Geospatial Data Literacy for Public Libraries

Project Justification

Portland State University Geography Department, in collaboration with ESRI (the leading producer of GIS software), propose a two-year project that will develop the capacity of public libraries to serve as key partners in local Geographic Information System (GIS) data ecosystems. The project's primary outputs will be an enhanced online 'Toolkit' (repository of resources), in-person and virtual trainings for public libraries, funding plus general support for GIS projects, published case studies and a "community of practice." Our previous work in this capacity suggests that a library's GIS service can support patrons best through collaborative learning, professional support, and diverse outreach perspectives, with different focuses according to the stages of learning and research. The framework we have adopted can not only serve as an effective model for developing GIS services but can also be expanded to other library service areas. The project's outputs and findings will be widely disseminated to libraries and allied groups that support the publication and use of geospatial data (location data related to earth).

This proposal aligns with the selected NLG program Goal #1, Objectives 1.1 and 1.2. We aim to provide public access to knowledge and educational resources by addressing library practitioner skills and incorporating allied professional expertise into library services. Specifically, it furthers the education of library professionals and the materials they can use to help patrons utilize GIS tools and datasets. ESRI defines GIS as: "A geographic information system (GIS) is a system that creates, manages, analyzes, and maps all types of data. GIS connects data to a map, integrating location data (where things are) with all types of descriptive information (what things are like there). This provides a foundation for mapping and analysis that is used in science and almost every industry. GIS helps users understand patterns, relationships, and geographic context. The benefits include improved communication and efficiency as well as better management and decision making." These tools can exploit the story and the power of geography in unique ways, enabling them to be accessible to both library workers and the people they serve. This, in turn, can expand the relevance of the library into new territory. Additionally, the collaborative model proposed here will extend training through local partnerships and target topics for mapping or data exploration that have local relevance. While GIS training may not be one of the top challenges in the field, it can serve as a helpful and illuminating capability offered by libraries.

Historically, GIS in public libraries was primarily used to assess facilities usage and the impact of services in the community, as well as to answer queries about 'what' is available in the library and most importantly 'where' (Shastri 2020). In other words, the public library's view of GIS has been as an assessment tool rather than an area of service enhancement. Public libraries, accountable to a political entity by default, have embraced GIS as a tool for evaluating usage, collection development, and community impact by capturing GIS data to provide evidence of the library's function in the community served. Yet, GIS should also be used to handle cartographic or geo-referenced data in providing information services. In addition, GIS can allow libraries to better align their services to community needs and in turn, they can target inequities and support economic opportunity. The information age has changed the role and duties of library and knowledge professionals. According to Weimer, Andrew & Hughes (2008), "Librarians have a collaborative role (not currently being fully realized) to ensure that the principles and expertise of library science be present in the fast-evolving geoinformatics and spatial literacy movements." US public libraries are using GIS for such things as to answer queries about demographic characteristics of patrons, opening a branch of the library in a particular area, or for geography-based analytics (Shastri 2020). We believe that GIS can help to create a complete account of how a public library can facilitate the needs of the local community. In addition, GIS, remote sensing, and geospatial applications are beneficial for a public library to visualize the collections, connect the users with rich resources and contextualize all information in one data set. GIS can also be used to provide a quantitative measure for the social activities taking place inside the library (Hussain, 2023).

GIS helps users understand patterns, relationships, and geographic context. The benefits include improved communication and efficiency as well as better management and decision making. This project proposes that strengthening libraries' comfort-levels with offering geospatial services will have a broad impact, supporting American libraries' capacity to make GIS more accessible to the public. The project directly addresses the underutilization of GIS outside the sphere of academic specialists therefore enlisting public librarians to serve as local GIS resources to the public. This approach breaks down barriers to access that might currently mimic the paper ceiling and has the potential to exponentially increase use of GIS technology by the public. Understanding the capabilities, benefits, and limitations of these tools can greatly enhance reference service in both traditional and virtual environments. In fact, familiarity with different open-source geographical resources can answer many common reference inquiries (Kowal, 2002). For example:

* Maps effectively illustrate data. For instance, if a researcher is seeking the latest population numbers for a particular neighborhood, a map of that area in the context of the entire city with associated statistics is more

helpful. Similarly, a map of Superfund locales or toxic release sites can be more effective than a listing, as a visual display of the highest concentrations of harvested croplands or forest cover types is preferable to a description.

* GIS technologies commonly have clickable maps that link locational information to pertinent data. For instance, a prospective homebuyer can research what houses last sold for in a neighborhood and when they sold by looking at the property's selling history. A hiker can check the land elevation of an area before setting off on a trip, or a citizen can find details on the aquifer supplying municipal water, all by pointing at a map.

* Geographic technologies can combine several variables in a single, custom-made map. For instance, public officials can assess the adequacy of public transport to local health facilities by overlaying city bus lines onto a map of clinics and hospitals, and they can also map their districts according to race and income levels from the latest census. Similarly, a researcher can check mortality rates in the United States by specific types of cancer, while also analyzing by race, gender, socio-economic class, and several other factors.

* Mapping and gathering usage statistics in designated library learning spaces with expected learning activities could allow a library to associate the usage of a space with different types of learning and engagement frequency. The data could also indicate possible design improvements to make the learning spaces more functional for patrons. Leveraging the space usage data based on specific learning outcomes creates another means for the library to communicate its learning impact with stakeholders.

Furthermore, access to GIS technologies allows community groups and social justice organizations to share their experiences and stories in a compelling and powerful way.

In an online Journal of Map and Geography Libraries editorial, the author talks about paradigm shifts in the GIS field over the past 25 years (Bidney, 2019). When GIS moved beyond the domain of professional geographers and into "mainstream" technology in the early 1990s, libraries began seeking effective ways to utilize this powerful research tool. A particular focus was on the ability of GIS to deal with government data that is crucial to social science research (as well as many other disciplines) and which is increasingly distributed only in digital form. Amid this, the Association of Research Libraries (ARL) established the GIS Literacy Project as a support mechanism for libraries interested in learning about and introducing GIS into their services (Davie, Fox & Preece, 1999). This project was a collaboration between ARL and ESRI and other public and private partners. The goals of the project were designed to meet the current needs of libraries and users while addressing the changes libraries are undergoing as they enter the 21st century, and to provide the tools and expertise necessary to ensure that digital government information can be used effectively and remain in the public domain. These goals include:

• introduction of GIS to a variety of libraries (e.g., public, state-based, academic, and university libraries in public and private institutions) to address diverse user information needs;
• development of a team of GIS professionals in the research library community willing to lend time and expertise to applications, user training, and education programs;
• encouragement of connections among federal, state, and local GIS users and information;
• promotion of research, education, and the public right-to-know through improved access to government information;
• initiation of library projects to explore new applications of spatially referenced data and evaluate the introduction of these services in research libraries; and
• implementation of programs to allow institutions that have invested in networking capabilities to leverage the sharing of resources via networks.

As a result of this project, "During the 1990s, GIS began to be supported by library staff from a variety of departments such as maps, government documents, data services, reference, and systems" (March & Scarletto, 2017). However, in the 1990s there were very few GIS librarians available. Most GIS support was provided by librarians who were not systematically trained in GIS but had a varying degree of GIS training either through the ARL GIS Literacy Project or other training opportunities. Training on GIS can be difficult. The learning curve is steep, and GIS software is not easy to master. Suh and Lee (1999) suggested that "a specialist librarian should be designated for GIS, and he/she should receive continuous training to update skills." From the start of the 2000s, many academic libraries that had mainly provided informal GIS services realized that there was sufficient demand for a GIS librarian or GIS center in the library and therefore set about to devise plans to determine how to fund, staff, and locate these services. From 2010 to 2019, many more large university libraries and research libraries set up dedicated GIS labs or services staffed with specialized GIS librarians or other functional data specialists. The service models have also developed to include all around services with collaboration with different units of the university including the IT departments (Scaramozzino et al, 2014).

While ARL was primarily geared towards academic libraries, its successes have served as a model for our multi-phased project, which seeks to provide a forum for public libraries to experiment and engage in GIS activities by introducing, educating, and equipping librarians with the skills needed to provide access to digital spatial data. The fact that mapping technology has become easier (but not easy) to use in general, often without much specialized knowledge, is key to the use of GIS by librarians. Collaboration with others in the public and private sectors is an important element of the project and has been instrumental to the successful integration of GIS services and resources into libraries thus far. In cooperation with GIS and library professionals, we will organize training sessions for project participants, establish a community of practice and provide financial support, data, software, hardware, and expertise to assist with the local library project goals. While this grant will continue to focus on an introduction of GIS services, we hope by year two (2) we will be able to shift some of our focus on enhancement of programs at institutions with GIS services currently in place. Occasional training sessions will be provided, as will other types of support for libraries wishing to develop GIS services. We will also continue to collect feedback and establish case studies to determine how, in the time since the local projects began, participants have organized their delivery of these GIS projects. These case studies will address the following categories of GIS service: 1) general information about the library's role in delivering GIS, 2) the number, level, and preparation of other training of staff involved, 3) the amount and kind of equipment, software, and data files that support GIS in the library, 4) the kind of service offered and by whom it is used, 5) outcomes from patron engagement, and 6) sustainability efforts on how they will continue using GIS at their library after the grant period.

Project Work Plan

Our previous work (via IMLS Planning and Implementation grants) allowed us to demonstrate the role, challenges, utilization, and impact of GIS in the public library scenario. This new grant would allow further exploration on the scope of GIS, its functions and the multiple challenges faced by library staff in implementation. While we greatly believe that GIS is important for libraries to teach, library staff are often not confident in their ability to teach geospatial tools and methods. Nor is there a general model about how public libraries can develop GIS services to best engage with stakeholders. Through this grant, we will continue to improve our service model. The solution we propose is to: (1) enhance our online 'Toolkit' (repository of resources), (2) develop training including an in-person and a virtual workshop for librarians, (3) establish funding and provide support for GIS projects, (4) publish case studies and (5) create a "community of practice." Our previous results suggest that a library's GIS service can support patrons best through collaboration, learning support, and outreach perspectives, with different focuses according to the stages of learning and research. The framework we have adopted not only can serve as an efficient model for developing GIS services but also can be expanded to other library service areas.

Online 'Toolkit'

One key objective for this project is to enhance our existing online toolkit, which is a repository of GIS and data management resources being used by libraries that are interested in beginning or expanding their role around serving their community as a geospatial data information and analysis hub. The project team will work with local partners, data publishers, and user groups as well as their involvement in other communities of practice, to further contribute to the existing toolkit. The toolkit currently consists of such resources as: evidence-based methods for developing and improving GIS services (including examples of successful GIS data partnerships); a guide to GIS, mapping-related data and resources; information about multiple open-source GIS tools and software options; and a list of select resources--specifically data sets broken down by state, as well as national data sets--aimed to help librarians interested in developing and building their GIS capabilities. In addition to these core resources, this new grant will allow us to develop additional resources and trainings, including:

- Information on types of expertise and skills needed to effectively work with GIS users and a list of outlets for geospatial professional development services (i.e., where to find trainings, workshops or webinars). For example, ESRI offers training modules on ArcGIS and several professional organizations offer related online courses.
- A sample survey (template) for assessing the local landscape.
- Outreach and marketing approaches for different stages of implementation (e.g., a how-to guide for hosting a GIS Day event).
- A one-page guide for public understanding of "What is GIS?"
- Updated annotated bibliography of resources and geospatial datasets.
- A component on how to make connections with local GIS expertise and organizations (e.g., community colleges, extension services, federal agencies).
- Module on how to generate place-based data.

- A list of useful geospatial products that libraries can purchase (e.g., SimplyMap, ESRI Online), potentially at reduced rates if vendors offer education or non-profit pricing.
- Guide to assessing the difference between ArcGISOnline vs. Software plus online.
- Outputs and findings.

The resources in this toolkit exist in an open platform (Google Site) that supports versioning, comments and contributions from project team members and invited contributors. The content will continue to be structured in the best way that provides guidance and models around core aspects of GIS data, with a focus on opportunities for libraries' participation. One way the project team will do this is by using notes and artifacts generated during the workshops along with feedback provided by workshop participants, partners, and supporting organizations to revise or update the toolkit resources. New examples and case studies will be incorporated, as well.

For the duration of the grant, the platform and program will be maintained by the PSU team. During this time, we will also negotiate with our national partners to establish a long-term sustainability plan that ensures this project lives beyond the grant period. One pillar of this may be a national GIS network hub hosted and maintained by ESRI or another national partner, in addition to the continued offering to participating libraries of the low-cost ArcGIS access. In addition, all our project results will be available publicly in digital format via a centralized web portal.

Trainings

Most of the support we have provided thus far is around GIS training and setting up library ArcGIS desktop licenses through ESRI. In addition, however we have provided instruction and troubleshooting for installation, trainings on how to use certain ArcGIS tools, like using ArcGIS pro to georeference historic images, and step-by-step walkthroughs of ArcGIS online features. Since GIS services in libraries are not widely promoted, most of the reference questions relating to GIS comes from knowledgeable patrons. At the same time, one of the major issues with integrating GIS services is instruction. To ensure the success of GIS services within the library, the basic strategies that librarians have applied to information literacy instruction can be adapted. While learners are instructed to critically evaluate print and electronic resources, typically minimal, if any, attention is devoted to evaluating the credibility of maps. To help learners better appreciate the value of evaluating information regardless of format, GIS instruction will be combined with hands-on exercises to bridge the geographic literacy divide. To promote these geographic literacy efforts, we will provide workshops that balance background information with GIS hands-on exercises.

Our in-person and online workshops will provide an overview of how ArcGIS software can help patrons analyze or visualize digital data that has a locational component. The learning outcome for participants is to become familiar with the ArcGIS interface and be able to create a simple map using the ArcGIS software. Utilizing ESRI's ArcGIS software, patrons can manipulate various types of numeric and geospatial data to create a powerful visual representation (maps). Successful GIS service requires that libraries provide patrons access to: GIS software, large format scanning and printing, instruction, data services, and technical support. By adapting this holistic approach to information literacy, libraries can help their community develop lifelong information evaluation skills.

The project team will conduct three (3) new workshops for librarians. The first workshop will take place in-person, in connection with the ALA sponsored LibLearnX Conference in Arizona in January 2025 and will also be posted online in a shorter format. In this "Introduction to GIS" hands-on session, participants will be introduced to library databases and will become immersed in the essentials of geographic literacy including the basics of map projections, scale, legend construction, data classification, and color usage. To provide examples of why maps should be critiqued, participants will be shown several maps produced from the same data that employ different classification methods. By using examples, it becomes obvious how maps can be misleading and why information evaluation methods must be applied to maps. Participants will then learn the basics of ESRI's ArcGIS software and complete a hands-on exercise. The exercise requires the creation of a simple map (with lines, points, and polygons), editing of the layout, and exporting the map into different formats. In addition, participants will learn basic terminologies for GIS and identify opportunities to apply GIS in their work. Our goal is to use real data to create maps that can help address local issues (e.g., a hurricane evacuation map that shows where the city's nonemergency service calls were received to report flooding or demographic data on a map and identify areas that needed more assistance during the evacuation). It is our hope that the tie-in's with local events will attract a lot of interest. Upon completion of this workshop, the foundation of geographic literacy has been established and allows for further GIS instruction and more time can be devoted to learning the ArcGIS software.

We will also add two additional online workshops, "Geocoding and Mapping Location Data" and "Mapping Census Data". Participants will be strongly encouraged to take Introduction to GIS course prior to these two workshops. In the Geocoding and Mapping Location Data workshop, participants will learn a few ways to geocode, the process of converting addresses (like a street address) into geographic coordinates (like latitude and longitude) and will learn how to retrieve location data from library databases, geocode them, and place them on the map. In the Mapping Census Data

workshop, participants will learn how to retrieve census data and join the data with census TIGER shapefiles, a public domain data source which has many geographic features. Using ArcGIS, participants will create choropleth maps, thematic maps in which areas are shaded in proportion to the measurement of the statistical variable being displayed on the map, such as population density or per-capita income. Both workshops will also serve to promote the use of library databases, such as ReferenceUSA for retrieving location data, and Social Explorer for retrieving census data. Both sessions will be hands-on, and learning resources, such as LibGuides and video tutorials will be housed on our free, easily accessible online toolkit to help learners retain the information.

All the workshops are intended to introduce the themes of the toolkit to participants, solicit input and discussion, and give participants concrete actions that they can take in their local contexts. In addition, the workshops will provide a forum for participants to learn about one another's work, areas of expertise, and needs; to identify opportunities for collaboration; and to demonstrate the structural forms that local partnerships may take. Our project team will use these workshops to test new toolbox resources and to recruit new library-GIS data partnerships. The project's coordinator and graduate student will conduct and facilitate the in-person workshop, and all members of the project team will contribute to the design. The online workshops will be conducted by the project coordinator and/or the project's graduate student. Workshops will be subsidized by the project budget. As part of the curriculum, we will encourage further strengthening of partnerships and cross-pollination among the learning communities. We will also attempt to work with library partners to test the workshop curriculum and the toolkit resources in a setting uncontrolled by the project team.

Funding and Support for GIS Projects

We are fully aware of the fact that public libraries face financial constraints for purchasing new materials and other things, hence our project proposes providing small awards between $2,500-$5,000 to support local GIS initiatives and partnerships. To promote this funding opportunity, we will conduct several informational sessions ahead of announcing the RFP and deadline.

Due to a variety of factors such as the different levels of training of librarians in GIS, and library spending devoted to GIS and data-related resources, different case studies have developed -- from informal and casual support to having dedicated GIS centers or trained GIS librarians in the library to support research and training for patrons and staff. For the most part, our library partners are supported without a dedicated GIS librarian. Yet, demands for GIS support continue to emerge, inspiring interested librarians to seek professional development opportunities to enhance GIS skills. Regardless of skill level, libraries incorporating GIS projects through our funding will need assistance periodically. Providing this assistance is the key piece of the GIS puzzle that libraries need and is commonly the portion overlooked. Through this effort, GIS assistance will be provided via Zoom consultation services and will take place at a variety of levels from basic troubleshooting to one-on-one tutorial sessions, to a customized workshop. Our Toolkit with quick start guides, user manuals, and video tutorials also helps to supplement the array of learning styles. This form of on-demand learning is a unique characteristic that provides our partner libraries with fast and efficient support, which we have found, in addition to working collaboratively with local GIS experts, is the key to success when dealing with minimal staffing. It is also important to acknowledge upfront that GIS service will ultimately include all librarians, as subject expertise is a crucial part of creating effective maps therefore enabling non-GIS librarians to aid patrons. That said, even with minimal staffing, it is possible to provide GIS support. Any public services librarian with an interest in GIS should be able to provide a minimum-level GIS service after about twenty hours of work either in a hands-on workshop or through self-paced tutorials (Hyland, 2002).

In addition to performing their proposed work, each awarded project will be required to participate in scheduled check-in calls with the project team as well as to write a project report (2-4 pages). Additionally, we will provide specific questions designed to create a consistent structure for the final report. We will draw on these reports to further develop case studies that will become part of the toolkit. The resulting case studies will provide real-world examples of roles that libraries can fill across geospatial data ecosystems.

We will also have a contingency plan if a team is unable to fulfill their project deliverables due to unforeseen circumstances. If some of the project components are not able to be acted upon, our goal will be to provide flexible types of support, with an emphasis on those most disproportionately impacted by the situation. For instance, we may accept verbal conversations/check-in, in lieu of written reports. We will also plan to work with teams on adjusting their timeline and/or deliverables in alignment with what they need to fit their new status, priorities, and plans moving forward. In addition to being responsive to our field project teams, we will also provide opportunities to share information about their projects with each other, as well as to solve problems, build trust and enhance their various initiatives.

While our team is deeply devoted to issues of open-source software access, our prior research has indicated that the success of a nationwide network of practice requires more consistency and accessibility than available open-source solutions provide. Because we envision program trainers originating from academia and local government, most of these

individuals can be expected to have a working knowledge of ESRI products, while the same cannot be said of many open-source options. Additionally, ESRI has agreed to offset the cost issue by providing special organizational licenses that should be extremely affordable for even small library organizations.

As partners in this effort, ESRI will support libraries that do not already have GIS technology or need additional support. More specifically, ESRI will offer all our Field Project awardees a low-cost way to acquire select ESRI products. Namely, they will be eligible for the 'Academic Departmental Agreement,' which provides access to most ArcGIS products, including ArcGIS Online, as well as technical support, software updates, and access to self-paced e-learning resources. For continued learning support, we will also provide advanced education suggestions including local university courses and ESRI's virtual campus. As part of the ESRI site licenses that some of our partner libraries purchase, an unlimited number of seats are available within the ESRI virtual campus. The ESRI virtual campus provides online module-based instruction for clients interested in obtaining additional GIS instruction. The virtual campus will be suggested as a supplement to traditional instruction and as an option for providing background and software specific instruction. In addition, ESRI's ArcGIS Hub will also provide the infrastructure for participating libraries to establish their own community-connected open data repositories and visualization platforms, completely under the control of the individual library.

Case Studies

Libraries considering the addition of GIS services for their patrons are often unsure where to start. Ideas for integrating successful GIS services in the library environment are numerous. With our first set of libraries leading the way in the integration of GIS service, it was essential to share their projects in the form of case studies on our toolkit. With this project, we will add to our repository of case studies describing how different libraries provide services and support for GIS needs of patrons and stakeholders. The case studies offer insights and lessons learned about the level of services that can be offered by public libraries interested in GIS-related research and training for patrons and staff. The case studies will also be used to illustrate the variety of library roles in GIS data partnerships and will focus on helping identify how these libraries will continue to use GIS beyond the grant period.

It is our belief that libraries wanting to make better use of geospatial data should focus on training workers to increase their data literacy and on giving staff the proper tools. Helping public libraries achieve these goals is the mission of this next phase effort. The evidence that we achieve this mission will come from the subaward case studies, which will help us identify: (1) which geospatial data projects work best based on partnerships and collaborations among various organizations and (2) which geospatial data ecosystems enable the regular release of potentially impactful data in order to address or attempt to solve a well-defined problem or issue that is a priority to local citizens. Our early findings have already identified some of the challenges that libraries face in implementing recommended resources, including: a lack of readiness (i.e., low technical and human capacity), lack of knowledge as to what their end-user or community member needs, and/or a shortage of resources. At the same time, innovations are critical for the survival and relevance of public libraries in the country. Our case studies will identify the best practices for managing GIS innovations in public libraries based on the experiential guidance shared by participating public libraries. We hope that these case studies can help to fill a gap by identifying the challenges and solutions for managing GIS projects in public libraries in the United States. Non-participating public libraries can also learn, apply, and benefit from these best practices, which in turn can enhance the perceived and real value of public libraries to their local communities.

Community of Practice

While the project workshops will emphasize ongoing communication and sharing after the events, we will also seek to reach a wider audience and provide broader opportunities for participation. To build relationships between libraries and other non-library data interests, and to gather additional information for the toolkit, the project team will establish means of communication for workshop participants, partner libraries, GIS experts and any other interested parties. We will do this using the 'community of practice' concept – one where collaboration and communication are key to sharing knowledge as a community. Since the notion of community of practice was introduced in the early 1990s, it has been popular in various organizations with the recognition that knowledge sharing is important for organizational learning (Kim, 2015). It has emerged as a strategic approach to knowledge sharing and an innovative way to foster learning. As such, we believe that by fostering communities of practice we will provide an intriguing framework for library services.

Whether we are conducting face-to-face meetings, social media groups, online discussions, webinars, or other group activities, it is our team's goal to provide safe, welcoming, productive spaces for these programs: spaces which allow people from different disciplines and practice areas to comfortably come together and share information. To effectively cultivate these learning communities, team members will take active roles such as establishing a contact list, offering monthly open conference calls, regularly monitoring, and responding to online discussions, and soliciting and working with participant contributions for reporting purposes. Project team and advisory members will also serve as

ambassadors within their own personal networks of practice by informing other members of our public library collaboration opportunities and outcomes.

We will also work with our partner, ESRI, and others to establish a program for this project. The goal of this program will be to connect public library staff with GIS learning opportunities and pathways that bring GIS agencies, organizations, and businesses together to help libraries and their patrons. This program will build upon the *ESRI-AAG GeoMentor Program* (http://geomentors.net/), an established K-12 GIS advocacy and mentorship program which connects local geospatial professionals with interested parties to form collaborative, mutually beneficial relationships. As such, we believe it is a natural partnership for our grant goals. While the GeoMentors program is currently focused on K-12 students and teachers (including homeschoolers), we aim to expand the program to include public library GIS training and advisory functions. Initially, we would like a local, registered GeoMentor to participate in sub-award workshop planning with their participating public libraries (where possible); depending on the results of our first round of sub-award workshops, we would like to explore the feasibility of GeoMentors planning *and* facilitating these workshops going forward. We will welcome anyone from the broad GIS community, across all disciplines and sectors, as volunteers to help us build this nationwide network of GeoMentors to assist public libraries and their staff with their project goals relating to using GIS. In addition, over the course of the two-year grant period, the project team will work to identify a cadre of GIS professionals and organizations across the country who will commit to supporting (and sustaining) this effort longer-term. The possibilities of things that a GeoMentor could do are open. They may deliver a career talk for local high school students, take part in a library workshop, or provide GIS services for their local library. GeoMentors will work with library staff to identify their specific needs.

Those working as professionals in the geographic information industry have an expectation to be up to date in their knowledge of the field and have appropriate skills for the various tasks that they are engaged in. These expectations are met by way of a formal or informal continuing professional development (CPD) scheme -- the intentional maintenance and development of the knowledge and skills needed to perform in a professional context. This could mean honing current skills, it could mean developing them to a new level, or it could mean learning new ones that will allow an employee's job role to expand or prepare them for potential promotion. In addition, a GIS professional (GIS-P) is a designation awarded to a certified geographic information systems (GIS) professional that provides him/her a professional distinction in the GIS profession. This is a well-recognized credential in the GIS community which sets the benchmark for skills in the GIS technology field. The criteria are much more stringent for GIS-P compared to other certifications because it not only considers one's educational background, but it also assesses experience and contributions to the GIS community. The GIS-P certification board may review the contributions a candidate has made to the GIS field outside of work, such as volunteer work experience, membership in professional societies and committees, conference presentations they've given and additional projects. Time as a GeoMentor can count towards one's CPD and GIS-P status.

Like the case studies, our community of practice will share knowledge through personal storytelling, based on relevant experiences. The members will share mistakes, successes, and learnings, contemplate new ideas and solve problems together. They will help us to create our case studies for our extended network by sharing their knowledge and best practices. By giving our community of practice a platform to share their stories, and creating their case studies, we will use our own communication channels to get them heard – creating a feedback loop by making direct calls out to the wider movement to add their experiences, identify the new knowledge that emerges and curate the content into follow-up blogs or quick-fire tips.

Diversity Plan

Librarians and GIS professionals have the ability and responsibility to address issues around diversity, equity, and inclusion (DEI) in their professional practice and through engagement with their varied user communities. While such conversations around DEI in librarianship and library work have proliferated in recent years, it is important to note that the field remains overwhelmingly white demographically and permeated by whiteness ideologically (Galvan 2015, Hathcock 2015). According to the Bureau of Labor Statistics' 2020 report on labor force characteristics by race & ethnicity, the makeup of librarians and media collection specialists in the United States was 83.1% White, 9.9% Hispanic/Latino, 9.5% Black, and 3.5% Asian (USBLS, 2021). This is less diverse than the general population of the United States, and represents only a marginal improvement from 2010, when librarianship was reported as 87.5% White by the same study (USBLS, 2011). We intend to promote practicing map and GIS librarianship through the lens of DEI. We believe in this idea, rather than any specific claim to authority on this topic, but the last several years have seen a wave of social justice demonstrations and conversations that have brought the ongoing effects of systemic racism and inequity to the forefront, including in libraries. Many of our libraries and academic institutions issued statements supporting the Black Lives Matter movement and committing to anti-racism, reflected on how DEI-focused learning and

activities could be prioritized, and hopefully dedicated resources to advance and sustain these efforts. Nevertheless, we still find ourselves at what may seem like only the beginning of a necessary and overdue reckoning with the structures and practices that perpetuate inequities across our institutions and professions, requiring continued acknowledgement, reflection, conversation, and action to rectify. It is within this environment that our team and partners will continue to operate, bringing with us varying personal experiences and professional expertise as current and former geospatial data professionals and librarians.

We acknowledge that there are a broad range of concepts that fall under the scope of DEI, our aim has always been to share diverse perspectives, advance conversations, and spur reflection and action as to how public librarians can approach their work through a DEI lens. In our training and workshop materials, we will continue to be intentional about the contributions as it relates to addressing these issues. We will discuss mapping biases and issue a call for libraries to scrutinize their established practices and priorities; to embrace opportunities for co-creative, community-engaged scholarship; resource sharing; and making space for experimentation and unpredictability; and for library leaders to acknowledge the benefits of such work and allocate resources accordingly. At the same time, DEI issues such as environmental justice and unequal resource distribution are best understood by examining patterns over space and time. Analyzing change over space and time, through many different lenses and viewpoints, and at multiple scales is exactly why GIS was created. With increased understanding, we can work towards solutions that promote equity and inclusion.

GIS technology can also help libraries learn more about its patrons so it can better identify their needs, develop, and manage services delivery, and market its services effectively. Using GIS, libraries can conduct a detailed dissection of a neighborhood's demographics, including education level, family composition and transit information. Once libraries have this profile defined, they can assess how their services align with the community's needs. We have several examples of this from our previous field projects. GIS-library partnerships included the use of GIS to track and analyze where patrons are located within the community to see if different neighborhoods/areas are using the library more. Another project created operations dashboards for the library, summarizing their active library cardholder data alongside demographic data from the 2020 US Decennial Census, the 2020 American Community Survey, and current Student Enrollment data from the Oregon department of education. The data for these dashboards was prepared using Esri's ArcGIS Pro and hosted on ArcGIS Online along with the dashboards themselves. These dashboards were then used to gain insight into the spatial distribution of active library cardholders and the demographics of the community they are serving, helping the library conduct better outreach and apply for grants. This example (case study) presents an approach to using ArcGIS to find out the characteristics of the population near each library branch in a particular city.

One way our team will identify the needs of our audience is to involve a diverse group of advisors in the design process. By engaging an inclusive and equally represented group of community members and stakeholders we know we can gain valuable insights into local sensibilities, preferences, needs, and expectations. This insight will help inform design decisions and ensures that our project reflects our audience's identity and values. Additionally, involving our community of practice in the design process should foster a sense of ownership and pride among our partners and, hopefully, increase their satisfaction and loyalty to this effort. After capturing the pulse of the community of practice, it will be important to make all library patrons feel welcomed, regardless of age, ability, background, or identity.

Project Staff and Tracking
The project team is comprised of:
- Nancee Hunter, Director of the Center for Geography Education in Oregon and Research Assistant Professor with the Geography Department at Portland State University, who will serve as Principal Investigator and will oversee project activities and progress;
- David Banis, Associate Director of the Center for Spatial Analysis & Research (CSAR) and GIS instructor at Portland State University, who will provide support with participatory GIS and mapping techniques for this project and will focus on engagement with the GIS community;
- Project Coordinator and GIS expert (TBD), who will coordinate and serve as liaison with library partners, in addition to providing library support on GIS-related projects and help to teach workshops; and
- Geography graduate student (TBD), who has demonstrated a strong ability to communicate geo-spatial and technology concepts to a novice audience.

Advisory Committee members include:
- Catherine Green, Geospatial Lab Coordinator at Portland Community College and Geographer, who will provide expertise in aspects of GIS and project coordination;

- Joseph Kerski, ESRI Education Manager and Geographer, who will provide support on the GeoMentors program which works to enhance GIS and geographic learning in public libraries through the introduction of ArcGIS Online;
- Marty Marquis, Geographer and GIS Trainer, who will provide expertise with designing and delivering community GIS workshops, as well as "storytelling" with maps;
- Eleanor "Nora" Mattern, a teaching assistant professor at the University of Pittsburgh's School of Computing and Information, who will provide support with library engagement and guidance on learning outcomes from a similar IMLS-funded project, Civic Switchboard;
- Lauren McKinney-Wise, GIS Technician at the City of Portland's Bureau of Planning and Sustainability, who will provide expertise on project design, GIS tutorials and tools, GIS presentations, and establishing collaborative creation and learning outcomes;
- Randy Morris, Geographic Information Systems Technician at the Center for Environmental Management of Military Lands (Colorado State University), who will contribute expertise on cartographic principles, networking, and support on geographic tools, as needed, for select field projects; and
- Peter Ward, Local History Librarian - Brentwood Public Library (NY), who will provide expertise on how best to support history-related projects at public libraries.

Advisory Committee will meet monthly as a full group to track overall project activities against the schedule of completion. The PI and project coordinator will meet at least once a week to track project costs and budget. Smaller team meetings will be scheduled as needed for work related to specific tasks. The entire project team will make use of web-based task tracking tools and file sharing platforms with which they have existing experience. The PI and project coordinator will regularly assess the frequency of full team meetings and will adjust if necessary.

Project Results

Public libraries serve as anchors for thousands of communities across the country and they exert extensive effort to promote information evaluation. Librarians should understand their missions, as well as strengths and limitations in providing GIS services in the library. The focus of library GIS services are collection, management, preservation, and dissemination of geospatial data or geographically referenced data. We believe that libraries should provide help with GIS reference questions, converting different data structures, and simple GIS analysis help such as overlays, buffers, spatial joins, and digital map production. Our proposed project reminds library professionals to include geographic literacy as one of the core components of information literacy. Providing access to GIS software within libraries is not a completely new trend but today the software has been streamlined to allow even novices to create maps with minimal training. GIS services in libraries represent an evolution of traditional information services and undeniably offer a holistic learning environment. Due to the multidisciplinary applications for GIS, public libraries can coordinate and provide access, training, and data services to both staff and patrons. Our initiative is to continue introducing GIS into libraries to allow the public to have access to geospatial data in a meaningful format. By using GIS, a patron and/or librarian can create a map based on geospatial data to illustrate the data in a spatial context. By integrating GIS services and data into the library environment, the local community benefits from increased information access. That said, due to the complexity of GIS software, it is essential that libraries work with GIS professionals to provide patrons access to appropriate levels of instruction and assistance.

As a result of our previous work, we have assembled several case studies of public libraries engaging in innovative GIS services geared toward addressing current social, economic, and environmental issues. This new funding will allow us to develop more case studies that can serve as models at the national level, which we feel must be done by capturing a wide variety of successful local practices. At the same time, we fully recognize that the importance of local context and the variety of local GIS data landscapes mean that no single model can be made to fit every location. As such, the project team members recognize that this project will provide a variety of examples of library participation in the local GIS data ecosystem. Our goal for this project is to grow a national network of shared practice and organizational capacity. Through such a community of practice, participating librarians can provide encouragement and mentorship to others looking to become involved in their GIS data ecosystems. We will provide sufficient funding and support, including training, for librarians interested in incorporating more geospatial data into their programming. In addition, our toolkit and service model will be made widely available to libraries and partner groups that support the publication and use of GIS data. The learning materials from all our workshops will be made available on our website (toolkit). As such, librarians can conveniently take advantage of the materials and learn on their own. The design of the workshops, in particular their connection to established professional communities of practice, are intended to directly support this growth.

At the same time, we recognize that barriers still exist for libraries to provide a robust GIS service without 'GIS specialists.' Preparing a librarian to provide basic GIS services requires a lot of time and motivation for training. Usually, the librarian has other job responsibilities and must make an extra effort to devote the time and energy needed for mastering this new skill. One of the big challenges we try to address with this work, is that librarians often do not know how to leverage available mapping tools. They may be familiar with maps in general, but not any specifics of how they are created. And that means they have a hard time deciding how they might use their subaward funding. Adding to that, much existing training is aimed at developing a more comprehensive knowledge of GIS than librarians can devote time to doing, so tailoring materials to their situations is very important. Becoming adept at using GIS software and maintaining proficiency in it often requires ongoing training to be successful. To sustain the learning scaffolding we will provide up-to-date information about external opportunities (in-person and online) for librarians to develop their GIS skills – especially those without having formal education in GIS. Some will be free (e.g., to audit GIS-related courses at local universities), while some will be fee based.

Online training courses are another option for librarians to develop their GIS skills. Coursera, an online learning platform offering a large variety of open online courses, specializations, and degrees, has free courses on GIS. ESRI also provides a suite of online asynchronized e-learning resources, encompassing a collection of intensive interactive training courses covering everything from the basics of making maps to advanced spatial analysis. These courses include conceptual material and presentations, hands-on software exercises, and exams. For example, Learning ArcGIS Desktop, a 31-hour web course offered by ESRI, provides librarians a good overview and fundamental knowledge to start offering services in GIS. Teaching with GIS: Introduction to Using GIS in the Classroom, a 5-hour web course offered by ESRI, focuses on integrating GIS into the curriculum and offers recommendations and ideas on how to work with faculty to apply GIS in their courses. Another way for librarians to develop their skills in GIS is to follow GIS related listservs. GIS for libraries (Gis4lib) is an email list for discussion of providing GIS services specifically in libraries, including academic, public, private, and corporate. Topics may include discussion of hardware, software, data acquisition, licensing, collection development, and more. The Western Association of Map Libraries, an independent association of map librarians and other people with an interest in maps and map librarianship, has a resource page on map librarianship discussion lists (http://www.waml.org/maplists.html). It includes listservs for different regions and librarians can join appropriate listservs based on their interest and geographic location.

Our evaluation methods will include surveys, web data and analytics, anecdotal feedback, local project-based evaluation efforts, etc. We will also take copious notes of our meetings with Field Project awardees to document our process, including aspects that worked well and obstacles we faced moving forward. Our results will be disseminated broadly in hopes to help other libraries and geospatial data partners effectively scale up or spread our efforts to other contexts. The project's outputs and findings will be widely disseminated to public libraries and partner groups that support the publication and use of GIS data. Project partners and supporters will promote our various resources and programs and help identify other GIS data partnerships. Although the project's toolkit will be open and available during the project, and a great deal of communication and outreach is built into the project plan already described, project team members will also make special efforts to publicize a summary of the project work and findings. Project members are also planning to conduct a presentation (if accepted) at the American Library Association Annual Conference & Exhibition in Philadelphia (Summer 2025) or the 2026 PLA conference for this purpose. At the end of the project, determinations will be made concerning appropriateness of long-term hosting and maintenance of the toolkit as well as possible expansion of the project with national partner organizations.

Sustainability is addressed in several ways. First, through the deliberately distributed activities in the project design, which aim to grow a national network and emphasize local capacity-building among a variety of regional participants. At the successful conclusion of the funding period, each participating region should be well-positioned to carry on activities beyond the term of the project, and moreover should have a network of allies performing similar work. Second, the project's resources (e.g., training guides and toolkit materials), will be published in an open format supporting copying, reuse, and modification. Third, the project team will seek an organizational or institutional host to take responsibility for ongoing promotion and maintenance of the online toolkit.

Schedule of Completion

Task Description	Start Date	End Date
Recruit project coordinator in advance of project commencement	8/1/2024	9/30/2024
Establish communications channels for project team and regional partners	10/1/2024	11/1/2024
Hold first Advisory Meeting Call for first workshop participation	11/1/2024	11/15/2024
Develop initial draft of in-person workshop materials Conduct in-person workshop	11/15/2024	1/31/2025
Develop and release RFP for subawards	1/1/2025	1/31/2025
Revise toolkit resources (include workshop feedback and observations)	2/1/2025	3/1/2025
Organize and release call for remote workshop participation	3/1/2025	4/30/2025
Revise and add resources according to workshop feedback and observations	5/1/2025	6/30/2025
Present and participate in outreach on project work	6/30/2025	8/31/2025
Continue supporting subawardees and developing toolkit/workshop materials	9/1/2025	5/31/2026
Finalize project findings and work with partners to sustain and maintain website and resources	6/1/2026	7/31/2026

Digital Products Plan

Type

We will generate digital content and resources. These digital products will be created by project personnel and through our community of practice. The content created will include images, GIS tutorial videos, curricula, training guides, maps, learning activities, annotated bibliographies, meeting notes, and case studies. All resource products and data developed as part of this grant will be considered 'open source' and PSU will assert no ownership rights over said results. All of the outputs from this project will be housed on our public, open access Google Site (https://sites.google.com/pdx.edu/imls-gis-toolkit/home) our internal collaborative file sharing folder (Google Drive) where the project team records meeting notes, reports from our community of practice, as well as observations from our in-person and online workshops. Print materials will be released as Adobe PDF documents in addition to being housed on the grant website. We will be using the Adobe Creative Cloud suite, as well as Microsoft Office, for all video and document production. Videos will be provided in some version of MPEG encoding at a minimum of 480p resolution (probably higher). The workshops will generate qualitative data artifacts. Findings from those data will be incorporated into the toolkit website. The data themselves are not considered a product of this project.

We will not be developing software. ESRI (our GIS software provider/partner) uses Amazon Web Services (AWS) for all digital storage, and Portland State University has an ongoing enterprise account with ESRI. In addition, all library partners will be offered a low- or no cost annual account through ESRI that allows for all storage necessary for workshops and data sharing. ESRI's ArcGIS Hub platform provides for nationwide GIS open data sharing for all participating partners. Any GIS data produced and distributed will conform to Federal Geographic Data Committee (FGDC) metadata standards.

Metadata for the toolkit (housed on our Google Site) will include elements such as title, date of last update and date of first publication, authors and contributors, license, and description.

This project will not be studying human subjects, but rather organizations and organizational structures. We will not collect any sensitive information as this project is focused on organizations and models for community GIS open data partnerships rather than on individuals. We will not collect any trade secrets or proprietary information during the project. We will obtain permission to disseminate any potential case studies in writing and will avoid recording information that may be sensitive.

Availability

We will make sure our digital products and publications are freely and widely available to the public; however, the specified audience is public library personnel. We will do this through our open-source website and via in-person and online presentations. In addition, we will share

information with our growing community of practice as well as partner organizations, networks, and relevant associations.

While we are not creating any new hardware/software platforms, we will be promoting a GIS software developed by a third-party partner, ESRI, who is committed to supporting those that choose to purchase this software.

Access

We do not intend to copyright any of our work, and we will assert no ownership rights over any of our digital products or publications. As such, we will freely allow others to reproduce, publish, or otherwise use our various materials. We are working under open-source licenses to maximize access and promote reuse. All work products will be distributed for free or at cost. Because we will be giving subawards to public libraries for their specific and localized work, we will ensure these grant partners are informed of these open-source conditions at the beginning of their participation.

We will use a Creative Commons license to encourage free sharing and use of our resources. The website will be marked by the Creative Commons license, which will notify users that they have permission to share and adapt the materials freely on the condition that they provide attribution to the original. None of our products will be developed with concerns related to privacy, obtaining permissions or rights. We will, however, inform and request permission to feature resources from library partners and our community of practice as case studies or models for GIS data partnerships.

We are aware that possible issues of cultural sensitivity in representation exist, and we intend to involve diverse partners to participate in creation of all video tutorials, guides, and other documents. The project team will also meet bi-monthly as a full group to track overall project activities against the schedule of completion. During these meetings, the file management approach for this project will be reviewed to ensure that all project team members are comfortable and aware of its contents. The project design is based on an iterative model of development with explicit components that focus on revising and adjusting our primary product. The entire project team will make use of web-based task tracking tools and file sharing platforms with which they have existing experience.

Sustainability

To the maximum extent possible, our digital products will be freely and readily available for use and reuse by libraries and the public. Early in the project, the project team will begin developing a sustainability plan for the stewardship of the toolkit resources, which will include the maintenance of associated metadata. Our intent is that the majority of the digital products that are generated during this project will be preserved permanently via the Center for Geography Education Website (https://www.pdx.edu/geography-education). For preservation

purposes, we will also deposit a PDF version of the toolkit, with a clear capture date, in PDXScholar, Portland State University's institutional repository.

Other communications or logistical materials would likely be retained and shared for a year or so after the grant ends, as these might be useful resources for partners or others interested in doing similar work. Any necessary costs for final publication or sharing of results would be spent from the federal award before closing the grant.