C·O·E CENTERS OF EXCELLENCE
FOR LABOR MARKET RESEARCH

Geographic Information Systems (GIS)

Inland Empire/Desert Region (Riverside and San Bernardino counties combined)

Introduction

This report profiles occupations related to Geographic Information System (GIS) training programs in the Inland Empire/Desert region (IEDR). Each GIS occupation is categorized into primary and secondary occupational groups. The primary GIS occupational group consists of jobs that require workers to use GIS as a primary function of their daily work. The secondary GIS occupational group consists of jobs that need GIS skills, but may only apply those skills less frequently on the job. Definitions for both groups are in the appendix, along with five-year projections. This report also includes a GIS and logistics search of local job postings to gauge demand for the combination of GIS and logistics skills beyond the selected occupations. Together, these three separate searches provide a comprehensive outlook for GIS workers in our region.

The student completions and program outcomes section on page 9 details regional activity related to the California Community College programs, surveying (TOP 0957.30), and geographic information systems (TOP 2206.10). The surveying program prepares students in GIS occupations by providing instruction on the mapping of angels, elevations, points and contours used for construction, map-making, urban planning or other purposes, which can include Global Positioning System (GPS) and Geographic Information Systems (GIS) applications. The geographic information systems program provides training related to computer-based tools for acquiring, editing, storing, analyzing, and visualizing geographically referenced information (Taxonomy of Programs, 2012).

Demand for Primary GIS Occupations

- Geospatial Information Scientists and Technologists (15-1199.04)
- Geographic Information Systems Technicians (15-1199.05)

The occupations listed above make up the primary GIS occupational group. Workers in these occupations use GIS as a primary function of their daily work. Both of these occupations are emerging occupations, and they cannot be quantified using traditional LMI. A real-time job posting search was conducted to gauge regional demand for these types of workers.

Job Postings for Primary GIS Occupations

Real-time labor market information from employer job advertisements is used in this report as a way to gauge demand for the primary GIS occupational group. Exhibit 1 displays the number of job ads posted during the last 12 months, along with the regional and statewide average time to fill. On average, regional employers fill online job postings for the primary GIS occupational group within 40 days, two

days more than the statewide average of 38 days. This may indicate that both geographic areas face similar challenges when seeking candidates to fill these positions.

Exhibit 1: Job ads and time to fill for primary GIS occupations in the last 12 months, Sep 2018 – Aug 2019

Occupation	Job Ads	Regional Average Time to Fill (Days)	California Average Time to Fill (Days)
Geospatial Information Scientists and Technologists	44	40	38
Geographic Information Systems Technicians	13	40	38
Total	**57**	**40**	**38**

Source: Burning Glass – Labor Insights

Employers, Skills, Education, and Work Experience

Exhibit 2 displays the employers posting the most job ads for the primary GIS occupational group during the last 12 months in the IEDR.

Exhibit 2: Employers posting the most job ads for primary GIS occupations, Sep 2018 – Aug 2019

Occupation	Employers	
Geospatial Information Scientists and Technologists *(n=30)*	• Esri • San Bernardino County • Riverside University Health System	• Riverside County • Southwest Gas Corporation • San Manuel Band of Mission Indians
Geographic Information Systems Technicians *(n=9)*	• Riverside County	• City of Hesperia

Source: Burning Glass – Labor Insights

Exhibit 3 displays a sample of specialized, employability, and software and programming skills that employers are seeking when looking for workers to fill positions in the primary GIS occupational group. Specialized skills are occupation-specific skills that employers are requesting for industry or job competency. Employability skills are foundational skills that transcend industries and occupations; this category is commonly referred to as "soft skills." The skills requested in job postings may be utilized as a helpful guide for curriculum development.

Exhibit 3: Sample of in-demand skills from employer job ads for primary GIS occupations, Sep 2018 – Aug 2019

Occupation	Specialized Skills	Employability Skills	Software and Programming Skills
Geospatial Information Scientists and Technologists *(n=42)*	• Information Systems • Project Management • Technical Support	• Problem Solving • Teamwork/Collaboration • Communication Skills	• ArcGIS • Python • SQL • Esri Software
Geographic Information Systems Technicians *(n=11)*	• Information Systems • Global Positioning Systems (GPS) • Data Conversion	• Research • Editing • Communication Skills	• ArcGIS • Microsoft Office • SQL

Source: Burning Glass – Labor Insights

Exhibit 4 displays the minimum advertised education requirements from employer job ads.

Exhibit 4: Minimum advertised education requirements for primary GIS occupations, Sep 2018 – Aug 2019

Occupation	Minimum Advertised Education Requirements from Job Ads			
	Number of job postings	High school diploma or vocational training	Associate degree	Bachelor's degree or higher
Geospatial Information Scientists and Technologists	37	5%	5%	90%
Geographic Information Systems Technicians	6	67%	-	33%

Source: Burning Glass – Labor Insights

Exhibit 5 displays the real-time work experience requirement from employer job ads. The majority of employers for both occupations are seeking candidates with two years of experience or less.

Exhibit 5: Real-time work experience requirements for primary GIS occupations, Sep 2018 – Aug 2019

Occupation	Real-Time Work Experience from Job Ads			
	Number of job postings	0 – 2 years	3 – 5 years	6+ years
Geospatial Information Scientists and Technologists	37	54%	24%	22%
Geographic Information Systems Technicians	9	56%	33%	11%

Source: Burning Glass – Labor Insights

Demand for Secondary GIS Occupations

- Cartographers and Photogrammetrists (17-1021)

- Surveying and Mapping Technicians (17-3031)

- Remote Sensing Scientists and Technologists (19-2099.01)

The occupations listed above make up the secondary GIS occupational group. These occupations require GIS skills but do not necessarily utilize these skills daily on-the-job. Traditional LMI is not available for *remote sensing scientists and technologists* at this time. Please see the job postings section for the demand for this occupation.

In 2018, there were *554* jobs in the secondary GIS occupational group in the IEDR. This occupational group is projected to increase employment by 11% by 2023. Employers in the region will need to hire 339 workers over the next five years to fill new jobs and backfill jobs that workers are permanently vacating (includes occupational transfers and retirements). Exhibit 6 displays five-year projected job growth for the secondary GIS occupational group.

Exhibit 6: Occupational demand for secondary GIS occupations

Occupation	2018 Jobs	5-Yr % Change (New Jobs)	5-Yr Openings (New + Replacement Jobs)	Annual Openings (New + Replacement Jobs)	% of workers age 55+
Surveying and Mapping Technicians	388	11%	260	52	28%
Cartographers and Photogrammetrists	166	11%	79	16	21%
Remote Sensing Scientists and Technologists	N/A	N/A	N/A	N/A	N/A
Total	**554**	**11%**	**339**	**68**	**27%**

Source: EMSI 2019.3

Job Postings

Real-time labor market information from employer job advertisements is used in this report as another way to gauge demand for the secondary GIS occupational group. Exhibit 7 displays the number of job ads posted during the last 12 months, along with the regional and statewide average time to fill. On average, regional employers fill online job postings for the GIS occupational group within 41 days, five days less than the statewide average of 46 days. This indicates that local employers face fewer challenges when seeking candidates to fill these positions than other employers in California. There were not enough advertisements for *remote sensing scientists and technologists* to obtain time to fill information.

*Exhibit 7: Job ads and time to fill for secondary GIS occupations in the last 12 months, Sep 2018 – Aug 2019*

Occupation	Job Ads	Regional Average Time to Fill (Days)	California Average Time to Fill (Days)
Surveying and Mapping Technicians	34	41	47
Cartographers and Photogrammetrists	4	40	38
Remote Sensing Scientists and Technologists	1	N/A	N/A
Total	**39**	**41**	**46**

Source: Burning Glass – Labor Insights

Earnings

The entry-level wage for each of the occupations in the secondary GIS occupational group is above the Family Needs Calculator estimate of $11.97 per hour for a single adult living in Riverside County and $11.63 for a single adult living in San Bernardino County. The Family Needs Calculator measures the minimum income necessary to cover all of an individual or family's basic expenses (Pearce & Manzer, 2018). The Metropolitan Policy Program at Brookings would classify GIS positions as "good jobs" because they provide an entry-level wage that allows workers to become economically independent and secure, above $18 per hour ($37,440 per year), with employer-sponsored health insurance (Shearer, Shah & Gootman, 2019, pg. 25). Exhibit 8 displays hourly earnings for the secondary GIS occupational group. Wage information for *remote sensing scientists and technologists* is not available at this time.

Exhibit 8: Hourly earnings for the secondary GIS occupational group
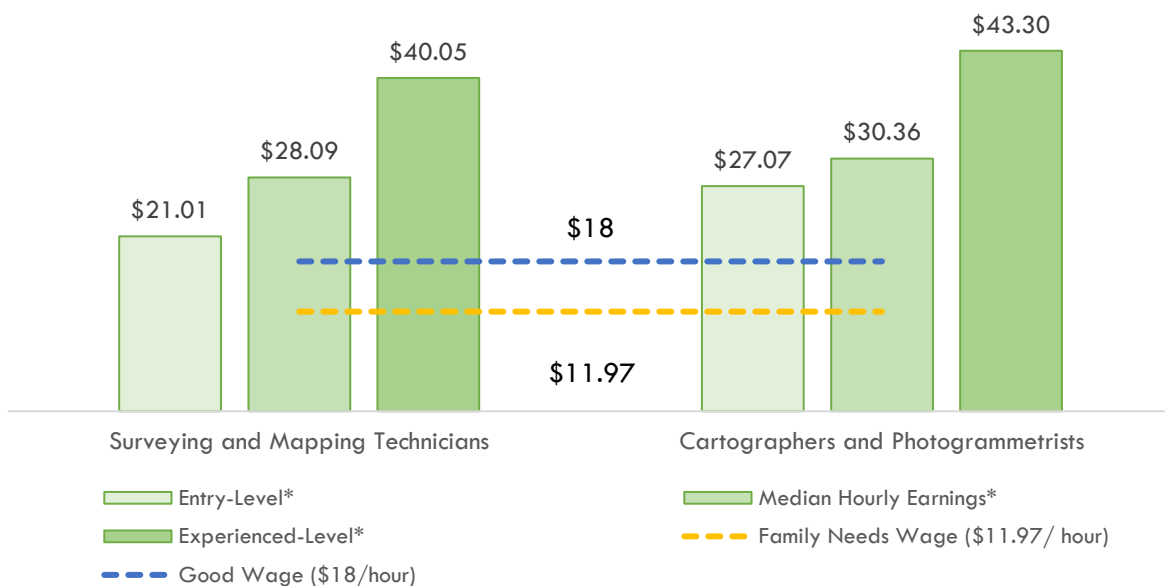
Source: EMSI 2019.3
*Entry Hourly is 25th percentile wage, the median is 50th percentile wage, and experienced is 75th percentile wage.

An alternative way to determine what wages workers can expect to earn is by extracting wage information from online job postings. Exhibit 9 displays advertised salary data from real-time job postings for the secondary GIS occupational group over the last 12 months. This information should be viewed with caution, as only 31% of job postings contain salary information. Please note that salary figures are prorated to reflect full-time, annual wage status. There are too few postings for *cartographers and photogrammetrists and remote sensing scientists and technologists* to obtain advertised salary information.

Exhibit 9: Advertised salary information for secondary GIS occupations, Sep 2018 – Aug 2019

Occupation	Real-Time Salary Information from Job Ads					
	Number of job postings	Less than $35,000	$35,000 to $49,999	$50,000 to $74,999	More than $75,000	Average Annual Earnings
Surveying and Mapping Technicians	12	17%	8%	50%	25%	$59,000
Cartographers and Photogrammetrists	0	N/A	N/A	N/A	N/A	N/A
Remote Sensing Scientists and Technologists	0	N/A	N/A	N/A	N/A	N/A

Source: Burning Glass – Labor Insights

Employers, Skills, Education, and Work Experience for Secondary GIS Jobs

Exhibit 10 displays the employers posting the most job ads for the secondary GIS occupational group during the last 12 months in the IEDR. There were not enough job postings for *remote sensing scientists and technologists* to obtain reliable employer information.

Exhibit 10: Employers posting the most job ads for the secondary GIS occupational group, Sep 2018 – Aug 2019

Occupation	Employers
Surveying and Mapping Technicians *(n=23)*	• NV5 • Esri • Riverside County • WestLAND Group, Inc.
Cartographers and Photogrammetrists *(n=4)*	• Esri
Remote Sensing Scientists and Technologists *(n=0)*	• N/A

Source: Burning Glass – Labor Insights

Exhibit 11 displays a sample of specialized, employability, and software and programming skills that employers are seeking when looking for workers to fill positions in the secondary GIS occupational group. Specialized skills are occupation-specific skills that employers are requesting for industry or job competency. Employability skills are foundational skills that transcend industries and occupations; this category is commonly referred to as "soft skills." The skills requested in job postings may be utilized as a helpful guide for curriculum development. There were not enough job postings for *remote sensing scientists and technologists* to obtain reliable skill information.

Exhibit 11: Sample of in-demand skills from employer job ads for the secondary GIS occupational group, Sep 2018 – Aug 2019

Occupation	Specialized Skills	Employability Skills	Software and Programming Skills
Surveying and Mapping Technicians *(n=33)*	• Land/Field Surveys • Global Positioning Systems (GPS) • Information Systems	• Communication Skills • Research • Planning	• Civil 3D • AutoCAD • ArcGIS
Cartographers and Photogrammetrists *(n=4)*	• Mapping • Remote Sensing • Image Processing	• Teamwork/Collaboration • Energetic • Communications	• ArcGIS • HTML5 • JavaScript
Remote Sensing Scientists and Technologists *(n=1)*	• N/A	• N/A	• N/A

Source: Burning Glass – Labor Insights

Exhibit 12 displays the entry-level education typically required to enter each occupation according to the Bureau of Labor Statistics (BLS), educational attainment for incumbent workers with "some college, no degree" and an "associate degree" according to the U.S. Census (2016-17), and the minimum advertised education requirement from employer job ads. There were too few job postings to obtain minimum advertised education requirements for *remote sensing scientists and technologists*.

Exhibit 12: Typical entry-level education, educational attainment, and minimum advertised education requirements for the secondary GIS occupational group, Sep 2018 – Aug 2019

Occupation	Typical Entry-Level Education Requirement	Educational Attainment*	Minimum Advertised Education Requirement from Job Ads			
			Number of job postings	High school diploma or vocational training	Associate degree	Bachelor's degree or higher
Surveying and Mapping Technicians	High school diploma or equivalent	57%	*11*	27%	18%	55%
Cartographers and Photogrammetrists	Bachelor's degree	12%	*4*	-	-	100%
Remote Sensing Scientists and Technologists	N/A	N/A	*1*	N/A	N/A	N/A

Source: EMSI 2019.3, Burning Glass – Labor Insights
*Percentage of incumbent workers with a Community College Credential or Some Postsecondary Coursework

Exhibit 13 displays the work experience typically required to enter each occupation and the real-time work experience requirement from employer job ads. There were too few job postings for *remote sensing scientists and technologists* to obtain reliable work experience information from employer job ads.

Exhibit 13: Work experience required and real-time work experience requirements, Sep 2018 – Aug 2019

Occupation	Work Experience Typically Required	Real-Time Work Experience from Job Ads			
		Number of job postings	0 – 2 years	3 – 5 years	6+ years
Surveying and Mapping Technicians	None	*21*	57%	43%	-
Cartographers and Photogrammetrists	None	*4*	100%	-	-
Remote Sensing Scientists and Technologists	N/A	*1*	N/A	N/A	N/A

Source: EMSI 2019.3, Burning Glass – Labor Insights

Demand for GIS and Logistics Skills

A regional GIS skill-based search was utilized to identify job postings that require a GIS skillset in the IEDR. Due to the overlapping nature of this search with the two previous job posting searches, there is some redundancy in the postings. During the last 12 months, there were 220 job postings seeking candidates with a GIS skillset. Exhibit 14 displays the top occupations from job ads looking for GIS skills. Postings for other occupations are aggregated as one line item above the total row.

Exhibit 14: Number of postings by occupation, Sep 2018 – Aug 2019

Occupation	Job Postings
Mapping Technicians	33
Geospatial Information Scientists and Technologists	31
Software Developers, Applications	22
Web Developers	12
Computer Systems Analysts	10
Geographic Information Systems Technicians	9
Civil Engineers	8
Other Occupations	*95*
Total	**220**

Source: Burning Glass – Labor Insights

A keyword search for logistics within the GIS skills search was conducted to determine the demand for the combination of logistics and GIS skills in the IEDR. During the last 12 months, there were only two job postings that requested both of these skills, indicating low demand for the pairing of these two skillsets.

Student Completions and Program Outcomes

Exhibits 15 & 17 display the average annual regional California Community College (CCC) credentials conferred during the three academic years between 2015 and 2018, from the California Community Colleges Chancellor's Office Management Information Systems (MIS) Data Mart, along with the enrollments from the most recent year available on LaunchBoard. Credentials are the combined total of associate degrees and certificates issued during the timeframe, divided by three in this case to calculate an annual average. This is done to minimize the effect of atypical variation that might be present in a single year. Enrollments are the count of enrollments in courses assigned to the TOP code in the selected year. The relevant TOP code is from the Taxonomy of Programs manual, and the corresponding program titles used at each college (in *italics*) are sourced from the Chancellor's Office Curriculum Inventory (COCI). Please note, a credential is not always equal to a single person in search of a job opening since a student may earn more than one credential, such as an associate degree, in addition to a certificate.

Exhibit 15: Annual average community college credentials and enrollments for surveying programs in the IEDR

0957.30 – Surveying	CCC Enrollments, Academic Year 2016-17	CCC Annual Average Credentials, Academic Years 2015-18
Mt. San Jacinto	22	-
Total CCC Enrollments, Academic Year 2016-17	**22**	
Total Annual Average CCC Credentials, Academic Years 2015-18		**-**

Source: LaunchBoard, Management Information Systems Data Mart

Community college student outcome information is from LaunchBoard and based on the selected TOP code and region. These metrics are based on records submitted to the California Community Colleges Chancellor's Office Management Information Systems (MIS) by community colleges, which come from self-reported student information from CCC Apply and the National Student Clearinghouse. Employment and earnings metrics are sourced from records provided by California's Employment Development Department's Unemployment Insurance database. When available, outcomes for completers are reported to demonstrate the impact that earning a degree or certificate can have on employment and earnings. For more information on the types of students included for each metric, please see the web link for LaunchBoard's Strong Workforce Program Metrics Data Element Dictionary in the References section (LaunchBoard, 2019a). Finally, employment in a job closely related to the field of study comes from self-reported student responses on the CTE Employment Outcomes Survey (CTEOS), administered by Santa Rosa Junior College (LaunchBoard, 2017). Data from the latest academic year for each metric is provided in Exhibits 16 & 18.

Exhibit 16: 0957.30 – Surveying strong workforce program outcomes

Strong Workforce Program Metrics: 0957.30 – Surveying Academic Year 2015-16, unless noted otherwise	Inland Empire/Desert region	California Median
Course enrollments (2016-17)	22	50
Completed 12+ units in one year (2016-17)	N/A	17
Economically disadvantaged students* (2016-17)	77%	59%
Transferred to a four-year institution* (transfers)	N/A	13
Employed in the fourth fiscal quarter after exit* (completers)	N/A	100%
Median annual earnings* (completers)	N/A	$91,687
Job closely related to the field of study (2014-15)	N/A	90%
Median change in earnings* (completers)	N/A	50%
Attained a living wage (completers and skills-builders)	N/A	88%

Source: LaunchBoard
*Data for these metrics is available in Community College Pipeline. All others are available in Strong Program Workforce Metrics

Exhibit 17 displays the average annual regional California Community College (CCC) credentials conferred during the three academic years between 2015 and 2018 along with the enrollments from the most recent year available on LaunchBoard for geographic information systems programs.

Exhibit 17: Annual average community college credentials and enrollments for geographic information systems programs in the IEDR

2206.10 – Geographic Information Systems	CCC Enrollments, Academic Year 2016-17	CCC Annual Average Credentials, Academic Years 2015-18
Mt. San Jacinto - *Geographic Information Systems*	-	
Associate Degree		1
Certificate 30 to < 60-semester units		1
San Bernardino - *Geographic Information Systems*	36	
Certificate requiring 18 to < 30-semester units		1
Certificate 6 to < 18-semester units		2
Total CCC Enrollments, Academic Year 2016-17	**43**	
Total Annual Average CCC Credentials, Academic Years 2015-18		**4**

Source: LaunchBoard, Management Information Systems Data Mart, COCI

Exhibit 18 displays community college student outcome information from LaunchBoard for geographic information systems programs.

Exhibit 18: 2206.10 – Geographic information systems strong workforce program outcomes

Strong Workforce Program Metrics: 2206.10 – Geographic Information Systems Academic Year 2015-16, unless noted otherwise	Inland Empire/Desert region	California Median
Course enrollments (2016-17)	43	53
Completed 12+ units in one year (2016-17)	N/A	15
Economically disadvantaged students* (2016-17)	77%	65%
Transferred to a four-year institution* (transfers)	N/A	15
Employed in the fourth fiscal quarter after exit* (completers)	N/A	82%
Median annual earnings* (completers)	N/A	$50,192
Job closely related to the field of study (2014-15)	100%	73%
Median change in earnings* (completers)	N/A	25%
Attained a living wage (completers and skills-builders)	N/A	70%

Source: LaunchBoard
*Data for these metrics is available in Community College Pipeline. All others are available in Strong Program Workforce Metrics

Contact
Michael Goss, Director
Center of Excellence, Inland Empire/Desert Region
michael.goss@chaffey.edu
September 2019

References

Burning Glass Technologies. (2019). *Labor Insights/Jobs*. Retrieved from https://www.burning-glass.com/

California Community Colleges Chancellor's Office. LaunchBoard. (2019). *California Community Colleges LaunchBoard*. Retrieved from https://www.calpassplus.org/Launchboard/Home.aspx

California Community Colleges Chancellor's Office. LaunchBoard. (2019a). *Strong Workforce Program Metrics Data Element Dictionary*. Pg. 3. Retrieved from https://www.calpassplus.org/MediaLibrary/calpassplus/launchboard/Documents/SWP-DED.PDF

California Community Colleges Chancellor's Office. (2019). *Chancellor's Office Curriculum Inventory (COCI), version 3.0*. Retrieved from https://coci2.ccctechcenter.org/programs

California Community Colleges Chancellor's Office Management Information Systems (MIS) Data Mart. (2019). *Data Mart*. Retrieved from https://datamart.cccco.edu/datamart.aspx

California Community Colleges Chancellor's Office, Curriculum and Instructional Unit, Academic Affairs Division. (2012). *Taxonomy of Programs, 6th Edition, Corrected Version*. Retrieved from https://www.cccco.edu/-/media/CCCCO-Website/About-Us/Divisions/Digital-Innovation-and-Infrastructure/Research/Files/TOPmanual6200909corrected12513.ashx?la=en&hash=94C709CA83C0380828415579395A5F536736C7C1

Economic Modeling Specialists International (EMSI) (2019). *Datarun 2019.3*. Retrieved from https://www.economicmodeling.com/

National Center for O*NET Development. (2019). *O*NET OnLine*. Retrieved from https://www.onetonline.org/

Pearce, D., Manzer, L. Center for Women's Welfare at the University of Washington. (2018). Retrieved from https://insightcced.org/2018-family-needs-calculator/

Shearer, C., Shah, I., Gootman, M. (2019, February). Metropolitan Policy Program at Brookings. Advancing Opportunity in California's Inland Empire. *Defining Opportunity*. (pg. 25). Retrieved from https://www.brookings.edu/wp-content/uploads/2019/02/Full-Report_Opportunity-Industries_Inland-California_Final_Shearer-Shah-Gootman.pdf

Appendix: Occupational definitions, sample job titles, and five-year projections for GIS occupations

Occupation Definitions (SOC) code), Education and Training Requirement, Community College Educational Attainment

Geospatial Information Scientists and Technologists (15-1199.04)*

Research or develop geospatial technologies. May produce databases, perform applications programming, or coordinate projects. May specialize in areas such as agriculture, mining, health care, retail trade, urban planning, or military intelligence.

Sample of reported job titles: *Geographic Information System Analyst (GIS Analyst), Geographic Information Systems Administrator (GIS Administrator), Geographic Information Systems Analyst (GIS Analyst), Geographic Information Systems Coordinator (GIS Coordinator), Geographic Information Systems Director (GIS Director), Geographic Information Systems Manager (GIS Manager), Geographic Information Systems Specialist (GIS Specialist), Geospatial Intelligence Subject Matter Expert, Geospatial Program Management Officer, Resource Analyst*

Geographic Information Systems Technicians (15-1199.05)*

Assist scientists, technologists, or related professionals in building, maintaining, modifying, or using geographic information systems (GIS) databases. May also perform some custom application development or provide user support.

Sample of reported job titles: *Geographic Information Systems Analyst (GIS Analyst), Geographic Information Systems Coordinator (GIS Coordinator), Geographic Information Systems Specialist (GIS Specialist), Geographic Information Systems Technician (GIS Technician), Technical Support Specialist*

Remote Sensing Scientists and Technologists (19-2099.01)*

Apply remote sensing principles and methods to analyze data and solve problems in areas such as natural resource management, urban planning, or homeland security. May develop new sensor systems, analytical techniques, or new applications for existing systems.

Sample of reported job titles: *Data Analytics Chief Scientist, Geospatial Intelligence Analyst, Professor, Remote Sensing Analyst, Remote Sensing Program Manager, Remote Sensing Scientist, Research and Development Director (R&D Director), Research Scientist, Scientist, Sensor Specialist*

*Traditional labor market data is not available for these emerging occupations at this time.

Cartographers and Photogrammetrists (17-1021)

Collect, analyze, and interpret geographic information provided by geodetic surveys, aerial photographs, and satellite data. Research, study, and prepare maps and other spatial data in digital or graphic form for legal, social, political, educational, and design purposes. May work with Geographic Information Systems (GIS). May design and evaluate algorithms, data structures, and user interfaces for GIS and mapping systems.

Sample of reported job titles: *Aerial Photogrammetrist, Cartographer, Cartographic Designer, Compiler, Digital Cartographer, Mapper, Photogrammetric Technician, Photogrammetrist, Stereo Compiler, Stereoplotter Operator*

Entry-Level Education Requirement: Bachelor's degree
Training Requirement: None
Incumbent workers with a Community College Award or Some Postsecondary Coursework: 12%

Surveying and Mapping Technicians (17-3031)

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.

Sample of reported job titles: *Aerotriangulation Specialist, CAD Technician (Computer Aided Design Technician), Geospatial Analyst, Mapping Editor, Mapping Technician, Photogrammetric Compilation Specialist, Photogrammetric Stereo Compiler, Photogrammetric Technician, Stereoplotter Operator, Tax Map Technician, Chainman, Engineering Assistant, Engineering Technician, Instrument Man (I-Man), Instrument Operator, Instrument Person, Rodman, Survey Crew Chief, Survey Party Chief, Survey Technician*

Entry-Level Education Requirement: High school diploma or equivalent
Training Requirement: One to twelve months of on-the-job training
Incumbent workers with a Community College Award or Some Postsecondary Coursework: 57%

Table 1: 2018 to 2023 job growth, wages, education, training, and work experience required for the secondary GIS occupational group, IEDR

Occupation (SOC)	2018 Jobs	5-Yr Change (New Jobs)	5-Yr % Change (New Jobs)	Annual Openings (New + Replacement Jobs)	Entry-Experienced Hourly Wage (25th to 75th percentile)	Median Hourly Wage (50th percentile)	Average Annual Earnings	Typical Entry-Level Education & On-The-Job Training Required	Work Experience Required
Surveying and Mapping Technicians (17-3031)	388	44	11%	52	$21.01 to $40.05	$28.09	$64,000	High school diploma or equivalent &1-12 months	None
Cartographers and Photogrammetrists (17-1021)	166	18	11%	16	$27.07 to $43.30	$30.36	$72,400	Bachelor's degree & none	None
Total	**554**	**61**	**11%**	**68**	-	-	-	-	-

Source: EMSI 2019.3