Joseph Flores

Ms. Silva

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Introduction

The career I am going to write about is Geographic Information Systems (GIS) Technicians/Specialist. This is a job that I think is very interesting and also allows for being outside of an office which is a plus in my book. I have always been more than happy to be in nature and love to go outdoors for hikes and tent camping. This job is very physical at least in the Computer Science and Information aspect. This is because it does not only focus on the digital part of the job, it requires going to different places and troubleshooting computers sometimes not in the most populated areas.

Career Duties

Geographic Information Systems (GIS) collecting information via computers, then, managing, modeling, and presenting the data in graphs, charts, etc. GIS software is used by many for a variety of things. One such use is to use flood history, and elevation maps to determine which homeowners are at risk during storms.

Enviromentalscience.org states "GIS is an analysis tool that's used in a wide range of areas, including health, city government, transportation, urban planning, business marketing, geology and archaeology." Because it is so spread between so many fields there are more requirements to be hired to do this job.

The most common skills needed are being able to use computers and electronics. Knowing how circuit boards, electronic equipment, other computer hardware and software are crucial to be able to work with the machines. As well as understanding of the different applications generally used in GIS work and programming. One such application used is grass[1].

Geography is another important thing to know. There are many ways to map land, sea and air spaces or masses and knowing how to read and produce such things are crucial. There are other things that could be included on maps such as their locations, physical attributes, even the corresponding plant, animal and human information if needed.

English is also something to learn, you would be expected to be able to write reports and communicate on a very professional level. This is important because there is a lot of data that other people would need to reference and they need to be able to understand it.

Mathematics is important to know as well. A question was asked on stack exchange[2] asking about what math is recommended to be a GIS analyst should know. I found this a very reasonable list to learn for a career in this field. It includes, arithmetic, algebra, geometry, calculus, statistics, and their applications. Basically everything you learn that you always thought you would never use. There was a reason behind each of the different math listings, which greatly increases the credibility of the OP (original poster) being a GIS analyst themself.

Discrete Math would definitely be something I would make a point to learn. Discrete mathematics deals with discrete objects, very informational I know. Discrete objects are separated from each other. Odu.edu explains discrete objects[3] as "Things such as integers (whole numbers), or rational numbers, automobiles, houses, people etc. are all discrete." Now discrete

[1] https://grass.osgeo.org/ - used in GIS
[2] https://gis.stackexchange.com/questions/6535/how-much-math-does-a-gis-analyst-need-to-know
[3] www.cs.odu.edu/

math would be doing something like if "Get the shortest route from house A to house B without using the highway." Or "How many paths are there between computer A to computer B on this network?

Learning how to properly design is also something that would greatly help someone aspiring to GIS as a career. For example knowing how to use software such as Adobe Illustrator to make infographics. The know-how of what goes into maps, charts, etc. This is important because if you collect all this data and are able to do amazing things with it such as predictions, understanding behaviors/patterns, etc but only you can understand it. This greatly lowers the value of your research.

Work Environment

The work environment would vary job to job, person to person. From what I could gather, there are many different types of work that GIS analysts do. Some work with forestry, and with National parks. While some could work with a company or a seller of some kind. This would be very different work environments in these two spectromes of this career. The nature work would be something more isolated. You would most likely have longer hours for a longer period of time of work and it may require a physical aspect. Such as taking a flight in an airplane, or hiking with GPS to gather data. While the marketing side would be more based in a city. You could have more "normal" work hours such as going in for 8+ hours a day weekdays. I would find working for nature reserves more enjoyable than a marketing team personally.

Important Qualities

There are a few qualities that would greatly help people in the GIS line of work. This is from research and not from any personal experience and a few of the sources said that there have

been plenty that succeed with or without fitting this list. The first is to have an analytical mind, and to have attention to detail. This was recommended on many platforms such as www.environmentalscience.org and www.cacareerzone.org. This is because the smallest lapse in attention can mess with data sets and what you generally would work with are important to many people. The second is to be able to do complex problem solving. This means Identifying complex problems and reviewing related information to develop and evaluate solutions. Then being able to share said options and implement said solutions. I snuck the third one in there, it's to be able to talk to other people and express information in a way people understand. This means having good soft skills and adequate social skills.

Education/Experience Requirements

There are many different spectrums of work for GIS specialists but some general classes listed on enviromentalscience.org include a bachelor's degree in geography, cartography, or surveying. Some other classes may also include engineering, forestry, geology, or environmental science. Many schools now offer minors, certificates, and master's programs in GIS and on other geospatial technologies. From my research getting certified may be the breaking factor in getting hired for this work. Most people are looking for experience in this field so it's important to get started as early as I can with internships or any other way to boost my GIS resume. Earth and environmental sciences are not something to land a career in GIS on their own. They are generally used to enhance the skills and credibility of scientists. For this reason, because I intend to apply for a GIS job on environmental issues. It would be good for me to develop a background in environmental science, forestry, and geology. This is because I would prefer to work as an environmentally focused GIS specialist. Math and programming are also things I enjoy just not

as much so I will be learning more about certain aspects of these subjects. The environmental classes might be something I would do at my own pace along with a computer science major. This is a high end career goal that is not something to start off at.

Salaries

According to Payscale[4] and enviromentalscience.org[5] the average pay for environmental GIS specialists is upwards of 50k annually. The listed figure for the average hourly pay of $22.16. The lower 10% of these jobs get paid ~$16.45 per hour. This is not the best paying job but I think I would enjoy this job more than something like Cybersecurity. The biggest factor in the difference of pay is experience. This is the average pay in CA, the average in the US is fairly even so there is little change state to state.

Low End	MEDIAN	High End
~10%	~80%	~10%
PAY:$16.45	PAY: $22.16	PAY:$29.24
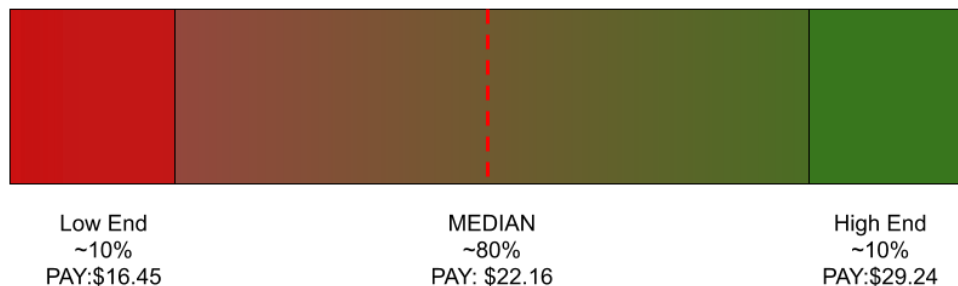
Job Outlook

According to enviromentalscience.org the job outlook of GIS specialists and cartographers is projected to grow 20 percent from 2012 to 2022. This is very fast growth compared to the average job growth rate. But because this is a small field to start with, the
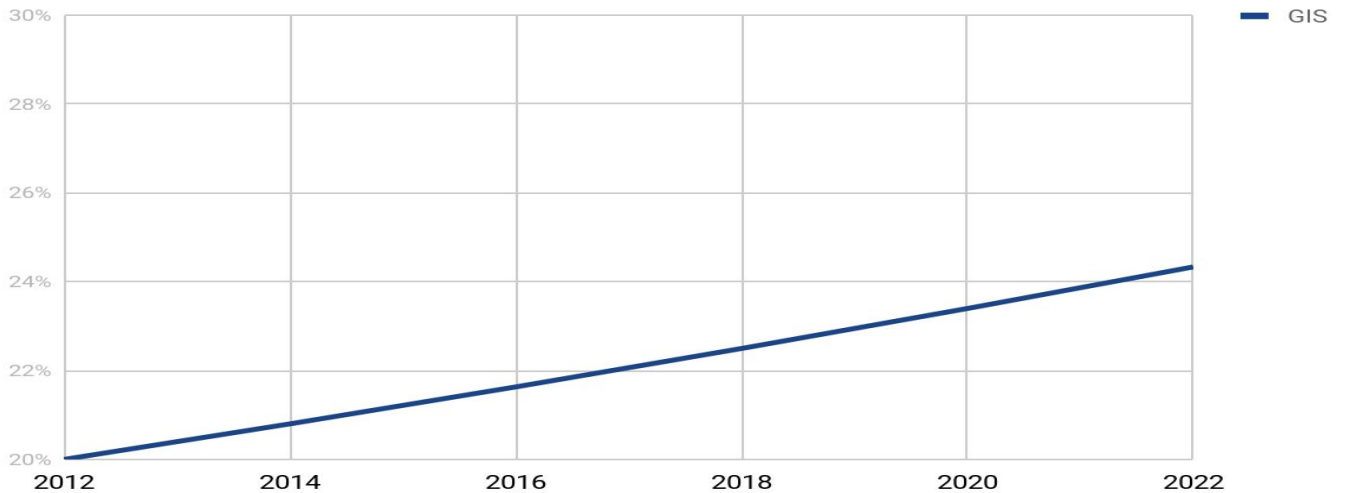
4
https://www.payscale.com/research/US/Job=Environmental_Scientist/Salary/75509303/Geographic-Information-Systems-GIS
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projected growth will create a minimal impact on the job market. Only 2,400 new jobs could be created during that time.

Job Growth for GIS

Educational Institution Options

Two different paths to get to be a GIS specialist include becoming an intern. A solid starting point of GIS courses is needed before becoming an intern. The most important thing is passing the test provided by the The GIS Certification Institute (GISCI). Taking a "Introduction to GIS" class. If possible a second advance GIS class can help put you above competition. Taking a separate cartography class if available is something some people overlook. Knowing how to develop maps are very crucial in this job. A class covering databases and discrete mathematics is something needed on certain occasions but might not be necessary for an internship.

The second way is to get a masters from a college such as The University of Arizona or a college who provides such a degree.

Conclusion

So in conclusion, the career of a Geographic Information Systems Specialist is not a starting job. It requires many different certifications and degrees, but experience above all else. There is a wide range of work people in this field do, from consumer data, too forestry. I will be pursuing a career in this because I would love to tie together Computer Science and Environmental work as a living. I have also always thought cartography was cool as well. I hope that through a career in this I can go places I have never been and places I would not be otherwise.

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