January 2022

Labor Market Analysis

Geographic Information Systems

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COVID-19 Statement: This report includes employment projection data by Emsi. Emsi'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

> **Please note the COVID-19 statement on page 2 when considering this report's findings.**

This study conducted by the Central Valley/Mother Lode Center of Excellence examines labor market demand, wages, skills, and postsecondary supply for geographic information systems. Three occupations related to geographic information systems were identified for Columbia College:
- 15-1299, Computer Occupations, All Other
- 17-3031, Surveying and Mapping Technicians
- 19-4099, Life, Physical, and Social Science Technicians, All Other

Key findings:
- **Occupational demand —** Nearly 1,050 workers were employed in jobs related to geographic information systems in 2020 in the North Central Valley/Northern Mother Lode (NCV/NML) subregion. The largest occupation is computer occupations, all other with 764 workers in 2020, a projected growth rate of 7% over the next five years, and 67 annual openings.

- **Wages —** Computer Occupations, all other earn the highest entry-level wage, $22.85/hour in the subregion.

- **Employers —** Employers with the most job postings in the subregion are Anthem Blue Cross, Danaher Corporation, and The Save Mart Companies.

- **Occupational titles —** The most common occupational title in job postings in the subregion is quality control analysts. The most common job title is quality assurance technician.

- **Skills and certifications —** The top baseline skill is communication, the top specialized skill is quality assurance and control, and the top software skill is Microsoft Excel. The most in-demand certification is a driver's license.

- **Education —** A high school diploma or equivalent is typically required for surveying and mapping technicians. An associate degree is typically required for life, physical, and social science technicians, all other. A bachelor's degree is typically required for computer occupations, all other.

- **Supply —** Analysis of postsecondary completions shows that on average 12 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 94 trained workers in the subregion and 338 workers in the region. The Center of Excellence recommends that Columbia College work with the regional directors, the college's advisory board, and local industry in the expansion of programs to address the shortage of geographic information systems workers in the region.

Introduction

The Central Valley/Mother Lode Center of Excellence was asked by Columbia College to provide labor market information for geographic information systems. The geographical focus for this report is the North Central Valley/Northern Mother Lode (NCV/NML) 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 NCV/NML subregion is $12.65/hour.[1] Analysis of the program and occupational data related to geographic information systems resulted in the identification of applicable occupations. The Standard Occupational Classification (SOC) System codes and titles used in this report are:

- 15-1299, Computer Occupations, All Other
- 17-3031, Surveying and Mapping Technicians
- 19-4099, Life, Physical, and Social Science Technicians, All Other

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. O*Net data was mot available for computer occupations, all other and life, physical, and social science technicians, all other.

Surveying and Mapping Technicians

Job Description: Perform surveying and mapping duties, usually under the direction of an engineer, surveyor, cartographer, or photogrammetrist, to obtain data used for construction, mapmaking, boundary location, mining, or other purposes. May calculate mapmaking information and create maps from source data, such as surveying notes, aerial photography, satellite data, or other maps to show topographical features, political boundaries, and other features. May verify accuracy and completeness of maps.

Knowledge: Computers and Electronics, Geography, Mathematics, English Language, Engineering and Technology

Skills: Critical Thinking, Reading Comprehension, Mathematics, Active Listening, Speaking

Occupational Demand

The NCV/NML subregion employed 1,049 workers in geographic information systems occupations in 2020 (Exhibit 1). The largest occupation is computer occupations, all other with 764 workers in 2020. This occupation is projected to grow by 7% over the next five years and has the greatest number of projected annual openings, 67.

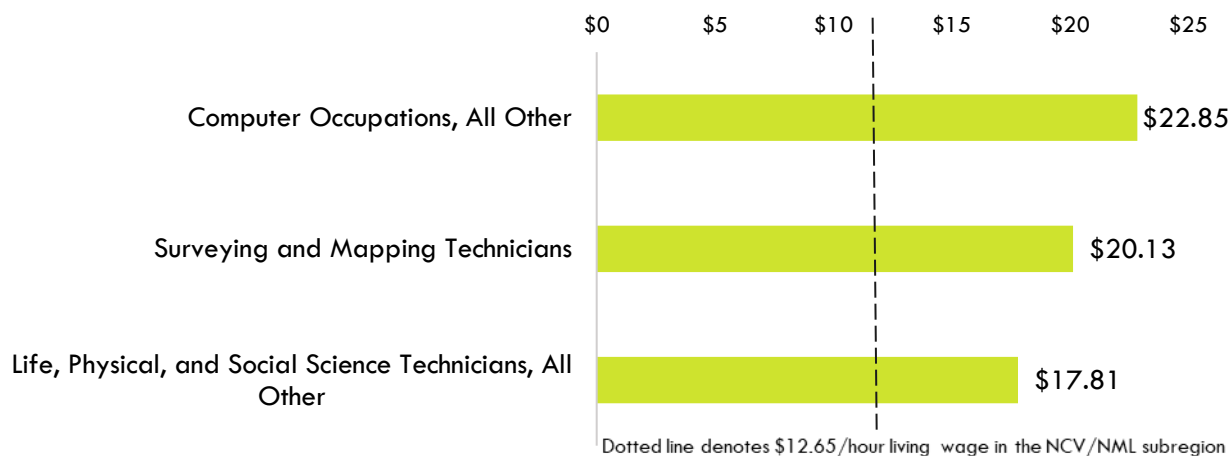**Exhibit 1. Geographic information systems employment and occupational projections in the NCV/NML subregion**

Occupation	2020 Jobs	2025 Jobs	5-Year Change	5-Year % Change	Annual Openings
Computer Occupations, All Other	764	816	53	7%	67
Surveying and Mapping Technicians	156	161	5	3%	20
Life, Physical, and Social Science Technicians, All Other	129	139	10	8%	19
TOTAL	**1,049**	**1,117**	**68**	**6%**	**106**

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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/.

Wages

Exhibit 2 shows the entry-level hourly wages of the geographic information systems occupations. Computer occupations, all other earn the highest entry-level wage, $22.85/hour in the subregion. Entry-level wages are derived from the 25th percentile.

Exhibit 2. Geographic information systems entry-level wages in the NCV/NML subregion

Dotted line denotes $12.65/hour living wage in the NCV/NML subregion

Job Postings

There were 770 job postings for the three occupations in the NCV/NML subregion from July 2021 to December 2021.[2] The employers with the most job postings are listed in Exhibit 3.

Exhibit 3. Top employers of geographic information systems by number of job postings

Employer	Job Postings	% Job Postings
Anthem Blue Cross	72	12%
Danaher Corporation	33	6%
The Save Mart Companies	28	5%
Cepheid	16	3%
Amazon	14	2%
Pacific Gas and Electric Company	12	2%
Ej Gallo Winery	8	1%
University Pacific	8	1%
Ej Gallo	7	1%
Paychex	6	1%

Exhibit 4 shows how job postings for the targeted occupations in the NCV/NML subregion are distributed across 10 O*NET OnLine occupations. The occupational title quality control analysts is listed in 171 job postings. Note how this occupational title dominates the job posting results. Common job titles in postings include quality assurance technician in 26 job postings, home product tester in 22 job postings, and quality control technician in 21 job postings.

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[2] 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 4. Top occupational titles in job postings for geographic information systems

Occupational Title	Job Postings	% of Job Postings
Quality Control Analysts	171	22%
Information Technology Project Managers	170	22%
Business Intelligence Analysts	116	15%
Computer Systems Engineers/Architects	74	10%
Software Quality Assurance Engineers and Testers	72	9%
Document Management Specialists	64	8%
Database Architects	22	3%
Video Game Designers	18	2%
Web Administrators	13	2%
Mapping Technicians	11	1%

Salaries

Exhibit 5 shows the "Market Salaries" for geographic information systems occupations that are calculated by Burning Glass which uses a machine learning model built off of millions of job postings every year, and accounts for adjustments based on locations, industry, skills, experience, education requirements, among other variables.

Exhibit 5. Salaries for geographic information systems occupations

Market Salary Percentile	Salary Amount
10th Percentile	$32,005
25th Percentile	$38,805
50th Percentile	$55,896
75th Percentile	$87,686
90th Percentile	$108,116

Education

Of the 770 job postings, 602 listed an education level preferred for the positions being filled. Among those, 63% requested a bachelor's degree, 46% requested a high school or vocational training, and 17% requested a master's 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%.

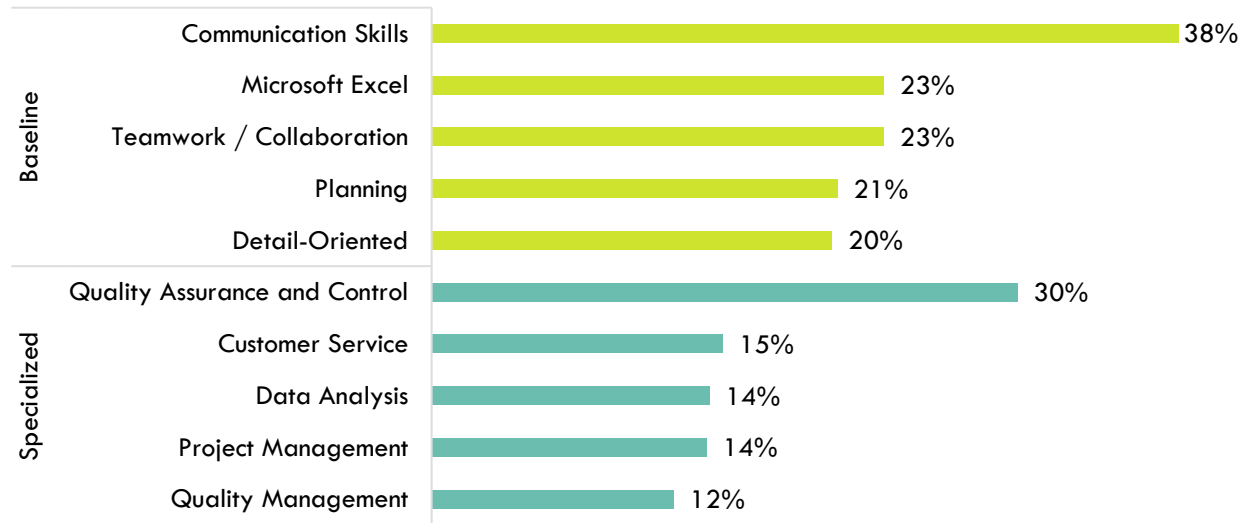**Exhibit 6. Education levels requested in job postings for geographic information systems**

Education Level	Job Postings	% of Job Postings
Bachelor's degree	380	63%
High school or vocational training	275	46%
Master's degree	104	17%
Associate's degree	73	12%
Doctoral degree	19	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, 38% of job postings, Microsoft Excel, 23%, and Teamwork/ Collaboration, 23%. The top three specialized skills are quality assurance and control, 30% of job postings, customer service, 15%, and data analysis, 14%.

Exhibit 7. In-demand geographic information systems baseline and specialized skills

Skill	Percentage
Baseline	
Communication Skills	38%
Microsoft Excel	23%
Teamwork / Collaboration	23%
Planning	21%
Detail-Oriented	20%
Specialized	
Quality Assurance and Control	30%
Customer Service	15%
Data Analysis	14%
Project Management	14%
Quality Management	12%

Software Skills

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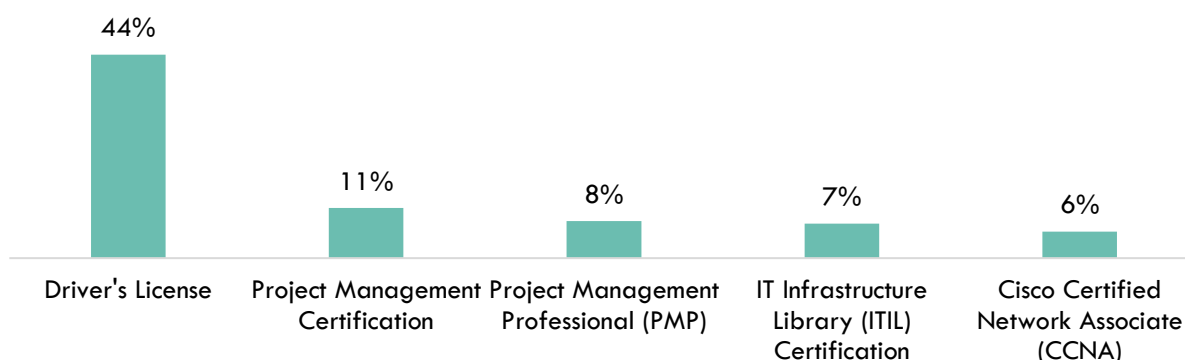
Exhibit 8. In-demand geographic information systems software skills

Software	Percentage
Microsoft Excel	23%
Microsoft Office	15%
Microsoft Word	12%
SQL	10%
Microsoft Powerpoint	9%
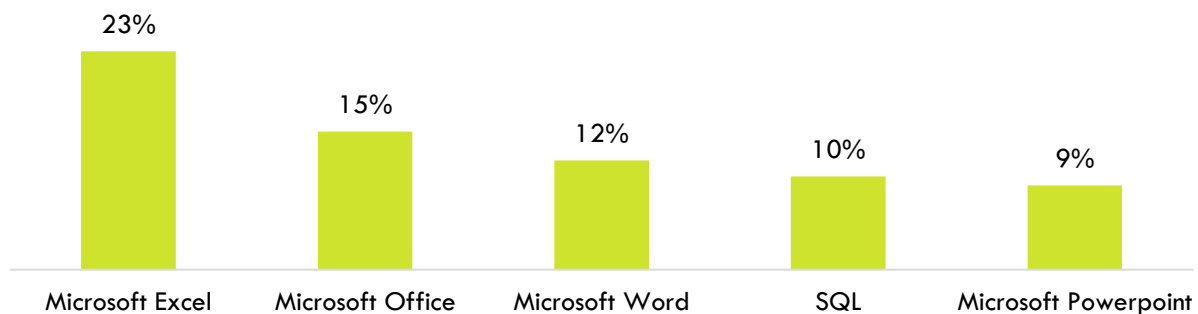
Certifications

Of the 1400 job postings, 32 contained certification data. Among those, 53% indicated a need for a driver's license. The next top certifications are a driver's license and AWS D1.1 (Exhibit 9). (Due to the low number of job postings with certifications listed, the chart below may not be representative of the full sample.)

Exhibit 9. Top geographic information systems certifications requested in job postings

Bar chart values:
- Driver's License: 44%
- Project Management Certification: 11%
- Project Management Professional (PMP): 8%
- IT Infrastructure Library (ITIL) Certification: 7%
- Cisco Certified Network Associate (CCNA): 6%

Education, Work Experience & Training

A high school diploma or equivalent is typically required for surveying and mapping technicians. An associate degree is typically required for life, physical, and social science technicians, all other. A bachelor's degree is typically required for computer occupations, all other (Exhibit 10).

Exhibit 10. Education, work experience, training, and Current Population Survey results for geographic information systems occupations[3]

Occupation	Typical Entry-level Education	Work Experience Required	Typical On-The-Job Training	CPS
Computer Occupations, All Other	Bachelor's degree	None	Moderate-term	27.2%
Life, Physical, and Social Science Technicians, All Other	Associate's degree	None	None	36.6%
Surveying and Mapping Technicians	High school diploma or equivalent	None	Moderate-term	57.7%

Supply

Analysis of program data from the California Community Colleges Chancellor's Office Data Mart included the TOP code and title: 220610 - Geographic Information Systems. Analysis of the last three years of data shows that, on average, 12 awards were conferred in the Central Valley/Mother Lode region each year (Exhibit 11).

Exhibit 11. Postsecondary supply for geographic information systems occupations in the region

TOP/CIP Code- Title	College	Associate Degree	Certificate 16 < 30 semester units	Certificate 18 < 30 semester units	Certificate 6 < 18 semester units	Credit Award, < 6 semester units	Subtotal
220610 - Geographic Information Systems	Columbia	2	0	0	8	2	12
TOTAL		**2**	**0**	**0**	**8**	**2**	**12**

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

There is an undersupply of 94 geographic information systems workers in the NCV/NML subregion and 338 workers in the region (Exhibit 12).

Exhibit 12. Geographic information systems workforce demand (annual job openings), postsecondary supply of students (awards), and additional students needed to fill gap in the NCV/NML subregion and region
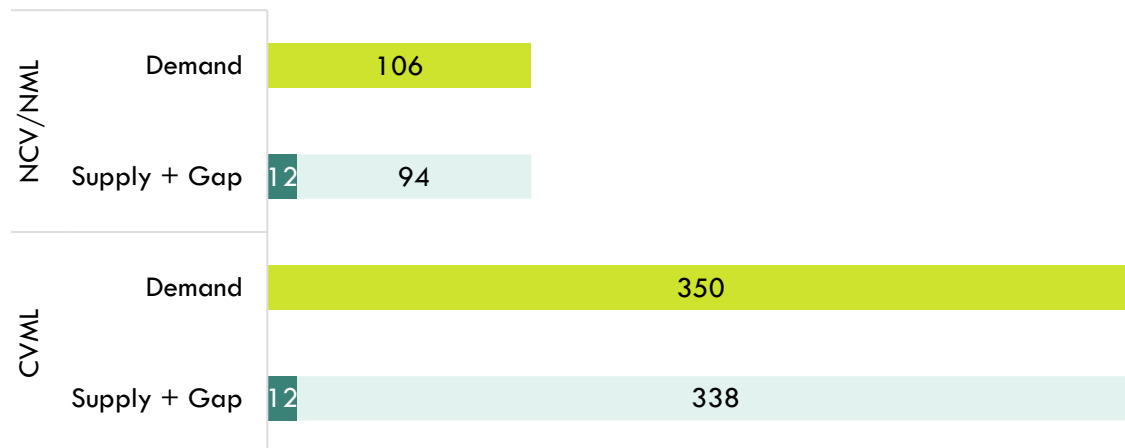
Student Outcomes

Exhibit 13 summarizes employment and wage outcomes from the California Community College Chancellor's Cal-PASS Plus LaunchBoard for the TOP code related to geographic information systems. Of note, 114% geographic information systems students reported a median change in earnings; and 65% of students attained a living wage.

Exhibit 13. Regional metrics for the TOP code related to geographic information systems

Metric	Geographic Information Systems 220610
Students Who Got a Degree or Certificate or Attained Apprenticeship Journey Status	*
Number of Students Who Transferred	*
Job Closely Related to Field of Study	*
Median Change in Earnings	114%
Attained a Living Wage	65%
* denotes data not available.	

Conclusion

The entry-level wages of the three occupations exceed the NCV/NML subregion's average living wage. There were 770 job postings in the past six months for occupations related to geographic information systems in the subregion. Analysis of skills and certification requirements in job postings indicates:

- The top baseline skill is communication, and the top specialized skill is quality assurance and control.
- The top software skill is Microsoft Excel.
- The top certification is a driver's license.

There is an undersupply of trained workers, a shortage of 94 in the NCV/NML subregion and 338 in the region.

Recommendation

Based on these findings, it is recommended that Columbia College work with the regional directors, the college's advisory board, and local industry in the expansion of programs to address the shortage of geographic information systems 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.
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. (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.