/hour, and the current average living wage for a single adult is \$11.59/hour. Self-sufficiency and living wage data by county and the overall eight-county average are shown in Exhibit 2. In the wages sections of this report, Pct. 25 hourly denotes entry-level wages, and median represents experienced wages.

Exhibit 2. Self-sufficiency and living wages in the NCV/NML subregion



Occupational Demand

The North Central Valley/Northern Mother Lode region employed 2,759 workers in forest fire management occupations in 2018 (Exhibit 3). The largest occupation is firefighters with 1,842 workers in 2018. This occupation is projected to grow by 6% over the next five years and has the greatest number of projected annual openings, 147.

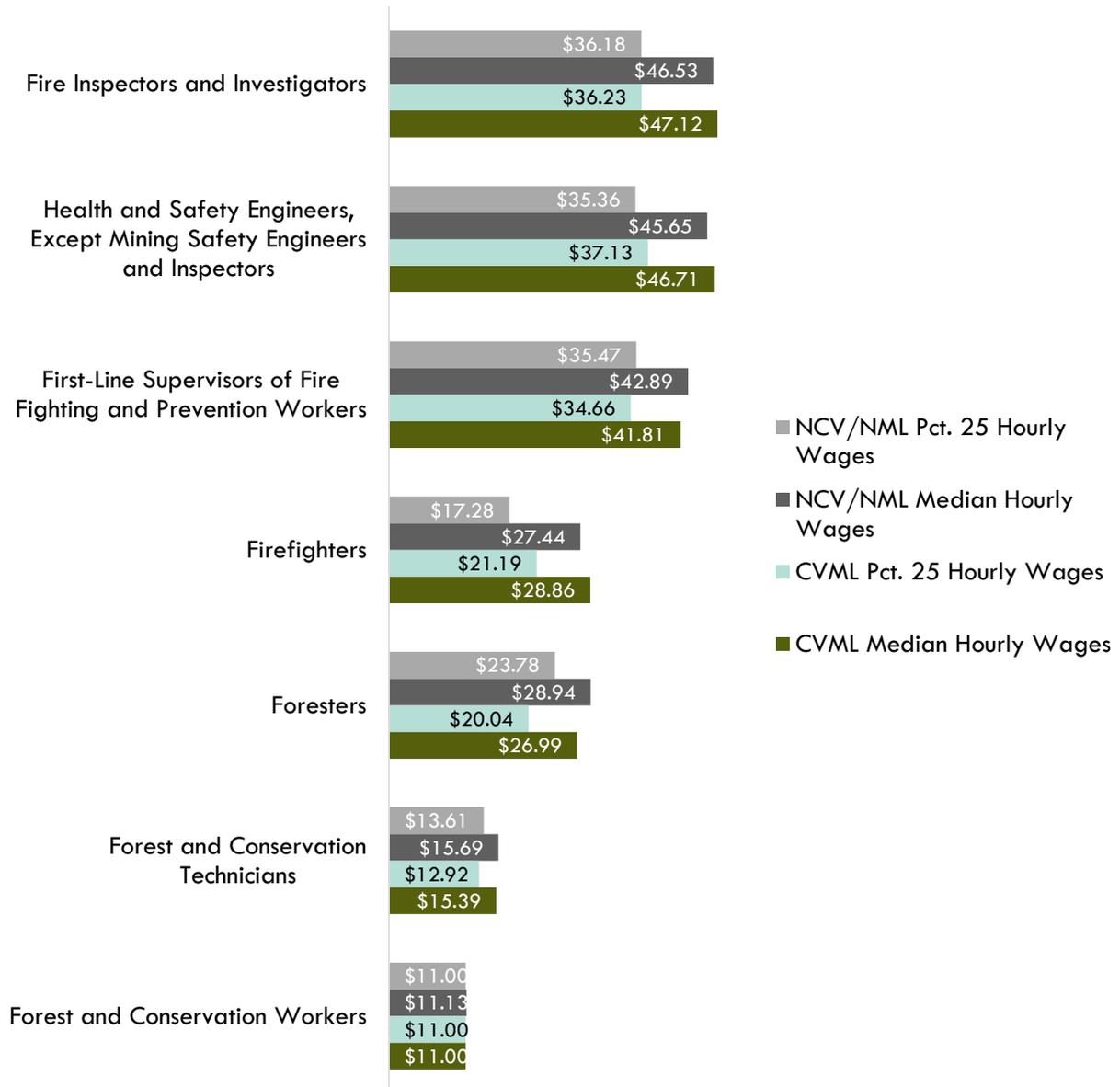
Exhibit 3. Forest fire management employment and occupational projections in the NCV/NML subregion

Occupation	2018 Jobs	2023 Jobs	2018-2023 Change	5-Year % Change	Annual Openings
Firefighters	1,842	1,961	119	6%	147
Forest and Conservation Technicians	519	512	(7)	(1%)	62
Forest and Conservation Workers	163	173	10	6%	28
First-Line Supervisors of Fire Fighting and Prevention Workers	131	146	15	11%	12
Health and Safety Engineers, Except Mining Safety Engineers and Inspectors	39	44	5	13%	4
Foresters	40	44	4	10%	4
Fire Inspectors and Investigators	24	28	4	17%	3
Total	2,759	2,908	150	9%	261

Wages

Exhibit 4 compares the entry-level and experienced wages of the forest fire management occupations. The entry-level wages for six of the seven occupations exceed the region's living wage and self-sufficiency wage for one adult. The entry-level wages of forest and conservation workers, however, fall below the subregion's living wage. The occupation earning the highest median wages is fire inspectors and investigators, \$46.53/hour in the subregion and \$47.12/hour in the region.

Exhibit 4. Entry-level and experienced wage comparison for forest fire management in the subregion and region



Job Postings

There were 194 job postings for the seven occupations in the North Central Valley/Northern Mother Lode region from October 2018 through September 2019. The top employers advertising these job postings are listed in Exhibit 5.

Exhibit 5. Top forest fire management employers by number of job postings

Employer	Job Postings
Acrt Incorporated	18
Forest Service	11
City Stockton	6
Army National Guard	6
State of California	5
ADT Security Services	5
Phillips Jordan Incorporated	4
US Department of Agriculture	3
Texas National Guard	3
Sacramento Metropolitan Fire District	3

Job titles

Exhibit 6 shows how job postings for the seven targeted occupations in the subregion are distributed across six O*NET OnLine occupations. The majority of job postings, 35 in total, use the occupational title forest and conservation technicians, followed by foresters, 32 job postings.

Exhibit 6. Top occupational titles in job postings for forest fire management

Occupational Title	Job Postings
Forest and Conservation Technicians	35
Foresters	32
Fire Inspectors and Investigators	30
First-Line Supervisors of Fire Fighting and Prevention Workers	23
Firefighters	12
Forest and Conservation Workers	7

Analysis of the advertised job titles for the targeted occupations reveals the top title is consulting utility forester, occurring in 19 job postings, followed by J++ fire control specialist, 15 job postings (Exhibit 7).

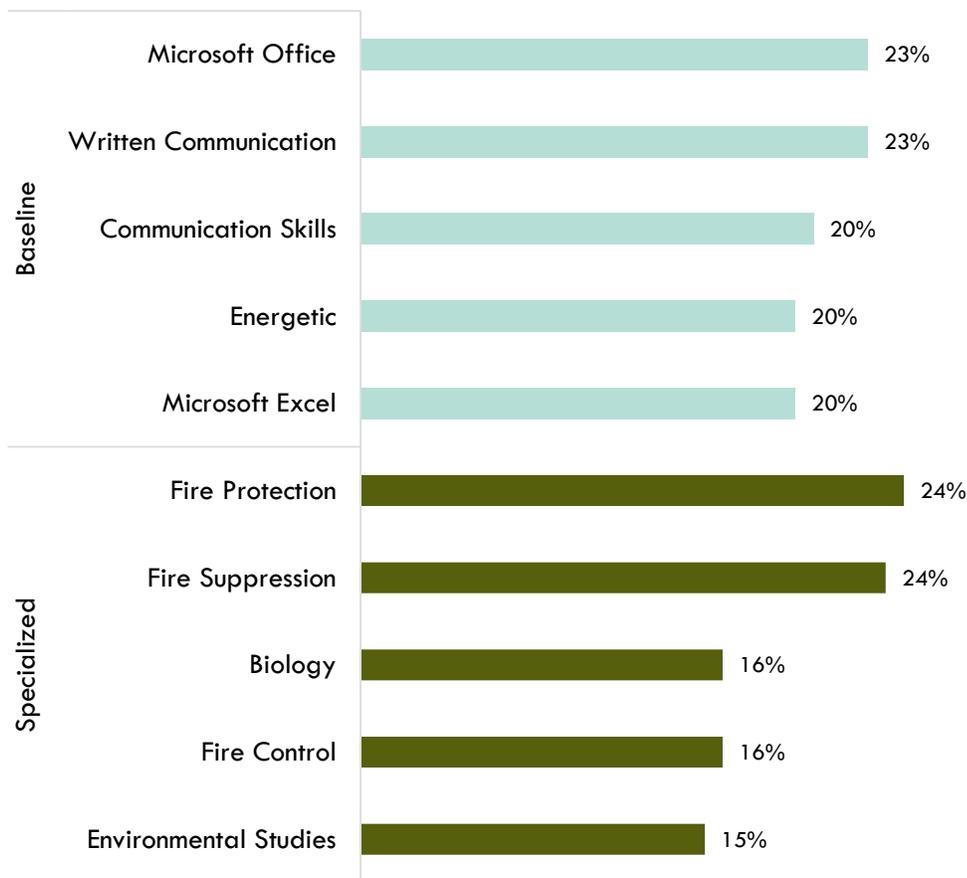
Exhibit 7. Top job titles by number of job postings for forest fire management

Job Title	Job Postings
Consulting Utility Forester	19
J + + Fire Control Specialist	15
Firefighter	10
Fire Chief	10
Forestry Technician	8
Inspector	7
Forestry Technician, Recreation	6
Systems Inspector	5

Skills

Exhibit 8 depicts the top baseline and specialized skills for the seven targeted occupations. The three most important baseline skills are Microsoft Office, 23% of job postings, written communication, 23%, and communication skills, 20%. The top three specialized skills are fire protection, 24% of job postings, fire suppression, 24%, and biology, 16%.

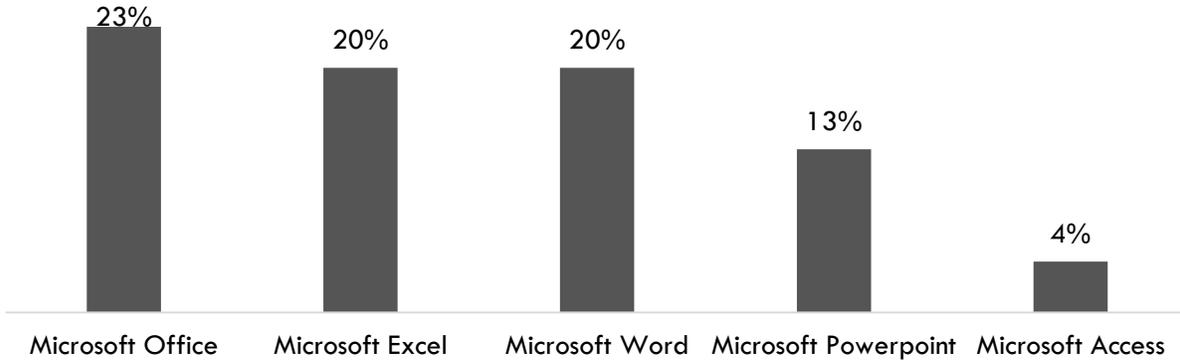
Exhibit 8. In-demand forest fire management baseline and specialized skills



Software skills

Analysis also included the software skills most in demand by employers. Microsoft Office and Excel rank first and second (Exhibit 9).

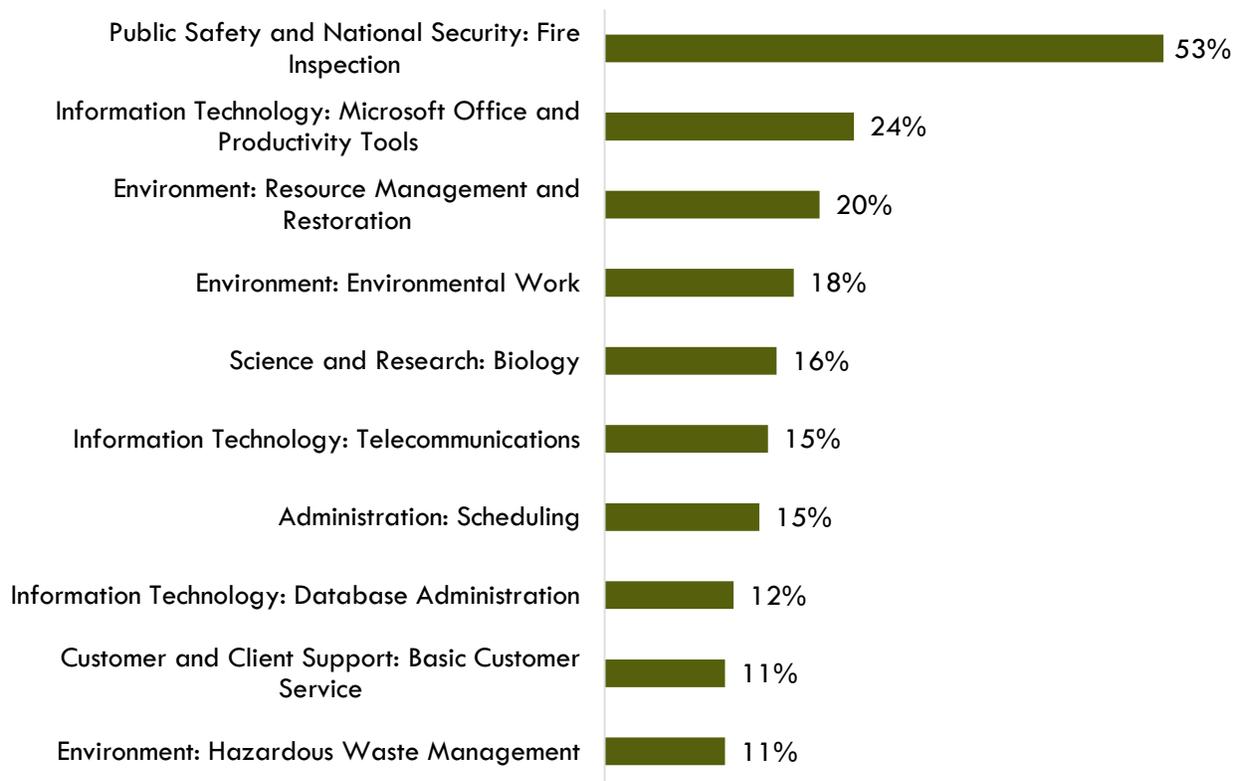
Exhibit 9. In-demand forest fire management software skills



Skill cluster projections

Of the 194 job postings, 123 postings contained skill projections. An evaluation of the skill clusters that will have the greatest gains in level of importance shows that the top areas are public safety and national security: fire inspection (53%); information technology: Microsoft Office and productivity tools (24%); and environment: resource management and restoration (20%) (Exhibit 10).

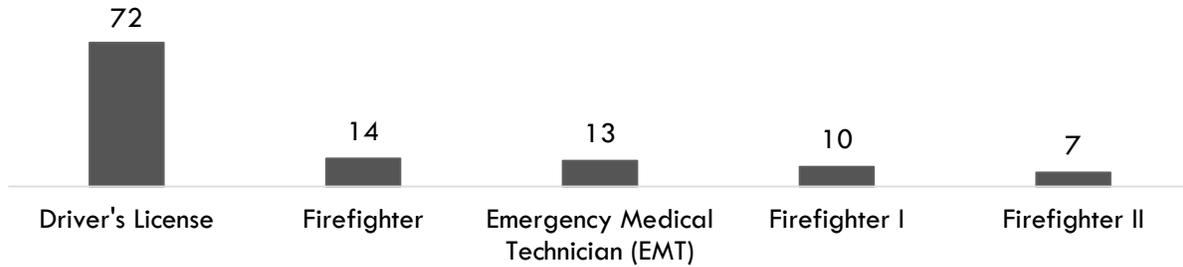
Exhibit 10. Skill cluster projections for forest fire management



Certifications

Of the job postings, 72 indicated a need for a driver's license. The next two top certifications are Firefighter and Emergency Medical Technician (Exhibit 11).

Exhibit 11. Top forest fire management certifications requested in job postings



Education, Work Experience and Training

Five of the seven occupations are middle-skill occupations and are relevant to community college education (Exhibit 12). Two occupations typically require a bachelor's degree: health and safety engineers (except mining safety engineers and inspectors) and foresters.

Exhibit 12. Education, work experience, training and Current Population Survey results for forest fire management occupations¹

Occupation	Typical Entry-level Education	Work Experience Required	Typical On-The-Job Training	CPS
Health and Safety Engineers, Except Mining Safety Engineers and Inspectors	Bachelor's degree	None	None	21.1%
Foresters	Bachelor's degree	None	None	0.0%
Forest and Conservation Technicians	Associate degree	None	None	34.5%
First-Line Supervisors of Fire Fighting and Prevention Workers	Postsecondary nondegree award	Less than 5 years	Moderate-term	57.9%
Firefighters	Postsecondary nondegree award	None	Long-term	61.1%
Fire Inspectors and Investigators	Postsecondary nondegree award	5 years or more	Moderate-term	51.6%
Forest and Conservation Workers	High school diploma or equivalent	None	Moderate-term	35.1%

¹ "Labor Force Statistics from the Current Population Survey," Bureau of Labor Statistics, <https://www.bls.gov/cps/>.

Supply

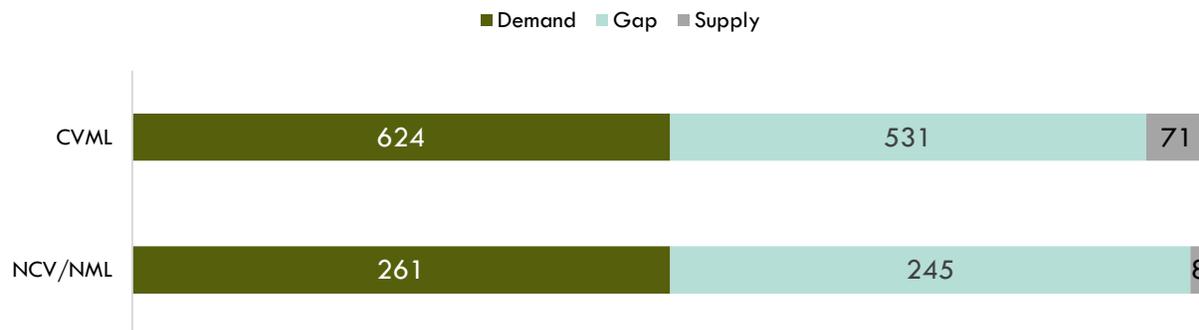
Review of program data from the California Community Colleges Chancellor's Office Data Mart provided two TOP codes: Forestry-011400 and Wildland Fire Technology-213310. Analysis of the last three years of TOP code data shows that, on average, 71 awards were conferred in the Central Valley/Mother Lode region each year (Exhibit 13).

Exhibit 13. Postsecondary supply for forest fire management occupations in the region

TOP Title-Code	College	Certificates	Degrees	Subtotal
Forestry-011400	Bakersfield	4	11	15
	Columbia	1	7	8
	Modesto Junior	0	0	1
	Reedley College	10	11	21
Wildland Fire Technology-213310	Bakersfield	1	2	3
	Porterville	24		24
Total		40	31	71

Even when the two none community college relevant occupations of Foresters and Health and Safety Engineers, Except Mining Safety Engineers and Inspectors are removed, there still remains an undersupply of 245 and 531 respectively (Exhibit 14).

Exhibit 14. Forest fire management workforce annual demand and supply in the NCV/NML subregion and region



Student Outcomes

Exhibit 15 summarizes employment and wage outcomes from the California Community College Chancellor's Cal-PASS Plus LaunchBoard for two TOP codes related to forest fire management. Across the region, 31 students received a degree or certificate and 86 students transferred in forestry; 15 students transferred in wildland fire technology. The percentage of forestry students employed in the second fiscal quarter after exit was 65%, and 113% of students reported a median change in earnings. The percentage of students in wildland fire technology who were employed in the second quarter after exit was 62%, and 44% of students reported a median change in earnings. The percentage of forestry students reporting attaining a living wage was 41%, while the percentage of wildland fire technology students was 52%.

Exhibit 15: Regional metrics for the TOP codes related to forest fire management

Metric	Forestry 011400	Wildland Fire Technology 213310
Students Who Got a Degree or Certificate	31	*
Number of Students Who Transferred	86	15
Employed in the Second Fiscal Quarter after Exit	65% (n=196)	62% (n=249)
Median Change in Earnings	113% (n=78)	44% (n=143)
Attained a Living Wage	41% (n=111)	52% (n=156)
Job Closely Related to Field of Study	*	*
*denotes data not available.		

Conclusion

The entry-level wages of six of the seven occupations exceed the NCV/NML subregion's self-sufficiency and living wages for one adult. The entry-level wages of forest and conservation workers, however, fall below the subregion's living wage. There were 194 job postings in the past 12 months for occupations related to forest fire management in the subregion. Analysis of skills and certification requirements in job postings indicates:

- The top baseline skill is Microsoft Office, and the top specialized skill is fire protection.
- The top software skill is Microsoft Office.
- The top certification is a driver's license.

There is an undersupply of trained workers, a shortage of 245 in the subregion and 531 in the region.

Recommendation

Based on these findings, it is recommended that Columbia College work with the regional director of Agriculture, Water and Environmental Technology, the college's advisory board, and local industry in the expansion of programs to address the shortage of forest fire management workers in the region.

Appendix A: Methodology & Data Sources

Data Sources

Labor market and educational supply data compiled in this report derive from a variety of sources. Data were drawn from external sources, including the Economic Modeling Specialists, Inc., the California Community Colleges Chancellor's Office Management Information Systems Data Mart and the National Center for Educational Statistics (NCES) Integrated Postsecondary Education Data System (IPEDS). Below is the summary of the data sources found in this study.

Data Type	Source
Labor Market Information/Population Estimates and Projections/Educational Attainment	Economic Modeling Specialists, Intl. (EMSI). EMSI occupational employment data are based on final EMSI industry data and final EMSI staffing patterns. Wage estimates are based on Occupational Employment Statistics (QCEW and Non-QCEW Employees classes of worker) and the American Community Survey (Self-Employed and Extended Proprietors). Occupational wage estimates also affected by county-level EMSI earnings by industry: economicmodeling.com .
Living Wage	A living wage calculator that estimates the cost of living in a specific community or region: livingwage.mit.edu .
Typical Education Level and On-the-job Training	Bureau of Labor Statistics (BLS) uses a system to assign categories for entry-level education and typical on-the-job training to each occupation for which BLS publishes projections data: www.bls.gov/emp/ep_education_tech.htm .
Labor Force, Employment and Unemployment Estimates	California Employment Development Department, Labor Market Information Division, labormarketinfo.edd.ca.gov
Job Posting and Skills Data	Burning Glass, http://www.burning-glass.com/
Additional Education Requirements/ Employer Preferences	The O*NET Job Zone database includes over 900 occupations as well as information on skills, abilities, knowledge, work activities and interests associated with specific occupations: www.onetonline.org

Key Terms and Concepts

Annual Job Openings: Annual openings are calculated by dividing the number of years in the projection period by total job openings.

Education Attainment Level: The highest education attainment level of workers age 25 years or older.

Employment Estimate: The total number of workers currently employed.

Employment Projections: Projections of employment are calculated by a proprietary Economic Modeling Specialists, Intl. (EMSI) formula that includes historical employment and economic indicators along with national, state and local trends.

Living Wage: The cost of living in a specific community or region for one adult and no children. The cost increases with the addition of children.

Occupation: An occupation is a grouping of job titles that have a similar set of activities or tasks that employees perform.

Percent Change: Rate of growth or decline in the occupation for the projected period; this does not factor in replacement openings.

Replacements: Estimate of job openings resulting from workers retiring or otherwise permanently leaving an occupation. Workers entering an occupation often need training. These replacement needs, added to job openings due to growth, may be used to assess the minimum number of workers who will need to be trained for an occupation.

Total Job Openings (New + Replacements): Sum of projected growth (new jobs) and replacement needs. When an occupation is expected to lose jobs, or retain the current employment level, number of openings will equal replacements.

Typical Education Requirement: represents the typical education level most workers need to enter an occupation.

Typical On-The-Job Training: indicates the typical on-the-job training needed to attain competency in the skills needed in the occupation.

Wages Family Compositions: The living wage calculator estimates the living wage needed to support families. For single adult families, the adult is assumed to be employed full time. For two adult families where both adults are in the labor force, both adults are assumed to be employed full time. For two adult families where one adult is not in the labor force, one of the adults is assumed to be employed full time while the other non-wage-earning adult provides full-time child care for the family's children. Full-time work is assumed to be year-round, 40 hours per week for 52 weeks, per adult. Families with one child are assumed to have a 'young child' (4 years old). Families with two children are assumed to have a 'young child' and a 'child' (9 years old). Families with three children are assumed to have a 'young child,' a 'child,' and a 'teenager' (15 years old).