Evaluating Map and Geospatial Academic Library Position Descriptions

Kimberly A. Plassche

Map librarianship, in the past incorporating duties involving acquisition, cataloging, or curation of physical map and atlas collections, has evolved into a profession often requiring knowledge of geographic information systems (GIS) software and data. This study examines descriptions for map and geospatial academic library positions from 2015 to 2020 with a goal of observing trends in requirements and specific duties for these roles. Institutions are recruiting individuals with strong backgrounds in geospatial technologies for some positions. However, a Master of Library and Information Science degree is still preferred for new hires in this field. Graduate library and information science programs can support future academic librarians by incorporating coursework related to geospatial data and traditional map resources into their curricula.

Introduction

Analyzing job advertisements can provide a valuable overview of the hiring landscape in librarianship. Uncovered trends in position descriptions can contribute to the development of education and training for future librarians and highlight recent changes in the field. Articles have been published specifically studying job advertisement trends for specialized librarianship areas including digital initiative, government documents, and cataloging librarians, to name just a few.[1] However, no study of geospatial or map librarian job announcements has been published in the peer-reviewed literature. This article seeks to examine requirements and position duties for professionals managing maps and geospatial data in academic libraries. Education and experience requirements for geospatial and map librarians are compared to those seen broadly in academic librarian position announcements. These observations build upon existing literature that highlights the evolution of the map librarian and historical need for library and information science education specifically for aspiring geospatial library professionals.

Literature Review
Job Advertisement Analysis Studies in Library Science Literature

Job advertisement analyses provide insights into current practices in hiring and can help predict where a profession is headed. Data revealed in such studies can be used to help students identify areas for study and degrees to pursue. Likewise, experienced professionals may review

Kimberly A. Plassche is Map Librarian and Liaison to Geography in the Sciences and Engineering Information Center of Lockwood Memorial Library at State University of New York at Buffalo; email: kf43@buffalo.edu. ©2022 Kimberly A. Plassche, Attribution-NonCommercial (https://creativecommons.org/licenses/by-nc/4.0/) CC BY-NC.

position announcements to stay abreast of new skills and technologies in the profession. This is particularly true for librarianship. As Meier points out, "the nature of a librarian's job is ever changing with new technology and the evolving information landscape. Librarians have adapted to fit new and expanded roles in this environment."[2]

Published articles that examine position openings focus on either specific roles or on the librarian profession as a whole. Some studies examine job advertisements across different library types or librarian roles, aiming to create a broader profile of the profession.[3] Conducting periodic reviews of job advertisements show trends over time, as in Triumph and Beile's comparison of 2011 academic library position announcements to data from 1996 and 1988.[4] Other research seeks to identify desired skills or typical duties for a specialty position, such as electronic resources librarians.[5] Regardless of the goal of the research, job advertisement analyses begin with identifying criteria for applicable positions and collecting announcements from a specified timeframe. With the sharing of job announcements to professional email listservs having become a common practice, the next step is to identify relevant listservs and search available archives. An analysis of specialized librarian positions can be done in a specific listserv for that type of librarian. For example, the listserv Code4Lib was searched for a 2017 analysis of digital initiatives librarian job announcements.[6]

The most important and difficult task in conducting a job advertisement analysis is defining criteria for announcements to be included in the final sample. For example, choosing positions that have the word "librarian" in the title may exclude many announcements for the same job at an institution where this title is not regularly used. Similarly, choosing only announcements for positions requiring an MLS/MLIS will miss postings from institutions that accept subject-specific graduate degrees in lieu of these traditional librarian degrees. A recent study analyzing cataloging job descriptions took a simple approach, focusing on the wording of position titles to identify a final sample. Those postings for cataloging, metadata, or metadata and cataloging were considered in the analysis.[7] Another approach is to consider the content of the job posting to find positions with similar duties or collections. In Sproles and Clemons' recent study of government information librarian position announcements, only advertisements including primary duties related to government documents were included.[8] Researchers must identify and refine their criteria for postings to include in the final sample, as we regularly witness special librarian roles being merged into more general position titles. This is noted by Sproles and Clemons, specifically in relation to government documents librarianship.

Subject Knowledge Requirements for Geospatial Librarians

Librarians working with maps, cartographic resources, and geospatial information are a specialized group and require advanced subject knowledge to fulfill their obligations. The Map and Geospatial Round Table (MAGIRT) of the American Library Association (ALA) identified core competencies for the profession in 2017.[9] The diverse set of skills and knowledge for geospatial librarians ranges from basic knowledge of map library equipment to understanding GIS programs. As stated in the Core Competencies for Map, GIS, and Cartographic Cataloging/Metadata Librarians, "most information professionals will need much more than their required courses in the typical MLS/MLIS program to master even Level 1 core competencies."[10] In an era when map librarians managed only paper collections, the lack of formal specialized courses for cartographic resources in graduate library degree programs was notable. B.M. Woods is-

sued a plea in 1952 for institutions to incorporate training for care, treatment, classification, and cataloging of maps in their curricula.[11] Eighteen years later, Woods noted the addition of sufficient cartographic resources coursework was not achieved.[12] By 1988, Gelfand found only six library graduate programs included map specialization courses.[13] In an attempt to identify other courses where map skills were taught, Gelfand distributed a survey to ALA-accredited programs in the United States and Canada.[14] Thirty-nine schools responded; they attested maps and cartographic information was covered in various courses including reference, government documents, preservation, conservation, cataloging, and management. As recently as 2015, Aber and Aber found only 10 of 59 accredited library schools in the United States and Canada offered map librarianship courses.[15]

In addition to working with traditional maps and atlases, map librarianship has now evolved to include geographic information system (GIS) data research and curation. Holstein surveyed 115 academic libraries to understand how they supported geographic data and technology use for their campuses in 2015.[16] The author found 85 percent of the libraries collected GIS and remotely sensed data, all libraries provided GIS software for campus use, and many library staff use GIS internally to help users locate library materials. In this new era of the profession, where applicants are expected to have advanced skillsets in traditional librarianship as well as geospatial concepts, dual degrees may be the answer. Appropriate training with GIS software and information can be achieved through M.A. Geography/MLS program, such as those offered at University of Maryland, College Park and University of Wisconsin–Milwaukee.[17] Aber also highlighted the program at the University of Wisconsin–Milwaukee offering a MLIS/MA Geography Coordinated Degree Program. UW–Milwaukee's website notes this prepares graduates "to assume positions as curators and staff in map collections of universities, governmental agencies, and industry."[18] Coursework offered by other schools or departments can also supplement the library program offering. The University of Oklahoma, for example, directs MLIS students to work with their advisor to take *GIS 5013: Fundamentals of GIS* as an elective.[19]

Rise of Geographic Information System Support in Academic Libraries

According to Bidney and Piekielek, there have been three "paradigm shifts" in map librarianship.[20] The first occurred approximately in 1992, when the Association for Research Libraries (ARL) joined forces with the producer of ArcGIS software, Esri, to initiate the Geographic Information System Literacy project.[21] The purpose of this collaboration was to support librarians as they became a trusted source for dissemination of spatial data. This marked a somewhat official beginning of GIS support in academic libraries. The second paradigm shift is identified by Bidney and Piekielek to have started circa 1995, with the onset of map digitization.[22] The third paradigm shift, occurring during the publication of the *Journal of Map & Geography Libraries* editorial in 2018, sees map librarians reshaping their roles in academic libraries. "In our limited view, the individuals hired into geospatial librarian positions seem, largely, to define the positions themselves rather than hiring for a specific skill set and/or set of interests."[23]

Mary Lynette Larsgaard's classic map librarianship textbook introduces common tasks map librarians encountered at the time of the publication of each of her three editions in 1978, 1987, and 1998.[24] Traditional map librarians' duties included acquisition, cataloging, preservation, in-depth research, collection development, map making, and instruction. Sweeping changes to the profession since Larsgaard's final edition, with a new focus on GIS resources

and services, are documented in Aber and Aber's more recent 2017 text.[25] Chapters outlining basic skills and knowledge related to work with GIS and remote sensing data and software are nestled among information about paper maps and charts, globes, aerial photography, and map library equipment needs. As noted by March and Scarletto in their own history of the profession, GIS librarians now may work in data curation and dissemination, technology troubleshooting and instruction, digital cartography, and data discovery.[26] Holstein's 2015 survey of 115 academic libraries attempted to highlight how academic research libraries support campus use of geographic information technology and data. Survey respondents responded to various questions regarding library GIS services. Thirty-six percent of the responding libraries indicated the dedicated geographic information services area is located alongside the paper map collection. The study found 65 percent of the 113 geographic services personnel at responding libraries had an MA/MS, MLS/MLIS, or PhD, and half of them held an MLS/MLIS specifically. As Holstein notes, "today's GIS professionals are just as likely to come from nonlibrary backgrounds, bringing their expertise and advanced geographic training to this nontraditional librarian role."[27]

An analysis of recent professional position openings for geospatial librarians should show a large percentage of institutions requiring subject-specific degrees and GIS experience. Based on recent trends of incorporating GIS support in academic library services, we may see fewer postings for individuals working with physical collections and more in a data creation or curation role. This author examined job postings for librarians working with maps and GIS to observe candidate qualifications and position duties during a period of five years.

Methodology

The author reviewed job postings in the United States that required the new hires to work with geospatial data or cartographic resources based on a search of the MAPS-L archives hosted on the University of Georgia website.[28] MAPS-L was selected since postings for map and geospatial librarians are most often shared or cross-posted to this list. The author searched the full text of listserv postings for the following string: job OR position. This search was intentionally general to ensure all position announcements to the listserv were included. Posts to the listserv for a period of five years (dating from November 1, 2015 to November 1, 2020) were searched, and 126 job announcements were discovered.

Each email was reviewed to become familiar with the general trends of the listserv postings, and those including duties with geospatial data or maps were marked for a second review. Each email from this broad initial search was reviewed as titles and email subject lines do not necessarily reflect all duties of the position. For example, postings for "Data Librarians" appear that include working with GIS data, as well as "Government Documents" librarians managing USGS topographic map collections. It is important to note that, although subscribers to MAPS-L are primarily map librarians, positions from members' home institutions that aren't specifically for map and geospatial librarians are shared on the list. The text of each email was examined in a first pass to confirm there was a geospatial or map component in the announcement. Those including duties with geospatial data or maps were marked for a second review.

Postings meeting the following criteria were selected for evaluation:
- Cataloging and metadata librarians
- Technology librarians

- Subject specialists or liaisons

A repeat of this initial review of the text in all discovered job postings was conducted to ensure no job postings with geospatial or map duties were missed from the selection. A third pass was then completed to further refine the list of final positions for analysis. Postings were removed from the sample if they were not for an academic library. Positions located outside the United States were also taken out of consideration.

The following types of positions were also eliminated:

- Cartographers, as these roles typically require no library background or education, and the job duties differ from any seen in the field of librarianship
- Library directors or department heads, unless it is clear they would work directly with the map or geospatial data collection, or if the specific department is a map/geospatial collection
- Duplicates of postings
- Part-time positions, since these positions tend to focus on a fraction of the duties full-time personnel are expected to conduct
- Government document librarian postings that did not specifically mention maps, geospatial data, or cartographic resources
- Fellowships or fixed short-term positions
- IT (information technology) professionals who provide administrative or technical support

GIS specialists and similar titles were included if the candidate would be specifically hired for the library.

When this process was complete, the author had selected 46 job announcements to evaluate. Eighty of the emails in the original set were deemed outside of scope due to the reasons detailed above.

Additional searching was required to locate complete postings for 17 percent of the positions, as the MAPS-L email announcements for these merely included brief summaries and links to the complete postings on the institutions' websites. Those links were no longer active. The author attempted to find complete postings using the archive.org Wayback Machine.[29] Only one full posting was found with this method. The author then searched Google with a combination of search terms for each job title and institution. Complete postings were found for three additional announcements in other listserv archives. Although complete postings for 9 percent of the positions were unavailable, the MAPS-L email announcements did provide limited information about the position. Information regarding required and preferred degrees, qualifications, and job duties were missing for these positions. To account for that missing information, the author coded data related to those areas as Unavailable. This should not be confused with the code Not Specified used by the author during data analyses. Not Specified indicates a certain piece of information is not included in the complete posting, but that doesn't necessarily mean the qualification or duty does not exist for that role. For example, some postings state whether a position is tenure-track or faculty. However, some may omit this information, and it cannot be assumed that those positions are not tenure-track. Similarly, responsibilities relating to collection development or supervision may be missing from job descriptions, but those duties may be omitted due to space restrictions or the task itself being a relatively minor task for the position.

Findings and Discussion
Dates of Job Announcements
The author chose a period of five years to search to capture a large sample of job announcements. The data gathering began in November 2020, so announcements posted for five years prior to this month were analyzed.

In the final sample, the oldest job announcement posted was December 7, 2015. The most recent was dated March 15, 2020. While we must consider the impact of the COVID-19 pandemic on the dates of our job announcement pool, speculation about the reasons for the absence of job postings between March and November 2020 is outside the scope of this research. The complete breakdown of the number of postings analyzed for each annual period can be seen in table 1.

TABLE 1 Frequency of Map and Geospatial Position Announcements in Academic Libraries	
Time Period	Number of Postings in Final Sample
2015-11-01 to 2016-10-31	9
2016-11-01 to 2017-10-31	10
2017-11-01 to 2018-10-31	9
2018-11-01 to 2019-10-31	13
2019-11-01 to 2020-10-31	5

Location of Positions
The final study sample included positions at academic libraries in 26 states. Postings in California and Texas were most prevalent (Figure 1). Seventy-six percent of the hiring libraries were in public institutions. A majority of the positions were in research universities (91 percent); the remaining nine percent were in liberal arts colleges.

Job Titles
Fifty-nine percent of the position titles include the word "librarian." Additional words in those titles indicate whether the position is devoted to GIS/spatial data, maps, government information, cataloging/metadata, or is a subject liaison:
- Academic Services Librarian
- Business and Social Sciences Informationist/Data Librarian
- Cartographic Metadata Librarian
- Data and Information Visualization Librarian
- Data Librarian
- Geosciences and Maps Librarian
- Geospatial Data, GIS, and Maps Librarian
- Geospatial Information Librarian (Note: This title appeared in two distinct job postings)
- Geospatial/Data Visualization Librarian
- GIS and Geospatial Data Coordinator position (Librarian II)
- GIS Librarian
- GIS Librarian/Instructional Assistant Professor
- GIS, Data and Research Librarian
- Government Information Librarian
- Head of Map & Government Information Library and Map & Government Information Librarian
- Librarian—Spatial and Numeric Data
- Map & Geospatial Data Librarian

- Map Librarian
- Metadata Librarian
- Research Support and Instruction/Special Projects Librarian
- Social Sciences Data Librarian
- Social Sciences Data/Geospatial Information Librarian
- Spatial Data Librarian
- Spatial Data Science Librarian
- Special Collections Cataloging and Metadata Librarian
- Special Formats Description Librarian

Forty-one percent of the position titles specifically not containing the word "librarian" include verbiage to indicate the individuals work with GIS, geospatial, or spatial data in their jobs:

- Director, Maps Imagery and Geospatial Services
- Geographic Information Science (GIS) Specialist
- Geographic Information Systems Specialist
- Geospatial Consultant
- Geospatial Information Specialist
- Geospatial Services Manager
- GIS Library Outreach Liaison/Instructional Assistant Professor
- GIS Specialist
- Spatial Data Analyst & Curator
- Spatial Data Architect

Nine percent of the positions advertised are specifically for collection curators.

Tenure-Track Positions

Job advertisements were reviewed to ascertain the number of postings for tenure-track or faculty status librarians. As not all academic institutions use the phrase "tenure-track," descriptions that included the following phrasing are assumed to be tenure-track or continuing appointment positions:

- "Continuing appointment status"
- "Promotion and advancement"
- "Rank and promotion system"
- "Tenure-track"

Thirty percent of the advertisements were for tenure-track or similar status positions. Nine percent of the postings explicitly stated they were for non–tenure-track positions. Fifty-four percent of the job descriptions did not mention tenure-track or appointment status. It should not be assumed those 54 percent are not tenure-track postings, so the author simply coded this data as Not Specified. Data related to tenure-track or similar appointment status is Unavailable for 7 percent of the postings.

Supervisory Duties

Twenty-one percent of the job postings listed supervisory duties. These ranged from supervising work/study student assistants to managing a department with six full-time staff. Four percent of the postings listed supervisory experience as a minimum qualification but did not include details about such duties in the position description. The following supervisory duties were listed:

- "Supervises Instruction Specialists' delivery of training to faculty, students and staff in locating and using maps, imagery and geospatial data as part of research activities"
- "Supervises one library support staff and student employees"
- "Supervision of student interns"
- "Supervises three full-time librarians and three full-time staff members and assesses policies and programs to maintain awareness of issues pertinent to specific subject areas"
- "Requires the management of… student employees and interns"
- "The incumbent may supervise student employees"
- "Supervise the GIS Graduate Assistant"
- "Supervise cataloging library assistant (1.0 FTE)"
- "Oversees graduate students who work as Technical Assistants to provide GIS and Mapping instruction and reference support to the GSD community"
- "Manages one librarian, four staff members, and over a dozen student assistants"

Cartographic Resources Cataloging

Twenty percent of the postings are for cataloging and/or metadata professionals. Seventy-eight percent of those positions are for specific special format or cartographic catalogers, while 22 percent are for general catalogers working on several resource types.

- Cartographic Metadata Librarian (Note: This title appeared in two distinct job postings)
- Cartographic Resources Cataloger (Note: This title appeared in two distinct job postings)
- Map Metadata & Curatorial Specialist
- Maps Cataloging Specialist
- Metadata Librarian
- Special Collections Cataloging and Metadata Librarian
- Special Formats Description Librarian

The cataloging positions included in the final sample list cataloging and metadata duties related to several types of cartographic resources. Seventy-eight percent will work with paper maps and atlases, 11 percent specifically mention digital maps, and 56 percent include GIS datasets.

Previous Library Experience

Thirty-three percent of the sample postings specified a minimum requirement or preference for years of professional experience in a library setting. Two percent of the postings indicated new graduates were encouraged to apply. Data regarding minimum experience requirements is Unavailable for 8 percent of the sample.

Previous studies look at the requirement for candidates to have prior work experience. Triumph and Beile found 570 of 957 job announcements from 2011, or 59.6 percent, required work experience. Conversely, 14 of those advertisements (only 1.5 percent) were found to be entry-level. They note the "number and percentage of position announcements that required or preferred prior work experience in 2011 (n = 707, 73.9%) were lower than 1996 ads (n = 719, 79.9%) and 1988 ads (n = 932, 82.4%)."[30]

GIS Data versus Paper Maps

Forty-six percent of the postings are for professionals working specifically with GIS or geospatial data. Notably, these announcements do not mention work with traditional paper maps as

a job duty. Only 19 percent of the total postings specifically mention collection development in paper maps, while 41 percent expect hired individuals to acquire GIS data and/or software.

Sixty-five percent of the postings request applicants with GIS experience or knowledge. The level of importance placed on geospatial data and GIS varies. Forty-three percent of the postings indicate such skills are "required," a "basic" or "minimum" qualification, or are "mandatory." Twenty-two percent of the sample indicate GIS experience or knowledge is "desirable," "preferred," or "preferable."

Per the job position titles included in announcements, 75 percent incomplete job descriptions include work with GIS, but data regarding the requirement for GIS experience is Unavailable.

Highlighting the relatively fewer positions working with traditional paper maps, only 2 percent of the postings specifically listed archival experience or knowledge as a required or preferred qualification. This is the only posting for a map librarian in an archive or special collection in the sample. Data regarding archival experience is Unavailable for 9 percent of the postings.

MLS versus Subject-Specific Degree and Certifications

Fifty-nine percent of the postings require the successful candidate to hold an MLS, MLIS, or equivalent international degree (see figure 2). For comparison, as recently as 2011, the MLS degree was found to be a requirement in 862 academic librarian positions (90.1% of that study's sample).[31] This percentage shows a decrease from the number found in similar 1996 and 1988 studies of requirements for academic librarian jobs, which showed 90.6 percent and 98 percent requiring an MLS, respectively.[32]

Many of the 27 positions in this study offer an alternative means to fulfill the requirement for an MLS or MLIS, including a combination of an advanced subject-specific degree and professional library experience. As the wording related to that requirement varies greatly, examples for how this requirement is articulated include:

- "Professional degree from a library school or other advanced degree, or equivalent experience in one or more fields relevant to library science, and a concentration or advanced coursework in GIS"
- "OR significant graduate-level coursework toward such a degree OR equivalent education and experience (subject expertise combined with professional library education and/or experience)"
- "OR other advanced degree in a discipline working with GIS, geography, or spatial analysis"
- "OR relevant advanced degree in informatics or information management"

A qualification for a successful candidate to hold a subject-specific bachelor's or advanced degree in geography, social sciences, engineering, geographic information science, or similar fields is mentioned in 48 percent of the postings. Specific disciplines specified in degree requirements vary. Those mentioned include:

- Engineering
- Environmental Science
- Geographic Information Science
- Geography
- Geoscience

- Geospatial Discipline
- Math
- Natural Resources
- Sciences
- Social Science

The level of importance placed on subject-specific degrees varies. Twenty-eight percent of the postings indicate that a subject-specific degree (including when the degree is a replacement for an MLS/MLIS) is a minimum or required qualification. Two percent of the postings specifically mention GIS Professional (GISP) certification as a preferred qualification. The GISP certification is awarded to GIS professionals by the GIS Certification Institute (GISCI) following successful completion of a portfolio review and exam.[33]

Sixty-one percent of the announcements require or prefer successful applicants to hold an MLS or MLIS degree, while less than half specifically mention another subject-specific degree preference or requirement (48%, n = 23). Nine percent of those announcements require the subject-specific degree only as an alternative to an MLS or MLIS and not as a separate qualification. Data regarding specific degree requirements is Unavailable for 9 percent of the postings.

Triumph and Beile examined requirements or preferences for advanced degrees in addition to the MLS in 2011 academic library job advertisements. Their study found 16.6 percent and 6.6 percent preferred or required additional degrees, respectively.[34]

GIS Professionals in the Library

Overall, the data supports the theory that recently hired geospatial librarians are expected to work more frequently with GIS data than with traditional paper maps. Sixty-five percent of all postings mention GIS experience or knowledge. Notably, 46 percent of the announcements for geospatial library professionals include no paper map component in their job responsibilities. While it is tempting to assume librarians are being replaced by this new professional focusing on GIS exclusively, we must consider degree requirements as a way to define *librarian*. More than half of the postings require graduates from an MLS, MLIS, or equivalent international program. Likewise, the same percentage (59%) of position titles include the word "librarian." Of the postings for positions without a library degree requirement, only one has the word *librarian* in the title. The others are directors, consultants, specialists, catalogers, data architects, and specialists.

The postings in this five-year sample show GIS is important in academic libraries, as GIS librarians and specialists are expected to train users on the software, assist patrons in analyzing and storing data, create maps, and tackle other aspects of GIS project management in academic institutions. However, this does not suggest that traditional cartographic resources are going away. Nineteen percent of the postings include paper map responsibilities, which is fewer than the 65 percent incorporating GIS duties. However, we do not have data regarding existing map librarian positions, as this study looks solely at new postings. GIS specialists may be new positions added to these academic libraries, intended to complement the role map librarians have working with physical resources. An examination of how retirements are handled in academic libraries, specifically if physical cartographic resources are a component of the new librarian's job when replacing a retiring map librarian, would illuminate how the landscape of map librarianship is developing in conjunction with the growing number of GIS roles in the academic library.

The Role of Library Schools in Geospatial Librarian Training

The lack of training for work with cartographic and geospatial resources in accredited library schools has been noted. As the role of the geospatial librarian expands further into the digital realm, and the need for specialized knowledge increases, library schools should reexamine their course listings to incorporate more training for work with print maps, digital mapping, and spatial data. They may also consider the value of actively recruiting geography and GIS graduates to library graduate degree programs. These students would have the foundations necessary for work with geospatial resources and can learn necessary librarian skills in the MLIS program. More programs may also follow the examples set by University of Wisconsin–Milwaukee or University of Oklahoma and offer dual degrees or opportunities for coursework in Geography and GIS departments at the institution.

Bolstering map and geospatial coursework in library schools will help prepare all graduates for working with these resources. The findings of this study show more general or subject liaison librarians are working with geospatial data, in addition to those librarians with specific map or GIS management roles. Job announcements for general and specialist areas of librarianship including a geospatial component were advertised to the MAPS-L listserv. These positions titles include "Academic Services Librarian," "Social Sciences Data Librarian," "Government Information Librarian," and "Research Support and Instruction/Special Projects Librarian." These librarians are often asked to work with data in a broader sense, not solely data with a spatial component. It can be assumed individuals hired into these positions did not endeavor to become geospatial librarians specifically and may not have a strong interest or background in this aspect of their new positions. By incorporating cartographic and GIS coursework into their curriculum, library schools will ensure students not setting out to be map or geospatial librarians specifically are sufficiently familiar with these topics.

Knowledge of cartographic resources is also important in the cataloging field. Twenty percent of the postings in this study were for catalogers; 78 percent of those were for special format or map catalogers. None of these job announcements request a subject degree in geography or cartography, but familiarity with cartographic metadata and various cataloging rules such as AACR2 and RDA are mentioned. This study focuses specifically on jobs posted to the MAPS-L listserv and does not consider general cataloger positions that may eventually work with maps, although this aspect isn't fully disclosed in the job advertisement. Experience with maps and geospatial resources in library school will help prepare these catalogers as well.

Postgraduate Certification and Professional Development

Postgraduate certifications in GIS are available for professionals, including librarians, seeking a way to highlight their experience with GIS. The most well-known certificate is GISP, which is awarded by the GIS Certification Institute (GISCI). However, this certificate is available only to individuals with four years of full-time experience in the GIS field that meet specific education requirements and pass the GISCI Geospatial Core Technical Knowledge Exam.[35] According to the GISCI website, education points are awarded to those earning a degree from an accredited educational institution—those degrees may be in any field of study.[36] Certificates specific to GIS will also be considered in calculating educational point value. Accredited course points are given for coursework in "geography, GIS, remote sensing, databases, data analysis, programming, higher math (especially trig and stat), AutoCAD, computer science, and networking." Finally, educational points are awarded for nonaccredited coursework or

software-specific training, as well as conference and webinar attendance. Is earning this GIS certification feasible for a recent MLIS graduate or a working librarian? Although a librarian would earn educational points for holding a bachelor's and master's degree in any field, the requirement for four years of experience in a GIS work environment may be more difficult to satisfy if a librarian has been working in a nongeospatial library.

The Esri Technical Certification, awarded by the company responsible for ArcGIS software, is a newer certificate available for professionals tailored to individuals using or administering this proprietary software. Individuals have the option to take one of several exams, each with their own education and experience requirements. Of particular interest to many of the librarians managing university ArcGIS licenses is the ArcGIS Online Administration Specialty (EAOS19-001). However, according to the Esri website, Administration Specialty exam takers "must already hold an Esri certification."[37] The ArcGIS Desktop Entry (EADE19-001) exam is offered to candidates having "less than two-years of applied experience and should be proficient in best practices and uses of Esri's ArcGIS technologies."[38] This exam is appropriate for recent library school graduates or practicing librarians, as they are not likely to have more than two years in the GIS working environment, if any at all.

Preparing and sitting for certification exams can be time-consuming, especially for working professionals or students in degree programs. There is also a monetary cost involved. As of March 2021, sitting for the EADE19-001 exam costs $250, and the EAOS19-001 exam adds $150.[39] The GISCI Geospatial Core Technical Knowledge Exam carries two hefty fees: a $100 application fee and a $250 exam fee for United States and Canada ($300 for international candidates).[40] As pointed out on the website GISGeography.com, online certifications from well-known universities are available.[41] These are available through Coursera; and, while certification does involve varying costs, online learners may choose the "Audit the course" option and view lectures and materials for free.

Librarians and library school graduates often turn to professional associations and conferences to learn new skills or expand on what they learned in their degree programs. Luckily, there are two map librarian associations in the United States meeting annually: Map and Geospatial Round Table (MAGIRT) of the American Library Association (ALA) and the Western Association of Map Libraries (WAML). In addition to these groups specifically for map and geospatial librarians, cartographic and geospatial skills may be enhanced through attendance at conferences for cartographers, geographers, and GIS professionals, such as North American Cartographic Information Society (NACIS), University Consortium for Geographic Information Science (UCGIS), American Association of Geographers (AAG), and local GIS user groups.[42]

While bolstering their skillsets via professional development and advanced certification is possible, librarians will need to find time and funding to complete this training in addition to their other obligations. Basic knowledge of cartographic and geospatial resources gained in library school will help prepare a map or geospatial librarian for their initial steps into the profession. Robust graduate library school programs can ensure graduates have this foundation in map and GIS resources.

Conclusion, Limitations, and Future Research

The main purpose of this study was to analyze the degrees, knowledge, and experience institutions desire when hiring librarians to work with maps and geospatial information. A

secondary goal was to observe trends in job titles and duties in job advertisements. While 41 percent of the postings did not include the word "librarian" in their titles, more than half of the postings specifically requested applicants with an MLS/MLIS (61%, n = 28). The data suggests library graduate degrees remain an important qualification for map and geospatial librarians. More than half of the job postings prefer or require GIS knowledge or experience (65%, n=30). The postings in the final sample also highlight the need for specialized metadata and cataloging librarians working with maps and geospatial data. Seventy-eight percent of the cataloging positions posted to MAPS-L in the five-year period were for individuals who would be working specifically with paper maps, digital maps, or geospatial datasets. Library school programs incorporating GIS education into their curricula will support students endeavoring to enter geospatial librarianship. The addition of coursework related to geospatial data and technologies will prepare all librarians for work with geospatial data and technology, as work with these resources is seen in librarian postings for cataloging, general reference, subject liaison, and data specialist roles.

As noted in the Methodology section, a limitation to this study was the availability of complete job announcements and descriptions for all postings in the final sample. Complete data is unavailable for four of the 46 postings in the final study. The author chose to include the limited data available and notes where it was missing. Future researchers might conduct a more thorough study by picking a date to begin collecting job advertisements live in real time and saving all files related to the announcement for future analysis. To gain a clear view of how geospatial librarianship is evolving beyond the timeframe examined in this study, future research focusing on postings beyond 2020 is needed. Such a study could include postings from this article, resulting in a larger sample population.

The author sought to search postings to GIS4LIB, an email list focusing on GIS and libraries hosted by University of Washington.[43] This double-check would confirm that all relevant positions from the timeframe were examined. However, as of August 2021, the listserv's archives only date to October 2019. While using one listserv could be viewed as a limitation, the author's personal experience is that positions related to map, geospatial, and data librarianship are consistently posted directly or cross-posted to the MAPS-L listserv. This study focuses on positions announced to this list.

This study relied on qualifications and responsibilities as articulated in position announcements. Some institutions may post general position announcements for reference librarians or subject specialists and will add duties with geospatial data or maps as the new librarian is onboarded. It is suspected there are many more geospatial librarians working in academic libraries today who did not interview specifically for a map librarian job. As academic institutions restructure and revamp their service models, more librarians may find themselves "accidental" map librarians. A survey of hiring managers regarding the qualifications they look for when hiring geospatial librarians may present another side of the story that isn't immediately apparent from a job advertisement analysis. An additional survey of active geospatial librarians can also provide further insights regarding the direction of map and GIS services in academic libraries. Finally, an examination of how map and geospatial librarian retirements are handled by institutions—specifically if new geospatial librarians are hired in their places—would determine how much the map librarian role is changing and if a new GIS specialist position is taking its place in our academic libraries.

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