

LABOR MARKET ANALYSIS

FOR PROGRAM RECOMMENDATION



C·O·E

CENTERS OF EXCELLENCE
FOR LABOR MARKET RESEARCH

GEOGRAPHIC INFORMATION SYSTEMS (GIS) IN THE GREATER SACRAMENTO REGION

North (Greater Sacramento)
Center of Excellence

OCTOBER 2022

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SUMMARY

The North (Greater Sacramento) of Excellence for Labor Market Research prepared this report to provide a labor market analysis of educational supply and occupational demand for middle-skilled career pathways in the North (Greater Sacramento) subregion. This report aims to determine if demand in the local labor market is unmet by the supply from existing community college programs and other postsecondary training providers.

This report primarily focuses on training that leads to jobs in middle-skilled occupations - jobs that typically require education beyond a high school diploma but less than a Bachelor's degree - but may include higher-skilled occupations for training pathways that lead to a bachelor's degree. Lowered skilled occupations are rarely considered in this analysis due to the lessened barriers for entry-level work, such as no formal education and on-the-job training requirements.

Key findings include:

- Between 2021 and 2026, GIS jobs are projected to increase by 4% in the Greater Sacramento subregion. Most GIS jobs and job growth are concentrated at the middle-skill technician level.
- Over the next five years, GIS jobs are projected to have 51 annual openings in the Greater Sacramento subregion – a majority will be for middle-skill occupations.
- Analysis of wage data shows that GIS occupations earn more than the single adult living wage of \$14.53 per hour.
- Awards data analysis shows that North (Greater Sacramento) community colleges conferred an average of 25 certificates and associate degrees in GIS programs over the last three academic years.

Recommendations include:

- The North (Greater Sacramento) Center of Excellence recommends moving forward with program development.

INTRODUCTION

The North (Greater Sacramento) Center of Excellence (COE) was asked to provide labor market information for a proposed program at a regional community college. This report focuses on the following Standard Occupational Classification (SOC) occupations and codes:

- These middle-skill occupations require more education and training beyond a high school diploma but less than a four-year degree:
 - Surveying and Mapping Technicians (17-3031)
- Students who transfer and earn a four-year degree could pursue the following high-skill occupations:
 - Cartographers and Photogrammetrists (17-1021)

A review of related programs revealed the following Taxonomy of Programs (TOP) title(s) and code(s) are appropriate for inclusion in this report:

- Geographic Information Systems (2206.10)

The corresponding Classification of Instructional Program (CIP) title(s) and code(s) are:

- Geospatial Intelligence (43.0407)
- Geographic Information Science and Cartography (45.0702)

OCCUPATIONAL DEMAND

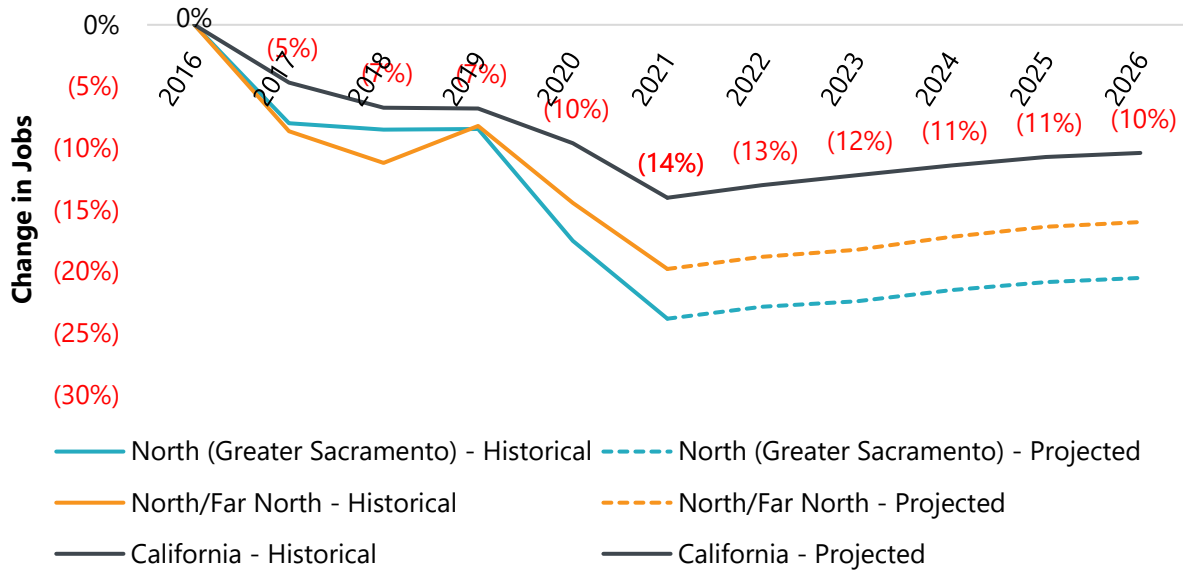
Exhibit 1 summarizes the five-year projected job growth for middle-skill and high-skill occupations in the North, North/Far North, and California.

Exhibit 1. Employment and projected demand, 2021-2026

Occupation	2021 Jobs	2026 Jobs	2021-2026 Change	2021-2026 % Change	2021-2026 Annual Openings
Cartographers and Photogrammetrists	105	112	6	6%	10
Surveying and Mapping Technicians	302	314	11	4%	40
North (Greater Sacramento)	408	426	18	4%	51
Cartographers and Photogrammetrists	132	139	7	6%	13
Surveying and Mapping Technicians	414	432	18	4%	56
North/Far North	545	571	26	5%	69
Cartographers and Photogrammetrists	1,136	1,178	42	4%	107
Surveying and Mapping Technicians	4,267	4,454	187	4%	575
California	5,403	5,632	228	4%	682

Exhibit 2 compares the percent change in jobs between 2016 through 2021 and the projected changes through 2026. The rate of change is indexed to the total number of jobs in 2016.

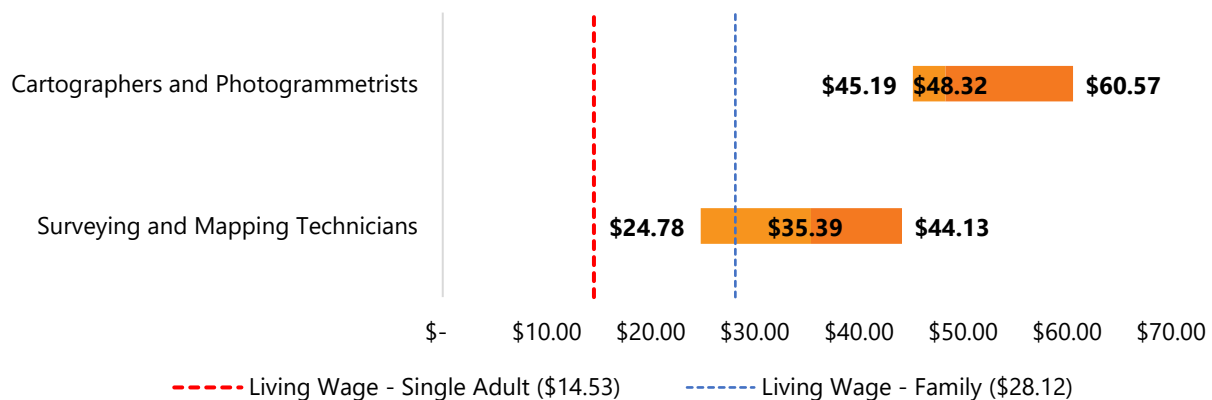
Exhibit 2. Changes in employment, 2016-2026



WAGES

Exhibit 3 compares the entry-level, median, and experienced wages for the selected occupations to the North (Greater Sacramento) living wage¹ for a single adult (\$14.53 per hour) and a small family² (\$28.12 per hour).

Exhibit 3. Comparison of wages by occupation, 2021



¹ Living wage is defined as the level of income a single adult with no children must earn to meet basic needs, including food, housing, transportation, healthcare, taxes, and other miscellaneous basic needs. Please note that the 25th-percentile and 75th-percentile hourly wages are used as proxy for entry-level and experienced-level wages.

² A small family is defined as a single adult and one school aged child (between the ages of 5 and 12 years).

JOB POSTINGS

This section analyzes recent data from online job postings (real-time LMI). Online job postings may provide additional insight into recent changes in the labor market that are not captured by historical trends.

The North COE identified 119 online job postings for the selected occupations in the Greater Sacramento subregion. Job posting data comes from Lightcast (formerly EMSI Burning Glass) and represents new listings posted online within the last year, from October 1, 2021, to September 30, 2022.

Occupations and Job Titles

Exhibit 4 details the number of online job postings for the selected occupations.

Exhibit 4. Number of job postings by occupation

Occupation	Job Postings	Share of Job Postings
Surveying and Mapping Technicians	116	97%
Cartographers and Photogrammetrists	3	3%
Total Job Postings	119	100%

Exhibit 5 shows the top 10 job titles with the most job postings and the share. All job postings included a job title.

Exhibit 5. Top jobs titles

Job Title	Job Postings	Share of Job Postings
Survey Technicians	22	18%
Land Survey Technicians	12	10%
GIS Managers	7	6%
Field Crew Members	6	5%
Assessment Technicians	6	5%
Survey Crews	5	4%
Water Resources Managers	5	4%

Job Title	Job Postings	Share of Job Postings
GIS Professionals	4	3%
Survey Field Technicians	4	3%
Land Surveyors	4	3%

Employers

Exhibit 6 shows the top 10 employers with the most job postings for the selected occupations.

Exhibit 6. Employers with the most job postings

Employer	Job Postings	Share of Job Postings
The Johnson Group	9	8%
The County Of El Dorado	6	5%
Mark Thomas (A/E)	5	4%
AEI Consultants	5	4%
The Great Basin Institute	4	3%
SunPower Corp.	4	3%
California State University	3	3%
American Conservation Experience	3	3%
CCI Software Systems	3	3%
Black & Veatch	2	2%

Certifications, Skills, and Experience

Exhibit 7 shows the most relevant certifications requested by employers for the selected occupations.

Exhibit 7. Most in-demand certifications

Certification	Job Postings	Share of Job Postings
Land Surveyor in Training	20	17%

Exhibit 8 shows the top 10 skills across three categories for the studied occupations: specialized, human-centered, and technical skills.

Exhibit 8. Most in-demand specialized skills

Top 10 Specialized Skills	Top 10 Human-Centered Skills	Top 10 Technical Skills
Surveying	Valid Driver's License	Geographic Information Systems
Geographic Information Systems	Communications	ArcGIS (GIS Software)
Legal Land Description	Coordinating	AutoCAD
ArcGIS (GIS Software)	Research	AutoCAD Civil 3D
AutoCAD	Management	Microsoft Excel
Easement	Planning	Microsoft Outlook
Field Surveys	Leadership	Microsoft Office
AutoCAD Civil 3D	Good Driving Record	Business Software
Civil Engineering	Customer Service	Global Positioning Systems
Field Notes	Mathematics	Microsoft PowerPoint

Exhibit 9 shows employers' minimum level of education for job postings for the selected occupations.

Exhibit 9. Employer-preferred minimum education levels

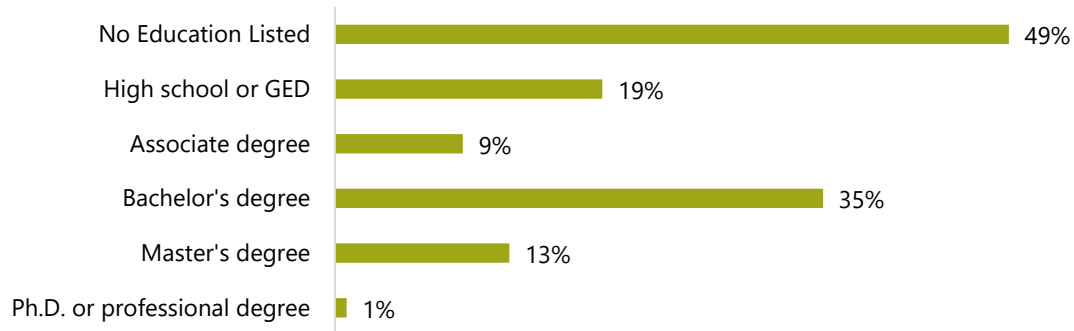
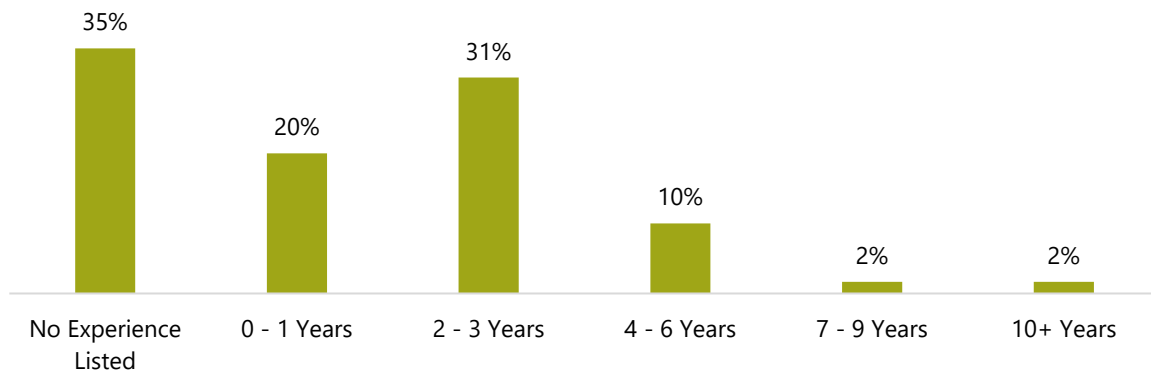


Exhibit 10 shows the experience levels required by employers for job postings for the selected occupations.

Exhibit 10. Employer-preferred experience levels



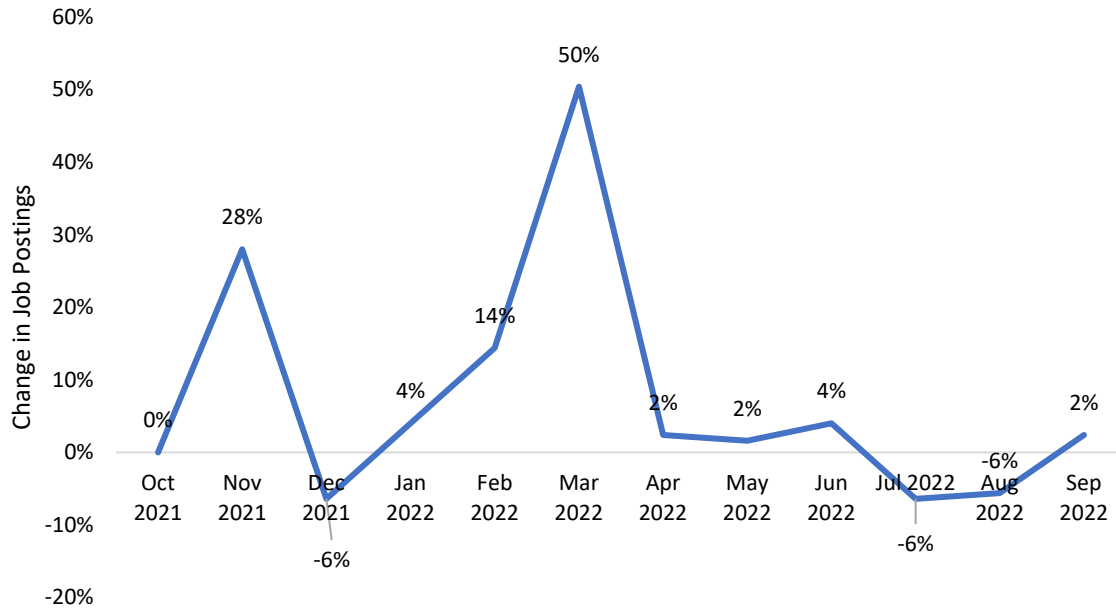
SKILL ANALYSIS

An analysis of online job postings in the Greater Sacramento area revealed stable demand for specialized GIS skills, including Geographic Information Systems (or GIS), Geospatial datasets, GIS applications, and GIS mapping. Between October 1, 2021, and September 30, 2022, 1,611 online job postings included "GIS" as a desired skill in the seven-county Greater Sacramento region.

Skill Posting Trends

Online job postings show a slight increase in employers searching for workers with GIS skills in the Greater Sacramento area (Exhibit 11). Job postings with "GIS" as a specialized skill increased by 2% between October 2021 and September 2022.

Exhibit 11. Job postings with GIS as a specialized skill, October 2021 – September 2022



Top Employers for Skill

Exhibit 12 shows the top 10 employers requesting "GIS" as a specialized skill, and the City of Sacramento had the most job postings requesting GIS skills.

Exhibit 12. Top employers for GIS skill

Employers for Project Management	Job Postings	Share of Job Postings
City of Sacramento	53	3%
Helix Environmental Planning	45	3%
PG&E	40	2%
WSP Global	39	2%
State of California	34	2%
University of California	31	2%

Employers for Project Management	Job Postings	Share of Job Postings
Kleinfelder	27	2%
The Johnson Group	27	2%
Stantec	26	2%
ACRT Pacific	24	1%

Top Occupations for Skill

Exhibit 13 shows the top 10 occupations with job postings that included "GIS" as a specialized skill. All but two occupations – civil engineering technologists and technicians and surveying and mapping technicians - are considered high-skill occupations, which typically require a bachelor's degree for entry-level jobs. For a complete list of occupations, please contact the Far North COE.

Exhibit 13. Top occupations for GIS skill

Occupation with Skill	Job Postings	Share of Job Postings
Computer Occupations, All Other	148	9%
Civil Engineers	82	5%
Biological Scientists, All Other	70	4%
Environmental Scientists and Specialists, Including Health	66	4%
Managers, All Other	62	4%
Software Developers	60	4%
Geoscientists, Except Hydrologists and Geographers	51	3%
Civil Engineering Technologists and Technicians*	41	3%
Surveying and Mapping Technicians*	41	3%
Anthropologists and Archeologists	40	2%

An asterisk () denotes a middle-skill occupation, which typically requires more education and training than a high school diploma but less than a four-year degree.*

Top Co-Occurring Skills

Exhibit 14 shows the most common specialized, baseline, and software/technology skills associated with GIS. Specialized skills are specific to the occupation and represent job-specific competencies. Baseline skills are foundational skills that cross occupations and industries, and many baseline skills are also considered soft skills. Technical skills refer to the specific software and technologies regularly encountered on the job.

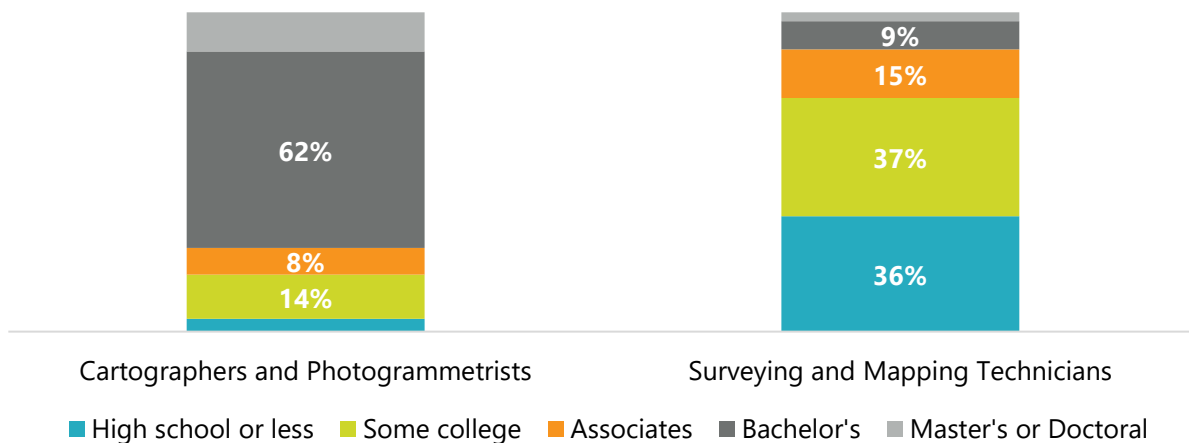
Exhibit 14. Top co-occurring skills with GIS

Top Co-occurring Specialized Skills	Top Co-occurring Baseline Skills	Top Co-occurring Technical Skills
Geographic Information Systems	Communications	Geographic Information Systems
ArcGIS (GIS Software)	Management	ArcGIS (GIS Software)
Global Positioning Systems	Planning	Microsoft Office
Biology	Valid Driver's License	Microsoft Excel
Data Collection	Research	Global Positioning Systems
Data Analysis	Operations	AutoCAD
Environmental Science	Coordinating	Microsoft Word
AutoCAD	Microsoft Office	Microsoft PowerPoint
Construction	Microsoft Excel	Python (Programming Language)
Project Management	Detail Oriented	SQL (Programming Language)

EDUCATION AND TRAINING

The U.S. Census Bureau collects data on education achieved by workers employed in occupations. Exhibit 15 shows the state-level educational attainment of the current workforce in the selected occupations.

Exhibit 15. California worker educational attainment for selected occupations, 2019



The Bureau of Labor Statistics (BLS) uses a system to assign categories for entry-level education, work experience in a related occupation, and typical on-the-job training to each occupation for which the BLS publishes projections data. Exhibit 16 shows the selected occupations' entry-level job requirements.

Exhibit 16. Typical education, work experience, and on-the-job training requirements

Occupation	Typical Entry-level Education	Work Experience Required	On-the-job Training Required
Cartographers and Photogrammetrists	Bachelor's degree	None	None
Surveying and Mapping Technicians	High school diploma or equivalent	None	Moderate-term on-the-job training

EDUCATIONAL SUPPLY

Educational supply for an occupation can be estimated by analyzing the number of awards issued in related Taxonomy of Programs (TOP) or Classification of Instructional Programs (CIP) codes. Exhibit 17 shows the TOP and CIP codes for educational programs related to the selected occupations.

Exhibit 17. TOP and CIP codes for training programs related to the selected occupations

TOP Programs and Codes	Aligned CIP Programs and Codes
Geographic Information Systems (2206.10)	Geospatial Intelligence (43.0407) Geographic Information Science and Cartography (45.0702)

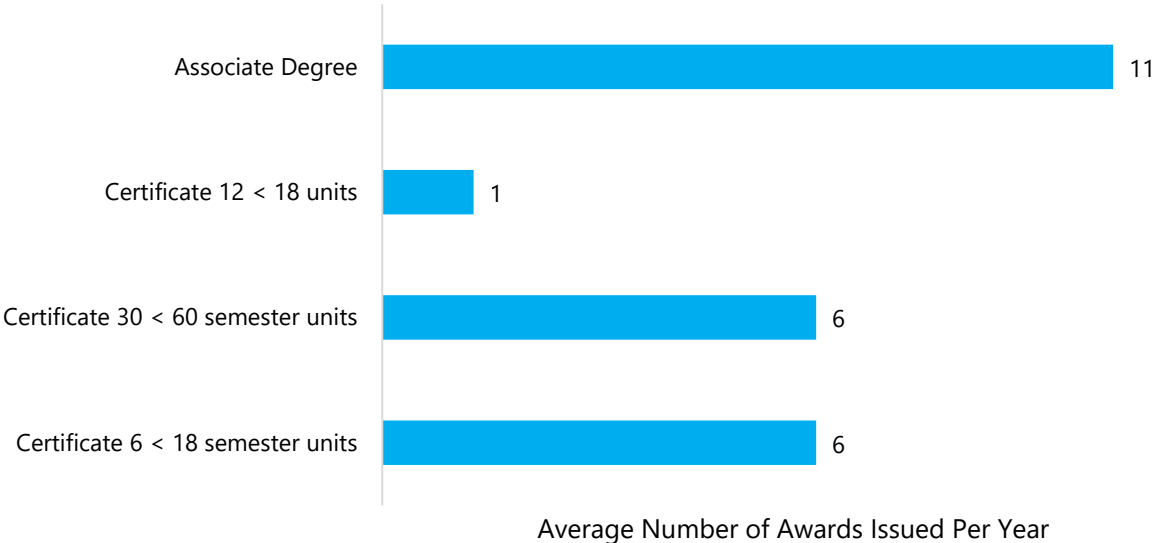
Community College Supply

Exhibits 18 and 19 compare the average number of certificates and degrees from selected community college programs over the last three academic years.

Exhibit 18. Annual average community college awards by program, 2018-19 through 2020-21

Program - TOP Code	College	Annual Awards 2018-19	Annual Awards 2019-20	Annual Awards 2020-21	3-Yr Annual Awards Average
Geographic Information Systems (2206.10)	American River	18	15	18	17
	Cosumnes River	3	0	0	1
	Folsom Lake	1	0	1	1
	Sierra	6	8	4	6
	Grand Total	28	23	23	25

Exhibit 19. Annual average community college awards by type, 2018-19 through 2020-21



Other Postsecondary Supply

The University of California, Davis, offers a master's degree and a doctorate in Geographic Information Science and Cartography (CIP 45.0702). However, since the award levels are beyond a bachelor's degree, the supply data is not included in this report. Additional information about these programs can be found on UC Davis' website.

FINDINGS

- This report focuses on two occupations in the Geographic Information Systems (GIS) career pathway: surveying and mapping technicians and cartographers and photogrammetrists.
- The North (Greater Sacramento) subregion held 408 GIS jobs in 2021. These jobs are projected to increase by 4% over the next five years, adding 18 new jobs to the subregion by 2026. Most jobs and job growth are concentrated at the middle-skill technician level.
- GIS jobs are projected to grow at nearly the same rate in the North (Greater Sacramento) subregion as in California, though they have yet to return to 2016 levels.
- Over the next five years, GIS jobs are projected to have 51 annual openings in the North (Greater Sacramento) subregion. Job openings are concentrated at the middle-skill occupation level, with 40 yearly openings for surveying and mapping technicians per year.
- Analysis of wage data shows that GIS occupations earn more than the single adult living wage of \$14.53 per hour. Entry-level wages start at \$24.78 per hour for surveying and mapping technicians and \$45.19 per hour for cartographers and photogrammetrists.
- According to real-time labor market information, there were about 1190 online job postings for GIS occupations between October 1, 2021, and September 30, 2022. Nearly all job postings were for surveying and mapping technicians.
- Analysis of the desire for GIS skills across the Greater Sacramento region reveals a slight increase in demand since October 2021. Between October 2021 and September 2022, the number of job postings requiring specialized GIS skills, including GIS, geospatial datasets, GIS applications, and GIS mapping, increased by 2%.
- Further analysis of GIS skill demand shows a high concentration of the skill set among above middle-skill occupations – or jobs that typically require a bachelor's degree or beyond. Above middle-skill occupations with the most job postings requesting GIS skills include computer occupations, all other; civil engineers; biological scientists, all other; environmental scientists and specialists; and managers, all other. Middle-skill occupations requiring GIS skills included civil engineering technologists and technicians and surveying and mapping technicians.
- Fifty-two percent of incumbent workers in the surveying and mapping technician occupation have educational attainment levels consistent with community college offerings (some college or associate degrees), with the larger share of workers having attended some college. These findings suggest that students interested in a surveying

and mapping technician career may not need to pursue an entire associate degree program to obtain work in the field.

- Jobs in the cartographer and photogrammetrist occupation typically require a bachelor's degree for entry-level work, and 62% of incumbent workers in the occupation have a bachelor's degree. Fewer than one-third of workers in the occupation have an educational attainment level consistent with community college offerings (some college or associate degrees), suggesting that a bachelor's degree would be necessary to obtain a job at this level.
- Four North (Greater Sacramento) community colleges offer degrees and certificates in programs related to GIS. These colleges conferred an average of 25 awards (certificates and associate degrees) in GIS programs over the last three academic years (2018-19 through 2020-21). Awards were evenly divided between associate degrees and certificates.

RECOMMENDATIONS

- Based on a three-year average of annual awards in North (Greater Sacramento) subregion GIS programs and projected yearly openings, the supply gap analysis shows that the region seems to have room for additional training.
 - Community colleges and other postsecondary training providers issued an average of 25 awards over the last three years.
 - There are 51 projected annual openings for GIS jobs.
- The North (Greater Sacramento) Center of Excellence recommends moving forward with the program.

New Program Recommendation		
Move forward with the new program	Proceed with caution	A new program is not recommended
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

APPENDIX A. METHODOLOGY AND SOURCES

This report identified Occupations using the Center of Excellence TOP-to-CIP-to-SOC crosswalk and O*Net OnLine. This report's findings were determined using labor market data from the Bureau of Labor Statistics (BLS), U.S. Census Bureau data from Emsi, and jobs posting data from Burning Glass.

Lightcast (Formerly EMSI/Burning Glass) 2022.3; QCEW Employees, Non-QCEW Employees, and Self-Employed. <https://www.economicmodeling.com/>. *Note: 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).*

Integrated Postsecondary Education Data System (IPEDS). National Center for Education Statistics. U.S. Department of Education. <https://nces.ed.gov/ipeds/>.

Labor Market Information Division. California Employment Development Department. <https://labormarketinfo.edd.ca.gov/>.

Management Information Systems (MIS) Data Mart. California Community Colleges Chancellor's Office. <https://datamart.cccco.edu/>.

O*NET OnLine. U.S. Department of Labor/Employment and Training Administration (DOL ETA). <https://www.onetonline.org/>.

Public Use Microdata Sample (PUMS). U.S. Census Bureau American Community Survey (ACS). <https://www.census.gov/programs-surveys/acs/microdata.html>

Self-Sufficiency Standard Tool for California. The University of Washington. <http://www.selfsufficiencystandard.org/>

"Taxonomy of Programs." California Community Colleges Chancellor's Office. June 2012, 6th Edition. <https://www.cccco.edu/-/media/CCCCO-Website/About-Us/Divisions/Educational-Services-and-Support/Academic-Affairs/What-we-do/Curriculum-and-Instruction-Unit/Files/TOPmanual6200909corrected12513pdf.ashx>

"TOP-CIP-SOC Crosswalk." Centers of Excellence for Labor Market Research. June 2021 Edition. <http://coecc.net/>

APPENDIX B. GLOSSARY OF KEY TERMS

Key Terms	Definition
Occupation	Occupation refers to professions, or careers, in the workforce. Occupations differ from jobs in that jobs show the number of positions held in a given occupation.
Jobs	<p>A job is any position where a worker provides labor for monetary compensation.</p> <p>Job numbers include employees (those who work for businesses) and proprietors (those who work for themselves). Full- and part-time jobs are included and counted equally (i.e., not adjusted to full-time equivalents). Data for jobs, or employment, are annual averages.</p>
Job Change	Job change is the net increase or decrease of jobs over a given timeframe.
Job Openings	<p>Job openings are the projected number of positions available for workers entering an occupation.</p> <p>Openings include growth and replacement jobs. Growth jobs are the positive change in the total number of workers employed. Replacement jobs are the estimates of new workers needed to replace workers permanently leaving the occupation.</p>
Wages	Wages, or compensation, show workers' percentile and average earnings in a given occupation. The 25th-percentile and 75th-percentile hourly wages are used as a proxy for entry-level and experienced-level wages.
Living Wage	The living wage is the level of income a single adult with no children must earn to meet basic needs. The living wage is calculated using basic levels of allowances for food, housing, transportation, healthcare, taxes, and other miscellaneous basic needs.
Educational Attainment	Educational attainment is the level of education achieved by workers in a given occupation. The data includes workers aged 25 years and older.
Typical Entry-level Education	The education level generally required for employment in an occupation. It may differ from the actual educational levels attained by workers in any given occupation.
Work Experience Required	The level of prior experience a worker needs to enter a job in a given occupation.
On-the-job Training Required	The level of on-the-job training a worker needs to obtain competency in a given occupation.
Awards	Awards are the number of certificates and degrees conferred for a specific course of study in a given year. Awards counts "papers" and, as a result, may be greater than the actual number of students who complete a program.

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.

Important Disclaimer: All representations included in this report have been produced from primary research and/or secondary review of publicly and/or privately available data and/or research reports. Efforts have been made to qualify and validate the accuracy of the data and the reported findings; however, neither the Centers of Excellence, COE host District, nor California Community Colleges Chancellor's Office are responsible for applications or decisions made by recipient community colleges or their representatives based upon components or recommendations contained in this study.

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Centers of Excellence for Labor Market Research, Economic and
Workforce Development Program



CENTERS OF EXCELLENCE
FOR LABOR MARKET RESEARCH

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