August 2022

Labor Market Analysis

Plant and Soil Science

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California Community Colleges

Prepared by the Central Valley/Mother Lode Center of Excellence

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COVID-19 Statement: This report includes employment projection data by Lightcast. Lightcast's projections are modeled on recorded (historical) employment figures and incorporate several underlying assumptions, including the assumption that the economy during the projection period will be at approximately full employment or potential output. To the extent that a recession or labor shock, such as the economic effects of COVID-19, can cause long-term structural change, they may impact the projections. At this time, it is not possible to quantify the impact of COVID-19 on projections of industry and occupational employment. Other measures such as unemployment rates and monthly industry employment estimates will reflect the most recent information on employment and jobs in the state and, in combination with input from local employers, may help validate current and future employment needs as depicted here.

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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 Plant and Soil Science. Three occupations related to Plant and Soil Science were identified for Reedley College:
- 11-9013, Farmers, Ranchers, and Other Agricultural Managers
- 37-3012, Pesticide Handlers, Sprayers, and Applicators, Vegetation
- 45-1011, First-Line Supervisors of Farming, Fishing, and Forestry Workers

Key findings:
- **Occupational demand —** Nearly 23,285 workers were employed in jobs related to Plant and Soil Science in 2020 in the South Central Valley/Southern Mother Lode (SCV/SML) subregion. The largest occupation is farmers, ranchers, and other agricultural managers with 19,003 workers, and it is expected to contract by 1% over the next five years, while still having 1,938 annual openings.

- **Wages —** Pesticide handlers, sprayers, and applicators, vegetation earn the highest entry-level wage, $16.47/hour in the subregion.

- **Employers —** Employers with the most job postings in the subregion are Elite Team Offices, Fresno's Chaffee Zoo, and Fresno's Chaffee Zoo Corp.

- **Occupational titles —** The most common occupational title in job postings in the subregion is Farm and Ranch Managers. The most common job title is Fish And Wildlife Technician.

- **Skills and certifications —** The top baseline skill is communication skills, the top specialized skill is repair, and the top software skill is Microsoft Office. The most in-demand certification is a CDL Class A.

- **Education —** A high school diploma or equivalent is typically required for the three occupations.

- **Supply —** Analysis of postsecondary completions shows that on average 143 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 2,620 trained workers in the subregion and 3,735 workers in the region. The Center of Excellence recommends that Reedley College work with the regional directors, the college's advisory board, and local industry in the expansion of programs to address the shortage of Plant and Soil Science workers in the region.

Introduction

The Central Valley/Mother Lode Center of Excellence was asked by Reedley College to provide labor market information for Plant and Soil Science. The geographical focus for this report is the South Central Valley/Southern Mother Lode (SCV/SML) subregion, but regional demand and supply data has been included for broader applicability and use. The average living wage for a single adult in the SCV/SML subregion is $11.91/hour.[1] Analysis of the program and occupational data related to Plant and Soil Science resulted in the identification of applicable occupations. The Standard Occupational Classification (SOC) System codes and titles used in this report are:

- 11-9013, Farmers, Ranchers, and Other Agricultural Managers
- 37-3012, Pesticide Handlers, Sprayers, and Applicators, Vegetation
- 45-1011, First-Line Supervisors of Farming, Fishing, and Forestry Workers

The occupational titles, job descriptions, sample job titles, and knowledge and skills from the Bureau of Labor Statistics and O*NET OnLine are shown below.

Farmers, Ranchers, and Other Agricultural Managers
Job Description: Plan, direct, or coordinate the management or operation of farms, ranches, greenhouses, aquacultural operations, nurseries, timber tracts, or other agricultural establishments. May hire, train, and supervise farm workers or contract for services to carry out the day-to-day activities of the managed operation. May engage in or supervise planting, cultivating, harvesting, and financial and marketing activities.
Knowledge: Administration and Management, Production and Processing, Biology, Mathematics, English Language
Skills: Critical Thinking, Speaking, Monitoring, Judgment and Decision Making, Time Management

Pesticide Handlers, Sprayers, and Applicators, Vegetation
Job Description: Mix or apply pesticides, herbicides, fungicides, or insecticides through sprays, dusts, vapors, soil incorporation, or chemical application on trees, shrubs, lawns, or crops. Usually requires specific training and state or federal certification.
Knowledge: Biology, Customer and Personal Service, Production and Processing, English Language, Administration and Management
Skills: Active Listening, Critical Thinking, Speaking, Time Management, Complex Problem Solving

First-Line Supervisors of Farming, Fishing, and Forestry Workers
Job Description: Directly supervise and coordinate the activities of agricultural, forestry, aquacultural, and related workers.
Knowledge: Administration and Management, Production and Processing, Customer and Personal Service, English Language, Mechanical
Skills: Coordination, Critical Thinking, Monitoring, Speaking, Management of Personnel Resources

Occupational Demand

The SCV/SML subregion employed 23,284 workers in Plant and Soil Science occupations in 2020 (Exhibit 1). The largest occupation is farmers, ranchers, and other agricultural managers with 19,003 workers in 2020. This occupation is projected to contract by 1% over the next five years while still having the greatest number of projected annual openings, 1,938.

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[1] The term "living wage" in Center of Excellence reports is calculated by averaging the self-sufficiency wages from the Insight Center's California Family Needs Calculator for each county in the subregion: https://insightcced.org/tools-metrics/self-sufficiency-standard-tool-for-california/.
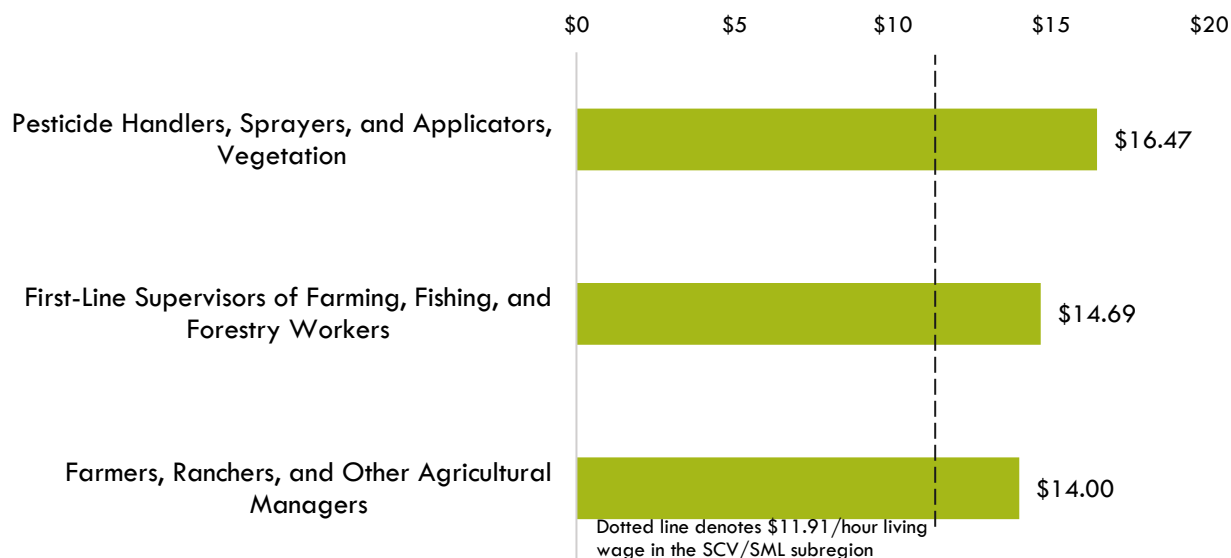
Exhibit 1. Plant and Soil Science employment and occupational projections in the SCV/SML subregion

Occupation	2021 Jobs	2026 Jobs	5-Year Change	5-Year % Change	Annual Openings
Farmers, Ranchers, and Other Agricultural Managers	19,003	18,746	(258)	(1%)	1,938
First-Line Supervisors of Farming, Fishing, and Forestry Workers	3,867	4,452	585	15%	745
Pesticide Handlers, Sprayers, and Applicators, Vegetation	413	422	9	2%	63
TOTAL	**23,284**	**23,620**	**337**	**1%**	**2,746**

Wages

Exhibit 2 shows the entry-level hourly wages of the Plant and Soil Science occupations. Pesticide handlers, sprayers, and applicators, vegetation earn the highest entry-level wage, $16.47/hour in the subregion[2].

Exhibit 2. Plant and Soil Science entry-level wages in the SCV/SML subregion

Pesticide Handlers, Sprayers, and Applicators, Vegetation — $16.47

First-Line Supervisors of Farming, Fishing, and Forestry Workers — $14.69

Farmers, Ranchers, and Other Agricultural Managers — $14.00

Dotted line denotes $11.91/hour living wage in the SCV/SML subregion

Job Postings

There were 87 job postings for the three occupations in the SCV/SML subregion from February 2022 to July 2022.[3] The employers with the most job postings are listed in Exhibit 3.

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[2] Entry-level wages are derived from the 25th percentile.

[3] Other than occupation titles and job titles, the categories below can be counted one or multiple times per job posting, and across several areas in a single posting. For example, a skill can be counted in two different skill types, and an employer can indicate more than one education level.

Exhibit 3. Top employers of Plant and Soil Science by number of job postings

Employer	Job Postings	% Job Postings
Elite Team Offices	3	4%
Fresnos Chaffee Zoo	3	4%
Fresnos Chaffee Zoo Corp	3	4%
Wilbur Ellis	3	4%
420 Kingdom	2	3%
Bee Sweet Citrus	2	3%
California Public Utilities Commission	2	3%
Ford Spraying	2	3%
Grimmway Enterprises Incorporated	2	3%
Kellogg Company	2	3%

Exhibit 4 shows how job postings for the targeted occupations in the SCV/SML subregion are distributed across seven O*NET OnLine occupations. The occupational title Farm and Ranch Managers is listed in 27 job postings. Note how this occupational title dominates the job posting results. Common job titles in postings include Fish and Wildlife Technician in six job postings, Farm Manager in five job postings, and Horticulturalist in five job postings.

Exhibit 4. Top occupational titles in job postings for Plant and Soil Science

Occupational Title	Job Postings	% of Job Postings
Farm and Ranch Managers	27	31%
Pesticide Handlers, Sprayers, and Applicators, Vegetation	26	30%
Aquacultural Managers	12	14%
Nursery and Greenhouse Managers	12	14%
First-Line Supervisors of Agricultural Crop and Horticultural Workers	6	7%
First-Line Supervisors of Animal Husbandry and Animal Care Workers	3	3%
First-Line Supervisors of Logging Workers	1	1%

Salaries

Exhibit 5 shows the "Market Salaries" for Plant and Soil Science occupations. These are calculated by Burning Glass using a machine learning model built off of millions of job postings every year. This accounts for adjustments based on locations, industry, skills, experience, education requirements, among other variables.

Exhibit 5. Salaries for Plant and Soil Science occupations

Market Salary Percentile	Salary Amount
10th Percentile	$26,385
25th Percentile	$29,631
50th Percentile	$36,237
75th Percentile	$49,017
90th Percentile	$63,647

Education

Of the 87 job postings, 44 listed an education level preferred for the positions being filled. Among those, 63% requested high school or vocational training, 37% requested a bachelor's degree, and 3% requested an associate degree (Exhibit 6). A job posting can indicate more than one education level. Hence, the percentages shown in the chart below may total more than 100%.
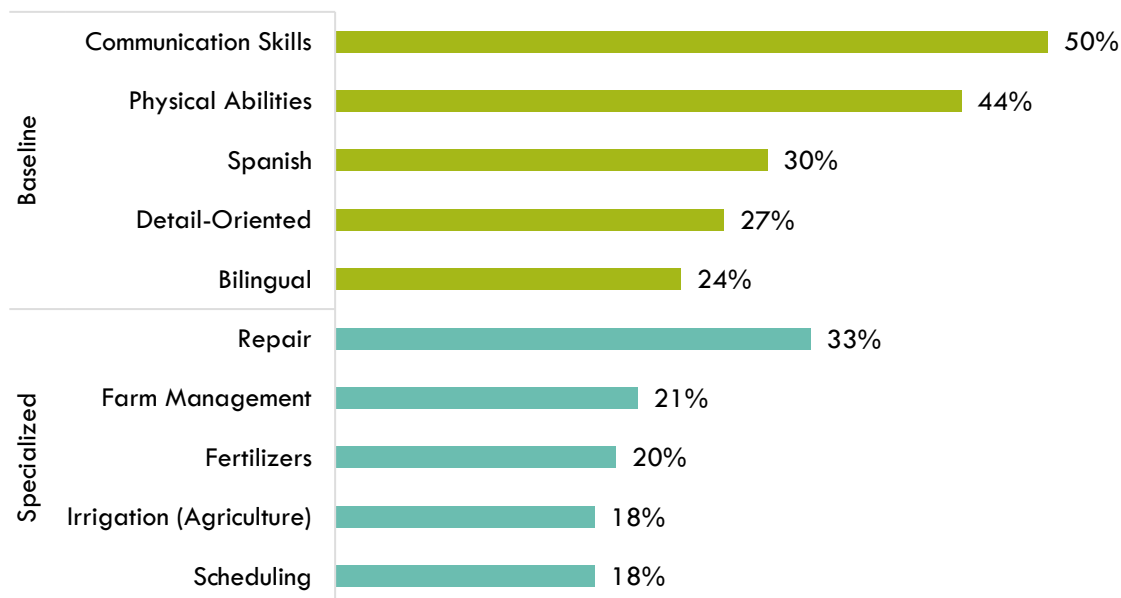
Exhibit 6. Education levels requested in job postings for Plant and Soil Science

Education Level	Job Postings	% of Job Postings
High school or vocational training	22	63%
Bachelor's degree	13	37%
Associate's degree	1	3%

Baseline and Specialized Skills

Exhibit 7 depicts the top baseline and specialized skills for the targeted occupations. The three most important baseline skills are communication skills, 50% of job postings, physical abilities, 44%, and Spanish, 30%. The top three specialized skills are repair, 33% of job postings, farm management, 21%, and fertilizers, 20%.
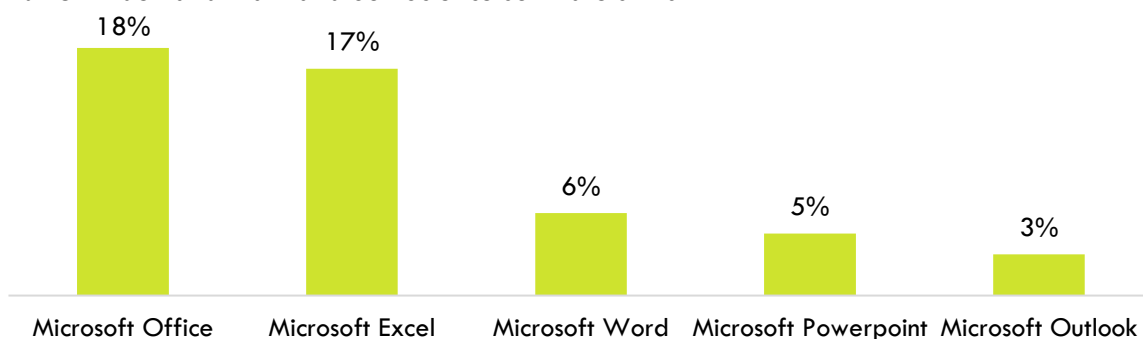
Exhibit 7. In-demand Plant and Soil Science baseline and specialized skills

Category	Skill	Percentage
Baseline	Communication Skills	50%
Baseline	Physical Abilities	44%
Baseline	Spanish	30%
Baseline	Detail-Oriented	27%
Baseline	Bilingual	24%
Specialized	Repair	33%
Specialized	Farm Management	21%
Specialized	Fertilizers	20%
Specialized	Irrigation (Agriculture)	18%
Specialized	Scheduling	18%

Software Skills

Analysis also included the software skills most in demand by employers. Microsoft Office and Excel were the top two software skills identified in job postings (Exhibit 8).

Exhibit 8. In-demand Plant and Soil Science software skills

Software	Percentage
Microsoft Office	18%
Microsoft Excel	17%
Microsoft Word	6%
Microsoft Powerpoint	5%
Microsoft Outlook	3%

Certifications

Of the 87 job postings, 44 contained certification data. Among those, 11% indicated a need for a California Drivers License (CDL) Class A. The next top certifications are appplicators license and certified Arborist (Exhibit 9). Please note 86% of job postings indicated a need for a driver's license, but it is not a certification.

Exhibit 9. Top Plant and Soil Science certifications requested in job postings

Certification	Percentage
CDL Class A	11%
Applicators License	9%
Certified Arborist	9%
Certified Pest Control	7%
Air Brake Certified	5%
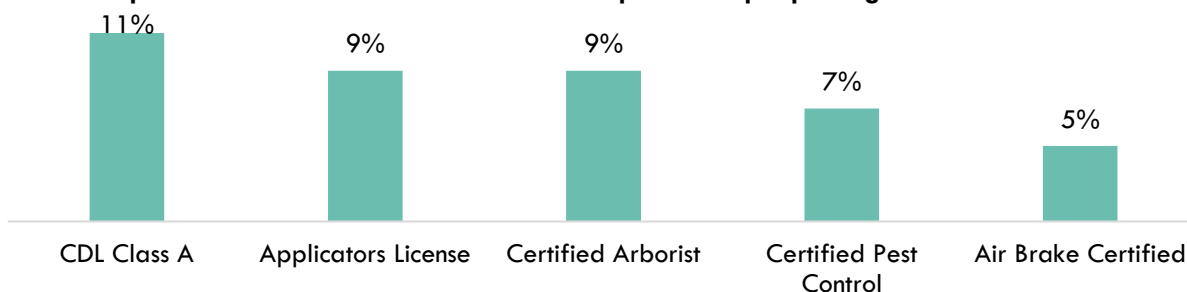
Education, Work Experience & Training

A high school diploma or equivalent is typically required for the two occupations (Exhibit 10).

Exhibit 10. Education, work experience, training, and Current Population Survey results for Plant and Soil Science occupations[4]

Occupation	Typical Entry-level Education	Work Experience Required	Typical On-The-Job Training	CPS
Farmers, Ranchers, and Other Agricultural Managers	High school diploma or equivalent	5 years or more	None	30.2%
First-Line Supervisors of Farming, Fishing, and Forestry Workers	High school diploma or equivalent	Less than 5 years	None	21.9%

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[4] "Labor Force Statistics from the Current Population Survey," Bureau of Labor Statistics, https://www.bls.gov/cps/.

| Occupation	Typical Entry-level Education	Work Experience Required	Typical On-The-Job Training	CPS
Pesticide Handlers, Sprayers, and Applicators, Vegetation	High school diploma or equivalent	None	Moderate-term	32.8%

Supply

Analysis of program data from the Integrated Postsecondary Education Data System (IPEDS) included the TOP code and title: 010300 - Plant Science. Analysis of the last three years of data shows that, on average, 143 awards were conferred in the Central Valley/Mother Lode region each year (Exhibit 11).

Exhibit 11. Postsecondary supply for Plant and Soil Science occupations in the region

TOP/CIP Code- Title	College	Associate Degree	Associate for Transfer Degree	Certificate 12 < 18 Semester Units	Certificate 16 < 30 Semester Units	Certificate 18 < 30 Semester Units	Certificate 30 < 60 Semester Units	Certificate 6 < 18 Semester Units	Subtotal
010300 - Plant Science	Bakersfield	8	2				1		11
	Merced	3				1			4
	Modesto Junior	16	1						17
	Reedley College	1	26	10	9	15	3		63
	San Joaquin Delta		1						1
	Sequoias	2	8			1		2	13
	West Hills Coalinga		34						34
TOTAL		**30**	**71**	**10**	**9**	**17**	**5**	**2**	**143**

There is an undersupply of 2,620 Plant and Soil Science workers in the SCV/SML subregion and 3,735 workers in the region (Exhibit 12).

Exhibit 12. Plant and Soil Science workforce demand (annual job openings), postsecondary supply of students (awards), and additional students needed to fill gap in the SCV/SML subregion and region
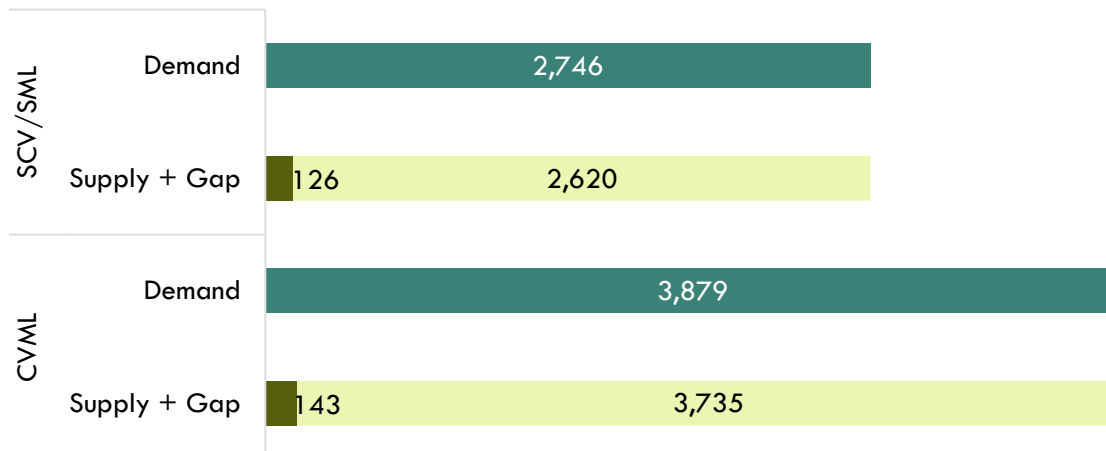
Student Outcomes

Exhibit 13 summarizes employment and wage outcomes from the California Community College Chancellor's Cal-PASS Plus LaunchBoard for the TOP code related to Plant and Soil Science. Of note, 95 plant science students received a degree or certificate or attained apprenticeship journey status; 266 students transferred; 72% of students obtained a job closely related to their field of study; 28% had a median change in earnings; and 62% of students attained a living wage.

Exhibit 13. Regional metrics for the TOP code related to Plant and Soil Science

Metric	Plant Science 010300
Students Who Got a Degree or Certificate or Attained Apprenticeship Journey Status	95
Number of Students Who Transferred	266
Job Closely Related to Field of Study	72%
Median Change in Earnings	28%
Attained a Living Wage	62%
* denotes data not available.	

Conclusion

The entry-level wages of the three occupations exceed the SCV/SML subregion's average living wage. There were 87 job postings in the past six months for occupations related to Plant and Soil Science in the subregion. Analysis of skills and certification requirements in job postings indicates:

- The top baseline skill is communication skills, and the top specialized skill is repair.
- The top software skill is Microsoft Office.
- The top certification is a CDL Class A.

There is an undersupply of trained workers, a shortage of 2,620 in the SCV/SML subregion and 3,735 in the region.

Recommendation

Based on these findings, it is recommended that Reedley College work with the regional directors, the college's advisory board, and local industry in the expansion of programs to address the shortage of Plant and Soil Science 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. (Lightcast). Lightcast occupational employment data are based on final Lightcast industry data and final Lightcast 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 Lightcast earnings by industry: economicmodeling.com.
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: https://www.bls.gov/emp/tables/educational-attainment.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: 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: 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. (Lightcast) 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.