

# Geographic Information Systems Certificate Feasibility Study

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# Comparable Programs

## Institutions in Tennessee

Across the state of Tennessee, programs that focus on geographic information systems (GIS) have been implemented in a number of ways. The University of Tennessee at Knoxville is currently the only institution to offer a free-standing bachelor's degree program in GIS and is only in its third year of implementation. Four institutions, including UTC, offer degree concentrations in GIS or similar subjects, and two institutions offer advising tracks that guide students with GIS courses. Since completions data are reported at the degree level, it is difficult to discern student success for concentrations or tracks.

Additionally, three institutions offer post-baccalaureate certificates in GIS. The University of Memphis certificate program has seen the highest and most consistent number of completions. This program uniquely offers up to nine credits of experiential learning credit for applicants that have GIS Professional status, leaving the GIS project course and capstone project as the only requirement for completion. The programs at both East Tennessee State University and Tennessee State University allow students to apply their credits earned for the certificate to a subsequent master's degree: ETSU MS Geology and TSU Professional Science Master's degree.

<sup>1</sup> New program implemented in Fall 2024.

<sup>2</sup> Completions are for entire degree program, not by concentration.

<sup>3</sup> New program implemented in Fall 2021.

### Baccalaureate Degree Programs

Institution	Program	Completions		
		2020	2021	2022
Austin Peay State University <sup>1</sup>	<a href="#">BS National Security Studies: GIS</a>	—	—	—
East Tennessee State University <sup>2</sup>	<a href="#">BS Geosciences: Geospatial Science</a>	15	28	29
Middle Tennessee State University <sup>2</sup>	<a href="#">BS Geosciences: Physical Geography Geospatial Analysis Track</a>	33	18	21
Tennessee Technological University <sup>2</sup>	<a href="#">BS Geosciences: Geographic Information Systems</a>	13	9	9
University of Tennessee-Chattanooga <sup>2</sup>	<a href="#">BS Geology: Geospatial Science</a>	7	9	8
University of Tennessee-Knoxville <sup>3</sup>	<a href="#">BS Geographic Information Science &amp; Technology</a>	—	—	0
University of Tennessee-Martin <sup>2</sup>	<a href="#">BS Geoscience: Geosystems Geographic Information Systems Track</a>	7	7	4

“—” signifies the program was not offered.

### Post-baccalaureate Certificate Programs

Institution	Credits	Program	Completions		
			2020	2021	2022
East Tennessee State University	12	<a href="#">Geographic Information Systems</a>	0	1	1
Tennessee State University	18	<a href="#">Applied Geospatial Information Systems</a>	2	1	1
University of Memphis	12	<a href="#">Geographic Information Systems</a>	2	5	6

# Comparable Programs

## Institutions in Surrounding States

With the low number of GIS free-standing degree programs in Tennessee, expanding the search to institutions within a 300-mile radius of Chattanooga returned three more degree programs. Each of these three degrees are offered under the Classification of Instructional Program (CIP) Code of 45.0702, Geographic Information Science and Cartography. Although other programs with different CIP codes may have concentrations or tracks in GIS, there is no standard way to identify those programs outside of Tennessee.

Additionally expanding the search for post-baccalaureate certificates within the same distance revealed programs from six different institutions from Alabama, Georgia, and Kentucky. These certificate programs range more widely in the number of credits required compared to those in Tennessee. The University of Kentucky also offers a 30-credit MS Digital Mapping degree that includes the 11 credits earned in the certificate program. Four of these institutions, Auburn University, Murray State University, University of Georgia, and University of North Alabama offer undergraduate certificates in addition to their post-baccalaureate certificate programs.

### Baccalaureate Degree Programs

Within 300-mile Radius of Chattanooga

Institution	Program	Completions		
		2020	2021	2022
Auburn University	<a href="#">BS Geospatial and Environmental Informatics</a>	7	3	5
Kennesaw State University	<a href="#">BS Geospatial Sciences</a>	13	8	16
University of North Alabama	<a href="#">BS/BA Geographic Information Science</a>	16	17	3

### Post-baccalaureate Certificate Programs

Within 300-mile Radius of Chattanooga

Institution	Level	Program	Completions		
			2020	2021	2022
Auburn University	17	<a href="#">Geographic Information Systems Science</a>	9	7	10
Auburn University-Montgomery	15	<a href="#">Geographic Information Systems</a>	1	6	1
Murray State University	9	<a href="#">Geospatial Data Science</a>	—	—	1
University of Georgia	15	<a href="#">Geographic Information Science</a>	4	2	3
University of Kentucky	11	<a href="#">Digital Mapping</a>	16	17	9
University of North Alabama	14	<a href="#">Geographic Information Systems</a>	5	10	0

“—” signifies the program was not offered.

# National Labor Market

## Occupations with Most Frequent Demand for GIS

The National Center for Education Statistics (NCES) and the Bureau of Labor Statistics (BLS) created a taxonomy of occupational matches with each CIP code as a way to align postsecondary programs of study to labor market data. Researching the standard occupational matches with a GIS program provides broad labor market data for a specific set of occupations; however, a post-baccalaureate certificate has the potential to serve graduates from a variety of disciplines. Therefore, analyzing job postings data compiled from Lightcast's more than 65,000 online job boards and company websites allowed for a more granular analysis. The number of unduplicated job posts for each of the past five years (2019-2023) within occupational categories that typically require a bachelor's degree or higher were filtered to count those that mentioned any of the following five specialized skills:

- GIS Certification
- GIS Applications
- GIS Mapping
- Geospatial Datasets
- Geographic Information Systems

The occupations identified as being the most frequent to request GIS skills were found by calculating the percent of each occupation's total job posts that mentioned any of the five skills. Job postings in the US for Foresters had the highest average rate of mentioning GIS skills at 34.3% from 2019 to 2023.

Percentage of Total Job Posts that Mentioned GIS Skills 2019-2023

Occupation	Five-Year Trend 2019-23	2023	High	Low
Foresters		37.1%	40.4%	27.9%
Hydrologists		23.4%	23.4%	14.2%
Cartographers & Photogrammetrists		20.3%	46.9%	20.3%
Urban & Regional Planners		17.8%	17.8%	13.4%
Zoologists & Wildlife Biologists		17.7%	17.7%	14.7%
Anthropologists & Archeologists		16.0%	17.0%	13.1%
Geographers		14.6%	26.8%	9.3%
Geoscientists, Other		12.7%	12.7%	8.3%
Environmental Scientists & Specialists		10.3%	11.1%	10.3%
Social Scientists & Related Workers		9.6%	9.6%	6.1%

# National Labor Market

## Occupations with the Largest Average Demand for GIS

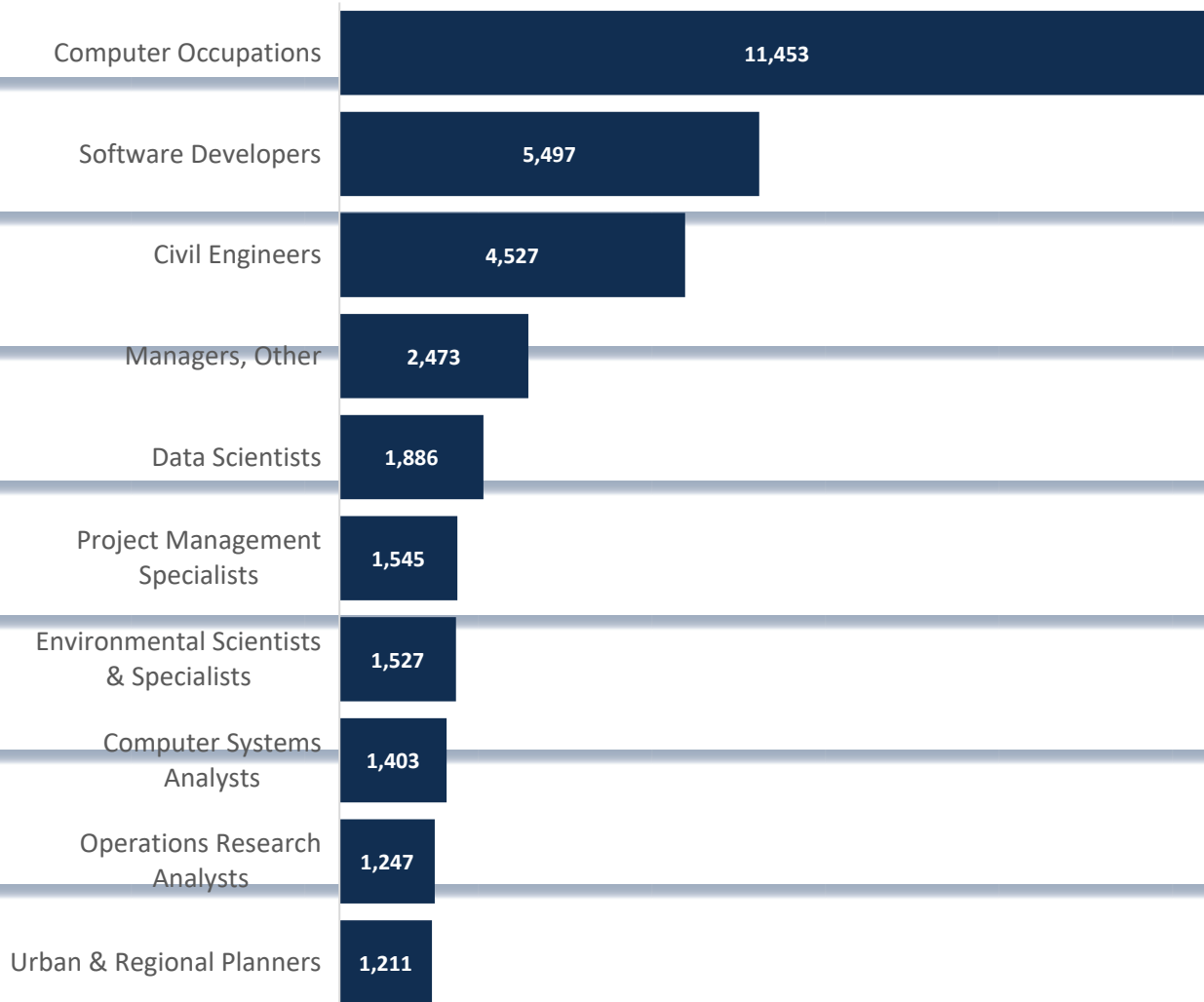
Identifying the occupations that most frequently request GIS skills helps to understand what students following those career paths may need; however, it doesn't identify the other occupations for which a post-baccalaureate certificate in GIS could be beneficial to have.

The ten occupations with the largest demand for GIS were identified by having the highest five-year average of job postings in the US that mentioned GIS skills. Only two of these occupations also frequently mention GIS skills, Environmental Scientists and Specialists, and Urban and Regional Planners. The top two occupations, Computer Occupations and Software Developers decreased in the number of job postings mentioning GIS skills from 2019 to 2023 by 3% and 20% respectively. Although GIS skills may not be frequently mentioned for these occupation, having a post-baccalaureate certificate in GIS may be able to advance careers in these sectors.

Conversely, the five following occupations had a 50% or more increase in the number of job postings to mention GIS skills from 2019 to 2023:

- Environmental Scientists & Specialists (74%)
- Project Management Specialists (71%)
- Urban and Regional Planners (56%)
- Civil Engineers (52%)
- Managers, Other (51%)

### Five-Year Average of Job Posts that Mentioned GIS Skills 2019–2023



# National Labor Market

## Occupations with Fastest Growing Demand for GIS

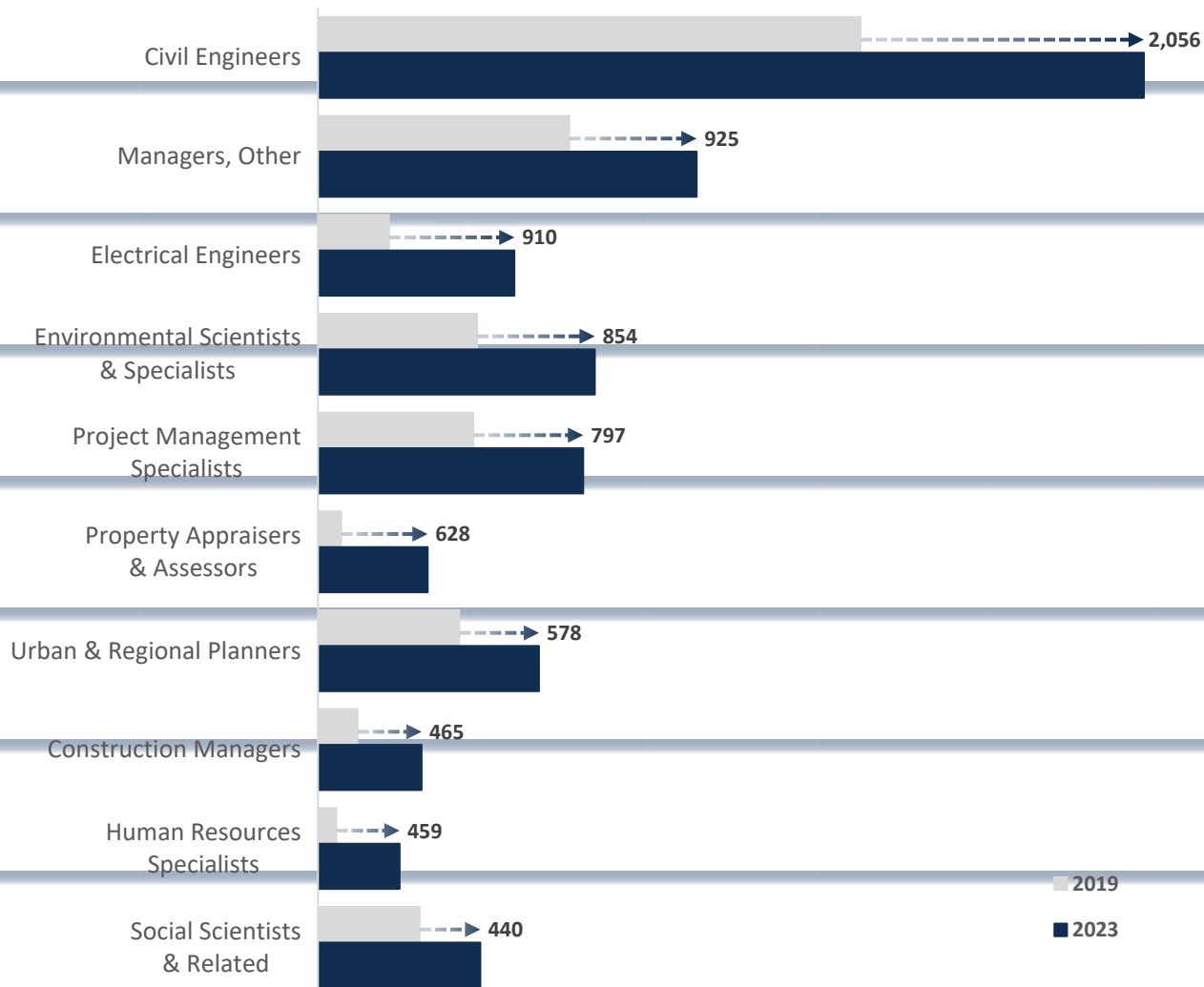
Further isolating the change in number of these job postings from 2019 to 2023 identifies the ten occupations with the fastest growing demand for GIS skills which continues to expand the list of occupations in the US in which a post-baccalaureate certificate may be beneficial.

The five previously mentioned occupations that had the largest average and a 50% or more increase in job postings that mentioned GIS skills are included in this top ten. In addition to these five, the occupational categories of Electrical Engineers, Property Appraisers and Assessors, Construction Managers, Human Resources Specialists, and Social Scientists and Related had large increases in job postings mentioning GIS skills.

### Job Posts with GIS Skills

Occupation	2019	2023
Civil Engineers	3,938	5,994
Managers, Other	1,823	2,748
Electrical Engineers	516	1,426
Environmental Scientists & Specialists	1,155	2,009
Project Management Specialists	1,128	1,925
Property Appraisers & Assessors	168	796
Urban & Regional Planners	1,026	1,604
Construction Managers	287	752
Human Resources Specialists	133	592
Social Scientists & Related	738	1,178

### Increase in Job Posts that Mentioned GIS Skills 2019-2023



# Tennessee Labor Market

## Occupations with Most Frequent Demand for GIS

In order to compare local labor market trends to those nationwide, the same methodology was used to identify occupations with the highest frequency of mentioning GIS skills in job postings across the state of Tennessee.

Again, the occupational category of Foresters had the highest five-year average frequency of mentioning GIS skills in job posts across Tennessee; however, this rate was 21% higher in Tennessee than that of the US. Job posts for Foresters in Tennessee mentioned GIS skills at an average of 58% over the past five years compared to 37% across the US which would imply that these skills may be a higher priority for this occupation in Tennessee compared to other states.

Additional occupations included in the top ten for Tennessee that were not included in the national labor market data are Landscape Architects, Surveyors, and Geoscientists, Other. Interestingly, the rate at which each of these three occupations mentioned GIS skills in job postings was the highest in 2019 and have since decreased.

Again, this data helps to identify which occupations and to what level GIS skills and knowledge may be an important pre-requisite; however, any significant fluctuation in rates of mentioning these skills at the state level should be cautiously considered since the sample sizes of yearly job posting data is much smaller than that of the US.

### Percentage of Total Job Posts that Mentioned GIS Skills 2019-2023

Occupation	Five-Year Trend 2019-23	2023	High	Low
Foresters		58.3%	64.2%	40.3%
Environmental Scientists & Specialists		27.9%	27.9%	1.7%
Urban & Regional Planners		22.2%	22.2%	6.3%
Zoologists & Wildlife Biologists		17.2%	24.5%	0.0%
Anthropologists & Archeologists		11.3%	22.1%	3.8%
Landscape Architects		7.9%	10.7%	5.8%
Hydrologists		7.1%	30.8%	0.0%
Social Scientists & Related Workers		7.0%	10.0%	5.6%
Surveyors		6.2%	15.0%	6.2%
Geoscientists, Other		5.4%	20.4%	0.0%



# Tennessee Labor Market

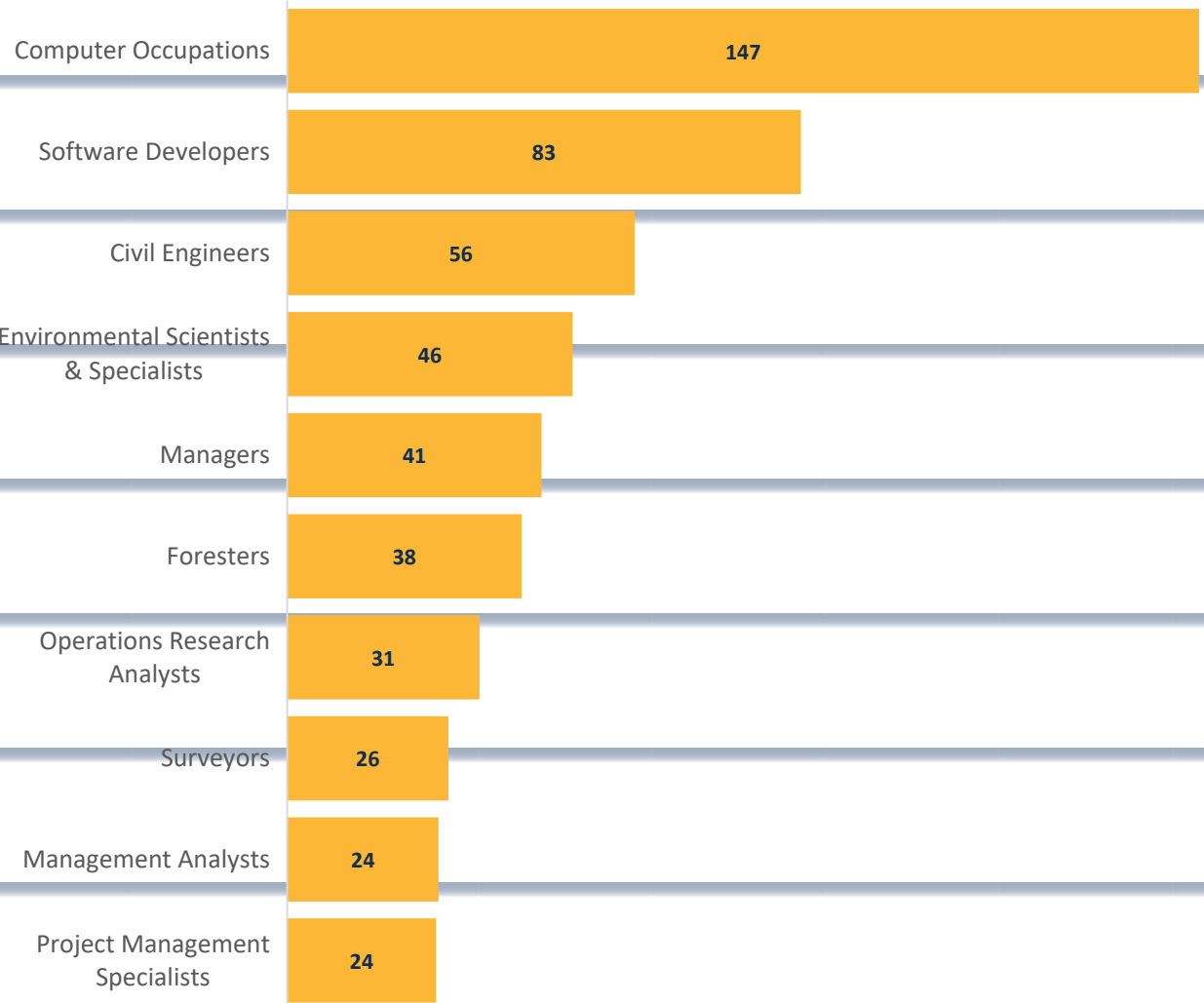
## Occupations with the Largest Average Demand for GIS

In addition to identifying the occupations with the highest frequency of mentioning GIS skills, the occupations in Tennessee with the largest five-year average of mentioning these skills were identified with the same methodology as the nationwide data. Computer Occupations, Software Developers, and Civil Engineers again had the three highest five-year averages.

Occupations that were in the top ten for nationwide job posts, but not for statewide include Data Scientists, Computer Systems Analysts, and Urban and Regional Planners. However, Foresters, Surveyors, and Management Analysts were identified in the top ten for statewide data. Foresters and Surveyors were also identified in the statewide list of most frequently mentioning GIS skills in job postings.

Of these ten occupations, six increased by more than 50% in the number of job posts mentioning GIS skills from 2019 to 2023, Civil Engineers, Environmental Scientists and Specialists, Managers, Foresters, Management Analysts, and Project Management Specialists. Each of these six occupations are further examined in the list of top ten occupations statewide with the fastest growing demand for GIS skills from 2019 to 2023.

### Five-Year Average of Job Posts that Mentioned GIS Skills 2019–2023





# Tennessee Labor Market

## Occupations with Fastest Growing Demand for GIS

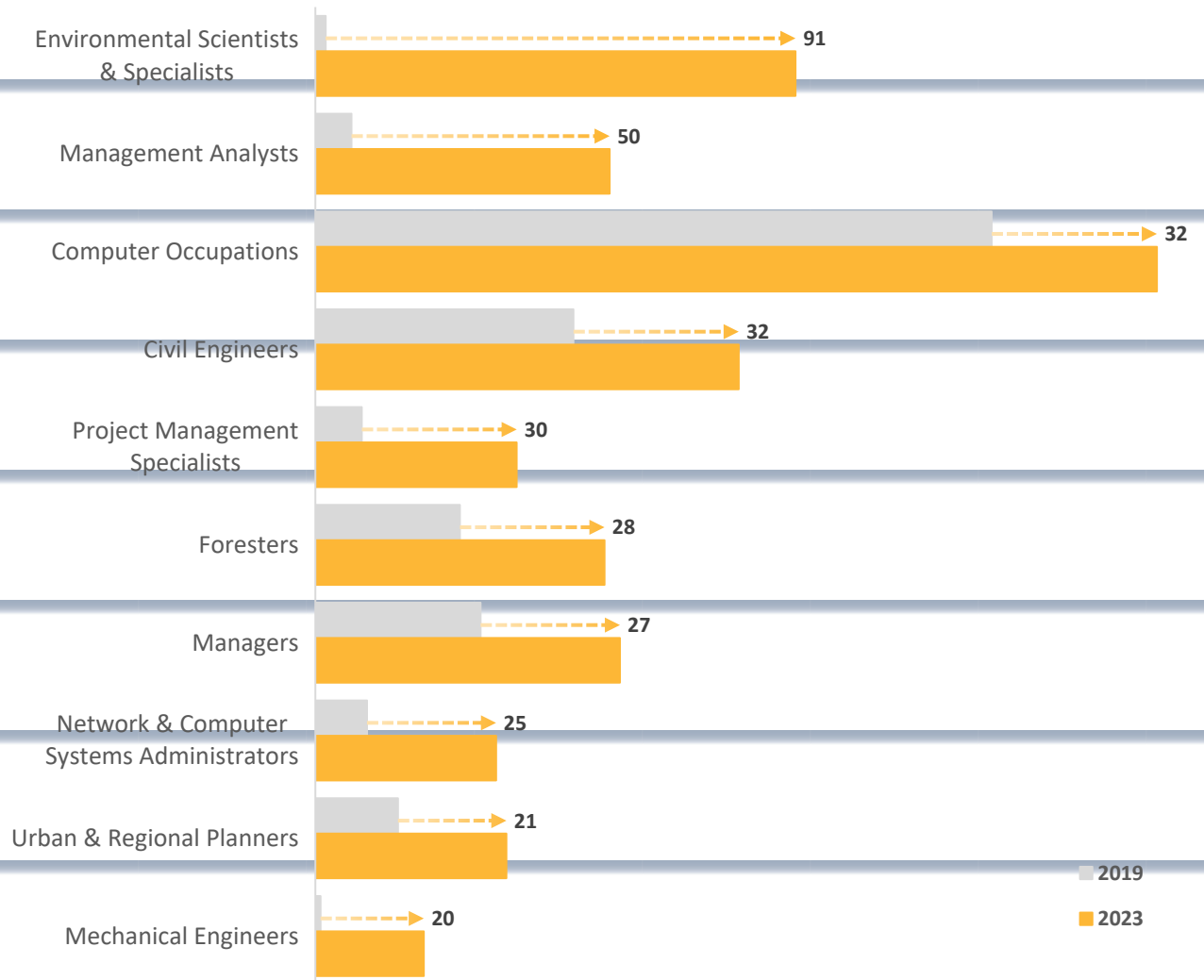
The occupations provided in this chart were identified as having the highest increase of Tennessee job posts mentioning GIS skills from 2019 to 2023. Most notably, job posts for Computer Occupations decreased by 3% nationwide, but increased by 24% in Tennessee. Furthermore, Environmental Scientists and Specialists, Civil Engineers, Project Management Specialists, and Managers also had significant increases in Tennessee compared to nationwide. This implies that GIS skills have become more desirable for employers of these occupations in Tennessee than the rest of the nation.

Although this provides evidence of a statewide increase in demand for GIS skills, it is important to note that the smaller statewide data will seem to change more drastically than the nationwide data.

### Job Posts with GIS Skills

Occupation	2019	2023
Environmental Scientists & Specialists	2	93
Management Analysts	7	57
Computer Occupations	131	163
Civil Engineers	50	82
Project Management Specialists	9	39
Foresters	28	56
Managers	32	59
Network & Computer Systems Admin.	10	35
Urban & Regional Planners	16	37
Mechanical Engineers	1	21

### Increase in Job Posts that Mentioned GIS Skills 2019-2023



# Regional Demand of Occupations

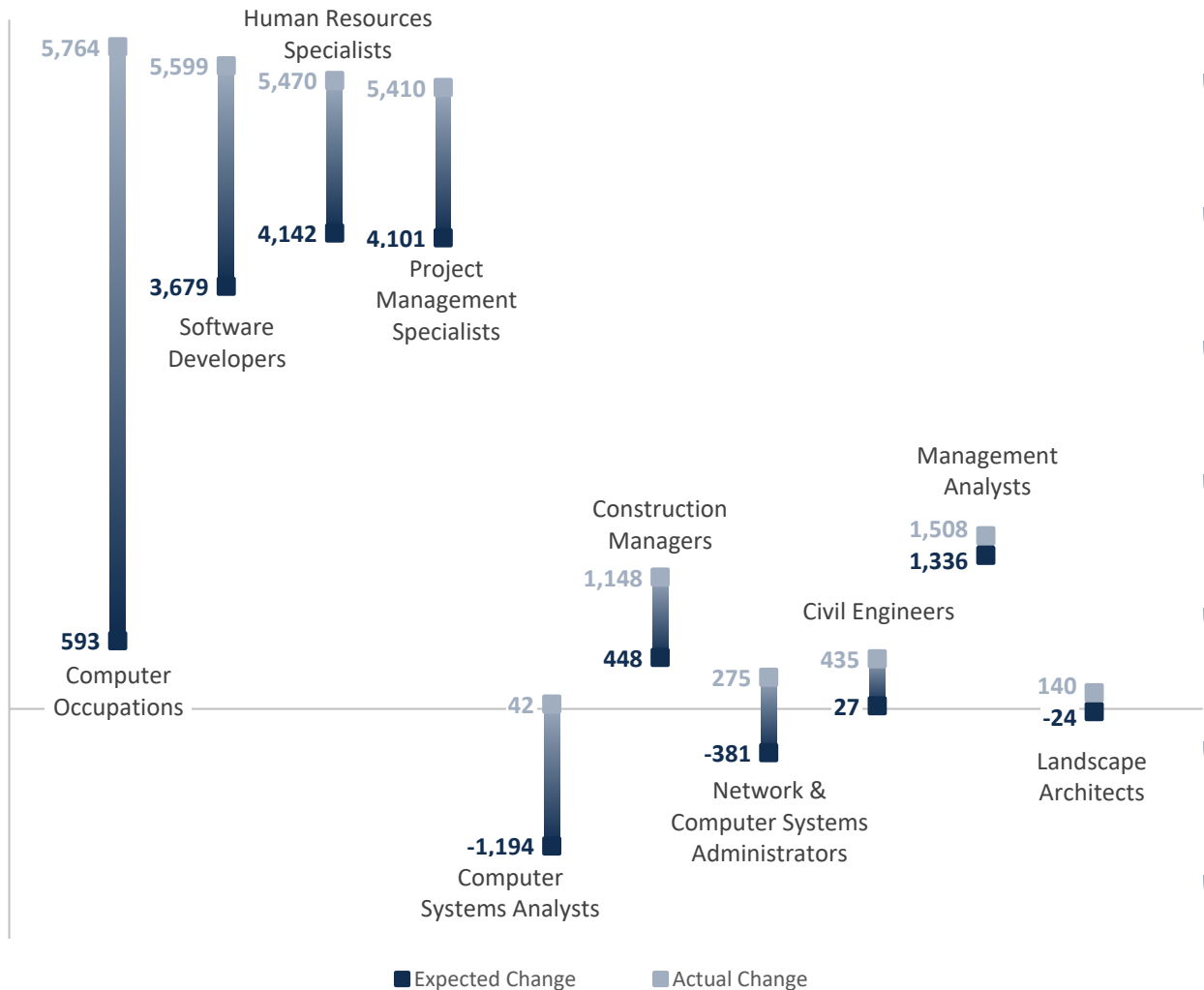
## Competitive Occupations in Tennessee

Further analysis of data was completed to examine whether any of the 27 previously identified occupations would be considered in high demand regionally. Using Lightcast Q4 2023 data, the metric called competitive effect indicates how much of an occupation's job change within a specific region might be the result of unique competitive advantages. This metric is derived from the difference between the region's expected change in jobs to the actual change in jobs and essentially gives a measurement of the region's job change that cannot be explained by broader trends such as the National Growth Effect or the Industrial Mix Effect. Across Tennessee, the following occupations had the highest competitive effect from 2019 to 2023 of the 27 identified.

### Occupational Competitive Effect

Occupation	C.E.
Computer Occupations	5,171
Software Developers	1,920
Human Resources Specialists	1,328
Project Management Specialists	1,309
Computer Systems Analysts	1,237
Construction Managers	700
Network & Computer Systems Administrators	657
Civil Engineers	408
Management Analysts	171
Landscape Architects	164

### Tennessee Competitive Effect for Identified Occupations 2019-2023



# Regional Demand of Occupations

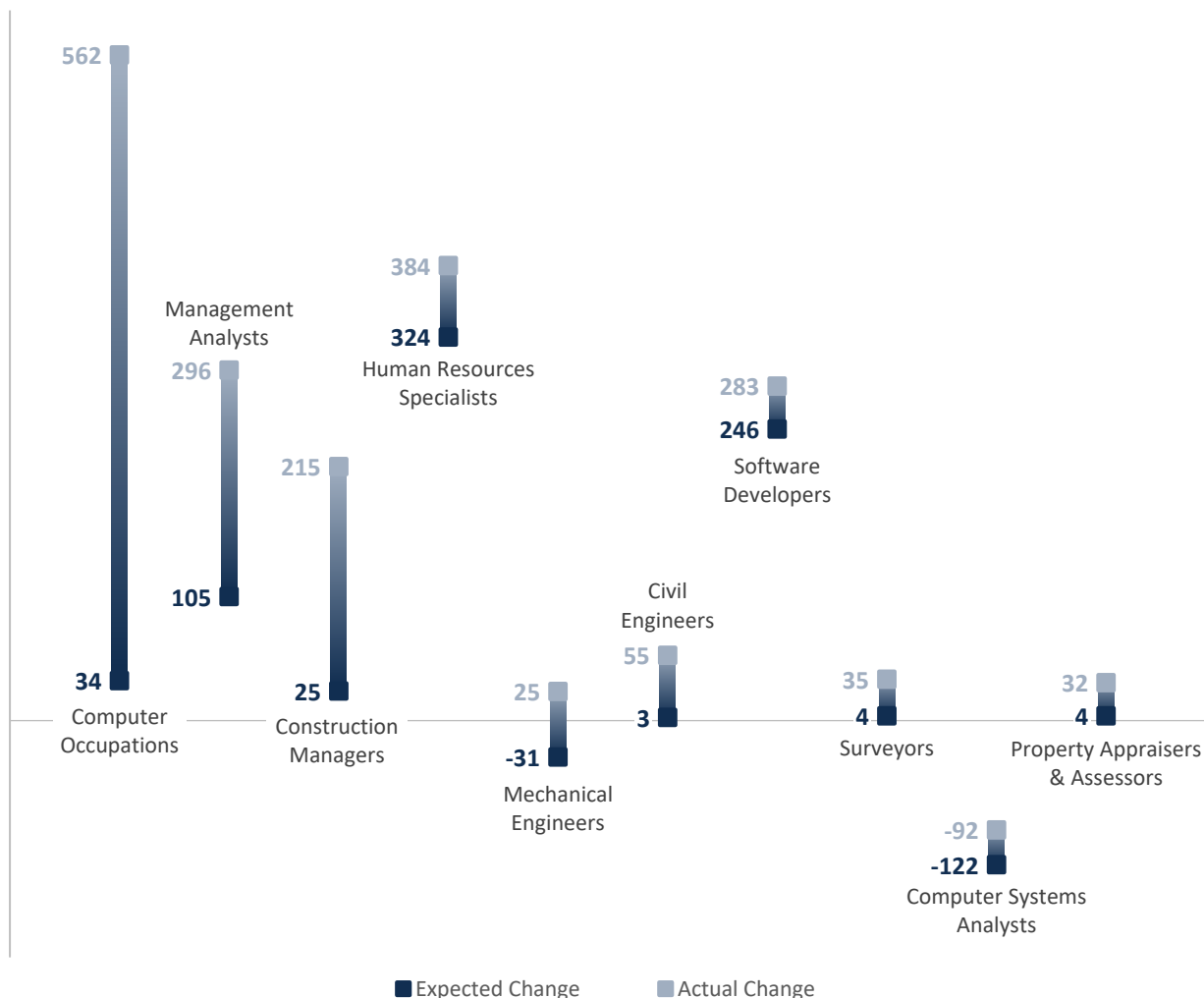
## Competitive Occupations in Chattanooga

The data was further narrowed to the Chattanooga metropolitan statistical area (MSA) which includes the counties of Hamilton, Marion, and Sequatchie in Tennessee as well as Dade, Catoosa, and Walker in Georgia. Compared to the occupations identified with the highest competitive effect in Tennessee, seven of the ten are also competitive in the Chattanooga MSA region. Overall, Computer Occupations has the highest competitive effect from in both regions from the list of 27 connected to having a demand for GIS skills.

### Occupational Competitive Effect

Occupation	C.E.
Computer Occupations	529
Management Analysts	191
Construction Managers	190
Human Resources Specialists	60
Mechanical Engineers	55
Civil Engineers	52
Software Developers	36
Surveyors	31
Computer Systems Analysts	29
Property Appraisers & Assessors	28

### Chattanooga, TN-GA Competitive Effect for Identified Occupations 2019-2023



# Regional Demand of Occupations

## Area Job Titles and Employers

In addition to looking at the potential demand for GIS skills by occupation, job postings data within a region can be analyzed to identify top employers and frequent job titles. From January 1 to December 31, 2023, the Chattanooga MSA had a total of 447 total job postings from 60 different employers across all occupational categories that mentioned the five identified GIS skills.

By counting any of these 447 posts that list the same job, company, and region as one unique job post, the ten companies with the highest unique posts in 2023 are listed here. The City of Chattanooga tops this list with 66 total and 30 unique job postings from January 1 to December 31, 2023.

Furthermore, posting intensity is the ratio of total postings to unique postings which gives an indication of the level to which each company was advertising. Despite having less than half as many unique postings, Black & Veatch had the highest posting intensity ratio with an average of four advertisements per job opening.

The most frequently posted job titles within these 447 posts included Survey Project Managers, Occupancy Managers, Civil Engineers, Water Resources Engineers, and Transmission Line Design Engineers. Although companies may advertise varying expectations regarding an employee's minimum education level, 52% of these job postings requested a bachelor's degree as the minimum education level.

### Top Employers in Chattanooga MSA Seeking GIS Skills for 2023

	Unique Postings	Total Postings	Posting Intensity
City of Chattanooga	30	66	2 : 1
Black & Veatch	11	39	4 : 1
GIS Field Services	10	31	3 : 1
Sargent & Lundy	9	16	2 : 1
Mesa Associates	9	24	3 : 1
University of Tennessee	8	21	3 : 1
CDM Smith	6	7	1 : 1
Geosyntec Consultants	6	6	1 : 1
Stantec	5	11	2 : 1
Hamilton County	5	10	2 : 1