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Making Cultural Heritage Interoperable: Lessons in Standardizing Metadata for Paper Maps, Geospatial Data, and Open-Source Software

Keywords: metadata, policy, data-exchange, libraries

Summary: The Johns Hopkins University's Sheridan Libraries Map Collection is home to the largest collection of Baltimore city maps, atlases, and aerial photography, among other imagery and plans, as well as an authoritative representation of the state of Maryland in general. Currently, the system of discovery and access for the Map Collection is focused on storage and preservation, connecting viewers to scans from the Libraries' digital collections repository using URLS composed of numeric identifiers, without image previews or robust searching capabilities. Seeking to build a more user-friendly experience, staff from the Map Collection's home department (Data Services) have been working on a cross-Libraries initiative to improve digital access with staff from Technical Services, Library Applications, Data Management, and many others who curate and maintain digital collections. This project has entailed implementing new platforms for the digital access and discovery of maps, using Islandora 8 for image storage and display in conjunction with GeoBlacklight for geographic discovery and access to geospatial data. Preparing our maps for these new systems has required extreme flexibility and balance to create interoperable and standardized metadata, without sacrificing the discoverability found in high-quality metadata record formats and controlled vocabularies used for cartographic description. To strike this balance effectively, we analyzed user experience data and best practices from our inter-institutional colleagues, prizing titles and concatenated descriptions more than traditional vocabularies or fields, and automating the metadata creation process as much as possible. The result is a lean but easily facetable data model recognizable to map experts, but easily comprehended by our end users.

Introduction

A critical part of making cartographic materials available to our academic patrons and the general public is through the use of cognitively and technologically accessible metadata. As maps and geospatial data gain ever greater prominence for projects ranging from the study of Classical literature to predicting disease outbreaks in real time, we cannot overstate the importance of map and GIS metadata that can easily be found, read, and understood by people from disparate fields. Furthermore, the materials contained in geoinformation repositories can vary widely in content and format, ranging from scanned pages of a city directory to gigabytes of tabular data. However, the metadata and data exchange models for these materials were formed in extremely different cir-

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cumstances over the past century, and integrating them for today's map and geospatial data users has been a formidable challenge for those who steward and provide access to them. At Johns Hopkins University, a group of GIS, data, and metadata specialists used the opportunity presented by a digital collections platform overhaul to address these challenges. In the course of our work, we rebuilt our legacy metadata into a format that can be interoperable with a wide variety of platforms and easy for non-specialist users to understand, while still being informative enough to aid discovery for seasoned researchers and analysts.

The Problem and the Proposed Solution

The Sheridan Libraries serve as the main research resource provider for Johns Hopkins University (JHU). Within Sheridan Libraries, the Data Services team collaborates with partners from Library Technical Services, Library Applications Group and the Digital Research and Curation Center to steward and share the university's geospatial data, software licenses and systems.

The geospatial data managed by the Sheridan Libraries encompasses a mix of resources, including licensed and/or purchased geospatial data, research data, and the University's collection of historical maps and aerial imagery. These resources are stored in a variety of locations: the university's institutional repository (JScholarship), the JHU Data Archive, a limited network drive on Data Services Lab computers, vendor interfaces for specific products, an institutional instance of Box, and the institutional instance of ArcGIS Online. This patchy landscape for geospatial data access and discovery has hindered the ability of library patrons to find and access the information needed for their research. In particular, the Sheridan Libraries' collection of historical maps and imagery is underutilized due to both this confusing landscape for geospatial data access and incomplete metadata records.

Over the past 20 years Data Services, in collaboration with Library Technical Services, has steadily stewarded and curated what is now the largest and most comprehensive collection of historically significant maps of Baltimore and Maryland. The Data Services Map Collection includes Maryland historical county atlases published from 1876 to 1915, Baltimore City atlases and maps published from 1876 to 2008, and aerial photography of Baltimore City. Most notably, in 2017, the family of JHU alumnus Willard Hackerman donated his private collection of historical Maryland and Baltimore maps, which includes resources such as A.P. Folie's *Plan of the Town of Baltimore and it's [sic] Environs*, published in 1792. Physical copies of these maps are stored in the Milton S. Eisenhower Library; digital scans are made available through JScholarship, the university's institutional repository.[1]

This historical collection managed by the Sheridan Libraries is a rich resource for researchers studying the development of Maryland and Baltimore in particular. However, the metadata for these resources reflect the changes in record-keeping standards, internal policies and practices over time; an internal review of our resources revealed that the Data Services Map Collection was poorly organized with outdated and often incomplete metadata.

The resulting challenges that the incomplete metadata presented were compounded by the platform itself: the institutional repository, JScholarship, is an outdated dSPACE instance, with limited capabilities for image previewing and metadata faceting. A separate library initiative was concurrently underway to replace JScholarship with a new repository instance built on Islandora

[1] *Maps and Atlases*, JScholarship. https://jscholarship.library.jhu.edu/handle/1774.2/32585

8, an open-source framework for digital asset management.[2] Taking advantage of the opportunity presented by this initiative, an interlibrary team led by maps, GIS and metadata specialists from Data Services and Library Technical Services proposed developing a discovery and access platform for the university's geospatial data using the Sheridan Libraries' collection of historical maps and images as a pilot project.

Why did we create a separate discovery and access platform for geospatial data? As stated earlier, the university's geospatial data resources are stored and accessed through multiple platforms and locations. While maps and atlases are stored in the institutional repository, other critical geospatial data resources, such as licensed and/or purchased datasets and archived research data, are stored elsewhere. The transition of the historical maps and atlases collection to an Islandora instance would greatly improve that particular collection's accessibility, but it would not solve a bigger concern of users needing to access and search multiple platforms for all of their geospatial research needs. To address this concern, we undertook the development of a GeoBlacklight instance for Johns Hopkins University.

GeoBlacklight is an open-source software application for discovering geospatial content.[3] Developed by an informal collaborative of participants across universities and cultural heritage institutions, it boasts an active user community and has been adopted by over fourteen institutions to serve as a front-end application that provides a centralized location for users to find and access geospatial data. Geospatial data sources can be stored across multiple locations, but be presented to the user in one central web platform, with both map and keyword/metadata search capabilities.

The Data Services Map Collection, with all of its disparate forms of maps and data, was a logical choice as one of the first collections for ingest first into Islandora and then into GeoBlacklight. While this arrangement was certainly beneficial for us, it also meant ironing out migration and metadata problems to the advantage of all our colleagues in the Libraries who would eventually follow our model.

Towards interoperable but discoverable metadata

The Data Services Map Collection metadata has traditionally existed in two principal formats: Machine Readable Cataloging (MARC)-based library catalog records and Dublin Core-based digital repository records. MARC records serve for finding and retrieving maps as requestable (non-circulating) library materials, and the digital repository serves to store digital objects with a focus on preservation and open access. These are important strengths, but in our current age of remote learning and remote research, they are no longer sufficient for the needs of our team or patrons.

The needs of users who search library catalogs frequently do not align with the practices of library professionals who catalog these records. This has been demonstrated by recent user experience (UX) research, which suggests that non-library professionals do not refine by subject headings when searching, and that subject headings make no difference to whether or not users seek out a

[2] *About*. Islandora 8. https://islandora.github.io/documentation/

[3] *About GeoBlacklight*. GeoBlacklight. https://geoblacklight.org/about/

particular record.[4] Despite this, library professionals are trained to view subject headings as key to a record's completeness and we are also trained to use them when we perform searches ourselves. At the 2021 Geo4Lib Camp conference, University of Colorado presenters Phil White and Erik Radio indicated that while their GeoBlacklight users do make topical searches, these searches are matched by title and description terms rather than subject heading terms. Furthermore, users do not match locations and places to subject headings either, but rather to publisher, creator, and title fields.[5] They concluded that title and description fields are the most important elements for discoverability, and that metadata creators view map and geospatial data records very differently than how the users and creators of this content do.[6]

In the case of digital repositories, while keeping archival copies is certainly of the utmost importance for digital assets, these platforms are not built for discoverability or querying. Our digital repository, JScholarship, does not provide image previews, a crucial feature of digital collections for users who do not have the disk space or time to download every potentially relevant image. It does not have sophisticated searching capabilities, nor does it link to library records or other external resources (Figs. 1-2). The repository's only nesting and linking features come from collections of items within larger material groups, which is a useful feature, but can be configured more nimbly with faceting in Islandora and GeoBlacklight.

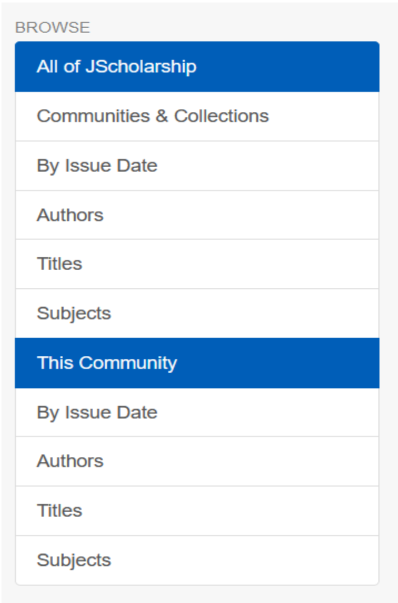

Figure 1: current search capacity limits.

[4] Nicole Trujillo, Erik Radio & Melanie Walker (2020) What Metadata Matters?: Correlation of Metadata Elements with Click-Through Rates for E-Books and Streaming Video in the Academic Library Catalog, Journal of Web Librarianship, 14:3-4, 86-99, DOI: 10.1080/19322909.2020.1850390

[5] Phil White & Erik Radio (2021) Mapping Search Queries to GeoLibrary Metadata Fields, https://outpw.github.io/slides/geometa.html#/14

[6] Ibid., #/18-#/19

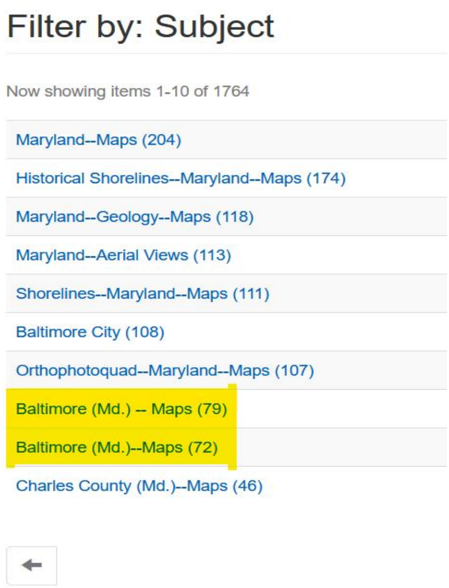

Figure 2: duplication in subject headings due to differences in characters.

In order to address the limitations of our current repository, we proposed developing a new method for crosswalking our existing MARC and Dublin Core metadata that would also enhance it. We needed a reproducible workflow that would allow for multi-faceted information searches, while also displaying access-point metadata visible in frequently used fields like title and description. Furthermore, we needed this workflow to be a repeatable and scalable process for new, incoming metadata as we continued to catalog materials during the course of this project. Most importantly, we wanted to accomplish these goals in a way that would not sacrifice discoverability of our records in the name of interoperability. An interoperable record is of no use if it does not contain helpful information. Therefore, we resolved to keep our Colorado colleagues' research and recommendations — emphasizing searchable keywords in titles and descriptions and not just subject headings — in mind as we formulated our next steps.

Established workflows and steps

Organizing our data for transformation

We decided to draw information from the MARC catalog records to begin creating GeoBlacklight JSON records due to the inconsistent nature of the metadata in JScholarship. By using a combination of MarcEdit and the Python pymarc library, we harvested controlled agent, geographic, and subject headings — along with other important string metadata —from MARC records for use in GeoBlacklight.[7] To begin this process, we used a combination of automatic and manual matching to find catalog records for JScholarship items lacking any clear link to the catalog. First, we worked with one of our library's programmers, Zoya Tsygan, to download all of our print map MARC records for matching — a total of 15,143 records. With this download, we used the Python library fuzzywuzzy to title match our JScholarship items to our MARC records, confirming

[7] MarcEdit is a widely-used GUI-based library application for MARC editing and transformations developed by Terry Reese. https://marcedit.reeset.net/. https://pypi.org/project/pymarc/

exact matches with author, publisher, and date metadata.[8] For less close matches, we created a shared Google spreadsheet where we worked to manually verify close match results and find matches for JScholarship items that did not return any title matches.

During the automatic matching process, we also discovered 579 digitized maps and atlases that were held by an institution other than Johns Hopkins. This number of identified non-JHU items eventually expanded to a total of 976 digitized items. The process of discovering these items was gradual, as metadata indicating a non-JHU holding institution was often 1) given in a free-text statement, 2) inconsistently placed in one of six metadata fields, 3) given at the collection-level, or 4) only discovered by looking at digital scans. While the vast majority of these non-JHU maps did not have a corresponding MARC record in our catalog, we were surprised to find matching MARC records for 80 of these non-JHU items. In these instances, we believe that print facsimiles of the originals were created and cataloged at Hopkins.[9]

We also knew that we would not find matches for two collections containing a total of 98 maps. These collections included 1) a small collection of 16 GIS data files previously used for library instruction, and 2) a collection of 82 Hopkins-owned maps not yet cataloged.

[8] This Python library uses Levenshtein distances to calculate the similarity between two strings or find "fuzzy" matches above certain thresholds. For more information, see https://pypi.org/project/fuzzywuzzy/.

[9] We hope to verify this once pandemic conditions allow us to physically access the collection.

Records to search	
Total MARC records	15,143
Total JScholarship records	1,764
Results of fuzzywuzzy search	
Exact matches	523
Probable matches	40
No matches	1103
Uncataloged JScholarship records	98
Final matches found	
Automatic matches confirmed	563
Manually matched	207
Total matches found	770

Table 1: Fuzzywuzzy matching results

Total JScholarship items		**Matched to MARC record**	**Not matched to MARC record**
Not held by JHU	976 items	80 items	896 items
Held by JHU	788 items	690 items	82 uncataloged items
			16 GIS files
Total	1764 items	770 items	994 items

Table 2: Final matching results

Meanwhile, we also divided the JScholarship items into two categories: 1) JScholarship items containing multiple maps (multipleMaps) and 2) JScholarship items containing one map (singleMaps).

Type	JScholarship items
multipleMaps	161 items
singleMaps	1587 items
GIS files	16 items
Total	1764 items

Table 3: JScholarship items with multiple or single maps

This distinction was important because while a record in JScholarship can contain one or more maps (one-to-many relationship), we wanted to increase discoverability in GeoBlacklight by creating a seperate record for each map (one-to-one relationship). Figure 3 and Figure 4 illustrate the different structure of items in these platforms by representing "[BALTIMORE CO.] Atlas of Baltimore County, Maryland," in JScholarship and GeoBlacklight, respectively. In JScholarship, the atlas is a single item with 94 files (47 identical images in both tiff and jpeg format) that represents 47 scanned pages. Of those 47 scanned pages, 33 pages are maps. In GeoBlacklight, however, the atlas will be represented as 34 individual items: 1 parent item to represent the complete atlas and 33 child items, each representing a single map.

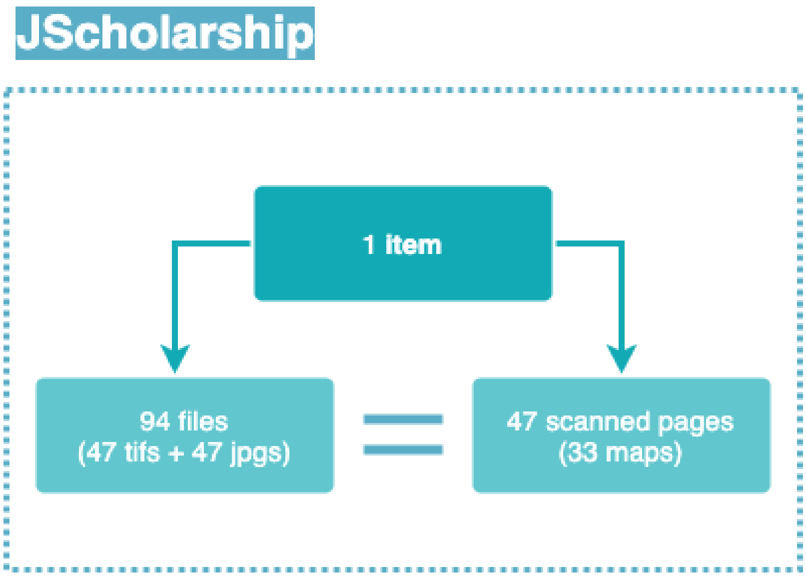

Figure 3: JScholarship representation of "[BALTIMORE CO.] Atlas of Baltimore County, Maryland"

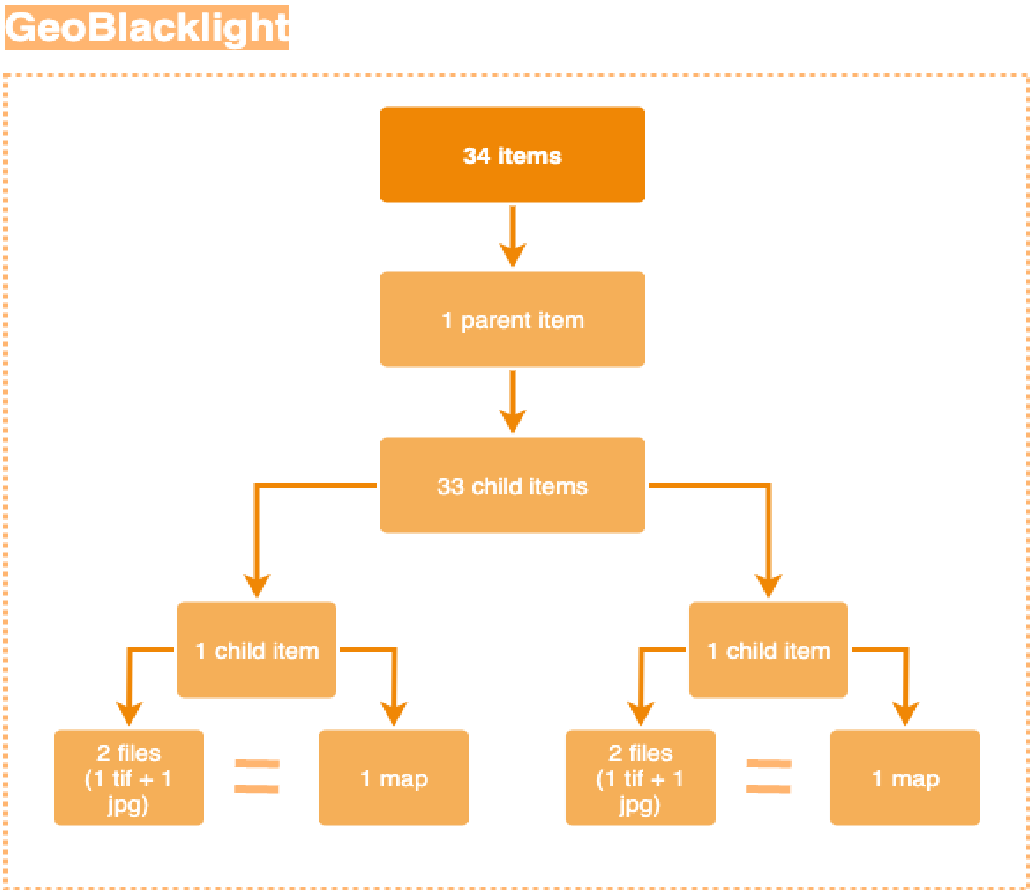

Figure 4: GeoBlacklight representation of "[BALTIMORE CO.] Atlas of Baltimore County, Maryland"

For multipleMaps items, we selected all of the map files within the multipleMaps items and created a shared Google spreadsheet where we generated item-level metadata that could not be inherited from the parent JScholarship or MARC records. We also created a shared Google spreadsheet for singleMaps, where we collaborated to create metadata for GeoBlacklight-specific fields with no corresponding information in MARC records. We created these spreadsheets in the larger context of a more formal workflow to convert MARC metadata to GeoBlacklight metadata, discussed in the "Implementing a workflow" section.

Mapping our metadata

During this process, we also created a "Johns Hopkins University Geoportal Metadata Application Profile (JHU-GMAP) 1.0" for our specific instantiation of GeoBlacklight Metadata Schema (Version 1.0) to provide guidance and local standards about how to create metadata for each element in the schema.[10] As we filled out the spreadsheets with GeoBlacklight metadata, we often turned to this documentation for instruction and clarification. Moreover, we also created a mapping of relevant MARC fields to their GeoBlacklight equivalents, as seen in Appendix 1. This mapping was used to create our formal MARC to GeoBlacklight workflow, "MARC to GeoBlacklight roadmap," discussed in the next section.

[10] https://github.com/jhu-data-services/GeoBlacklightMetadata/wiki

Implementing a workflow

After completing our matching process and creating documentation, we worked on creating a process to pull, clean, and transform all relevant metadata fields from the MARC records into relevant formats for GeoBlacklight metadata elements. Eventually, we created a 7-step conversion process, "MARC to GeoBlacklight Roadmap," to convert MARC metadata for historic and print maps into JSON metadata according to the GeoBlacklight Metadata Schema (Version 1.0) using a combination of Python scripts and the MarcEdit application.[11] As we created this workflow, we sought to automate clean-up and transformation tasks as much as possible while creating space for manual review and editing in a simple spreadsheet. We also sought to make our workflow simple and generic enough for re-use in future GeoBlacklight projects, both within Hopkins and by other institutions. A basic outline of "MARC to GeoBlacklight Roadmap" is found below, and the associated Python scripts and a wiki of instructions are openly available for reuse on GitHub.[12] See Appendix 2 to see how each GeoBlacklight metadata element is impacted by each step.

MARC to GeoBlacklight Roadmap

1. Batch edit coordinates
   Using MarcEditor, we first converted any bounding box coordinates within the MARC records to decimal degrees.

2. Validate names in MARC
   Next, we validated names in MarcEditor against the Library of Congress Name Authority File. While the GeoBlacklight Metadata Scheme doesn't require controlled headings, this quick step will help improve searching and browsing for our users.

3. Convert MARC fields to a CSV
   After these changes using MarcEditor, we turned to Python to convert our MARC records into an easy-to-edit CSV file. Our script uses pandas and pymarc to find and convert several MARC fields and codes into useful information for GeoBlacklight metadata.
   In particular, the script:
   - Converts language codes from the 008 field and the 041 field to the written value.
   - Converts the dat type code from the 008 field to the written value.
   - Coverts the category of material code from the 007 field to the written value.
   - Finds the OCLC number, deleting prefixes.
   - Transforms bounding box coordinates to W, S, E, N order.
   - Extracts geographic subject headings from the 600 fields, and divides them into likely FAST headings and LCNAF headings.

4. Clean up CSV
   This script cleans CSV metadata by performing the following functions:
   - Cleans up punctuation

[11] This conversion process is documented at https://github.com/mjanowiecki/geoportal/wiki.

[12] https://github.com/mjanowiecki/geoportal

    - Removes punctuation from end of title.
    - Removes punctuation from end of publisher field.
    - Removes punctuation from end of the scale field.
    - Expands common abbreviations in scale and description fields.
        - ca. → approximately
        - in. → inches
        - col. → color
        - ill. → illustration(s)
        - Creates expanded description by combining title, description, and scale information.
- Cleans up names
    - This script removes formatting punctuation in names by getting authorized name labels from the Library of Congress Name Authority File. This is especially important as GeoBlacklight collates names based on strings.
    - Uses URIs from Step 2 to get authorized name labels for creators and contributors
    - Conducts a search for authorized publisher labels
    - Splits creators column into into two columns:
        - A column with verified authorized author labels from LCNAF
        - A column with unverified authors that may still have punctuation issues
    - Splits contributors column into two columns:
        - A column with verified authorized contributor labels from LCNAF
        - A column with Unverified contributors that may still have punctuation issues
    - Splits publishers column into two columns:
        - A column with Verified authorized publisher labels from LCNAF
        - A column with Publishers that may still have punctuation issues
- Adds field information
    - Adds collection title to isPartOf
    - Create spreadsheet columns with default values (assumes scanned/digitized map)
        - rights: Public
        - suppressed: False
        - type: Image
        - geom_type: Image

5. Convert LCSH headings to GeoNames
Next, another Python script transforms Faceted Application of Subject Terminology (FAST) and Library of Congress Name Authority File (LCNAF) geographic headings gathered in Step 3 into hierarchical headings based on GeoNames. Within GeoBlacklight Metadata Schema, the Spatial Coverage element recommends GeoNames for place name keywords and the de-facto standard is to create a hierarchical string to flesh out the authorized GeoNames label. Thus, a GeoNames label of "Philadelphia" is extended to "Philadelphia, Pennsylvania, United States" under GeoBlacklight conventions.

The script first finds linked data "schema:sameAs" references to GeoNames within FAST and LCNAF records to find the equivalent label in GeoNames. Then the script finds the authorized GeoName label along with its administrative parent and grandparent labels (if available) and appends all of the labels together to create the desired hierarchical string. Thus, the FAST heading "Baltimore (Md.)" and the LCNAF heading "Maryland--Baltimore" are both converted to the GeoNames heading of "Baltimore, Maryland, United States." While the results of this script should be manually reviewed, this step helps us avoid repeating spatial subject heading work already completed during the traditional cataloging process.

6. Manually complete and review records
   Next, manual review of the CSV generated in Step 5 helps finalize the automatically generated elements and provides space to complete GeoBlacklight metadata elements without a MARC equivalent.

7. Convert completed CSV to JSON
   After the CSV is completed and reviewed, a final Python script converts the spreadsheet into JSON files and validates them against the GeoBlacklight Metadata Schema (Version 1.0) for ingest into GeoBlacklight. The script also adds the following metadata elements and performs final conversions on the bounding box fields:
   - Creates identifier and slug elements if not found in spreadsheet
   - Adds provenance element
   - Adds geoblacklight_version element
   - Adds b1g_centroid_ss element
   - Converts bounding box from (West, South, East, North) to (West, East, North, South)

Considerations, Challenges, and Opportunities Along the Way

As previously mentioned, an innate issue of metadata collected by many people for a variety of platforms over many years is that it contains every imaginable form of inconsistency. Uniting all of this metadata revealed not only divergent processes, but also accidental duplications and impending formatting problems. Internal networked drives can function without any further metadata than “P 01,” “P 02,” etc. within a folder for distinguishing subsequent plates within a specific volume. However, a relational collections space in which pages can be viewed separately from their contextualizing volumes requires that every file name be unique, and some characters – including spaces – cannot be used at all. Therefore, we created a formula for programmatically changing all our items’ file names. We used a map’s Library of Congress or Dewey Decimal call number as its digital shelf mark, by reformatting it with consistent punctuation and capitalization, and appending plate or sheet numbers to the end if applicable. The idea for the formula came from the long-standing practice of the Harvard Geospatial Library, which uses the same process for assigning layer IDs to its georeferenced scanned maps.[13] We were then able to generate and assign

[13] For example:
http://hgl.harvard.edu:8080/HGL/jsp/HGL.jsp?action=VColl&VCollName=G3851_S5_1862_A7

the new file names programmatically with a Python script that matched the call numbers from items' MARC records with any pagination information.

Beyond file naming, we also had to reconsider how to categorize the materials themselves and upgrade their catalog records in the process, particularly in three specific use cases. First, we learned that several items that had been cataloged as copy 1, copy 2, etc. of a map were in fact not the same map at all, but different editions or states of a map. Second, we had to retrace location-tracking changes made by different repositories within our universities that had held our maps at different times. Third, we had to determine how we would treat geospatial data, as opposed to scanned maps. In this final case, we needed to make sure we included sidecar world files for georeferenced maps, along with the image files themselves, and also explain their existence in a way that would make sense to non-GIS expert users. While some of these issues are simple to fix in the originating MARC records, such as changing a call number to a subsequent shelf mark number instead of a copy of a previous number, others present logistical challenges that we are in the process of resolving.

Current Status and Remaining Steps

At the time of this writing, nearly all of our metadata is ready to be ingested into our Islandora instance, which is scheduled to happen around July of 2021. The GeoBlacklight instance will follow, but in the meantime, testing GeoBlacklight internally with a small number of records is set to begin in late April of 2021. Later this year, an external contractor who has helped to implement GeoBlacklight instances at peer institutions will assist us in testing this process. Our records now contain descriptive titles that include dates and geographic location, concatenated with individual plate or sheet map titles when relevant. After all of our metadata and maps are present in these new digital collections portals, the next phase is to optimize their display by enabling IIIF in Islandora and exploring the use of a map display interface such as Geoserver for the GeoBlacklight instance. We also plan to leverage Islandora's Linked Data capabilities, so that our metadata is relational and easier to visualize. In turn, we intend to roundtrip this metadata back into our MARC records, which are an invaluable resource but – as the workflows of this project have made abundantly clear – could benefit from updates to item description and disambiguation. Finally, we intend to continue documenting these processes in our project GitHub so that our work can become iterative and require less onerous set-up for our collaborators within the Sheridan Libraries and partners beyond Johns Hopkins University. In the spirit of free and open-source software, we plan to publish replicable formulas for our metadata, both at the descriptive level and in regards to categorizing materials, so that other map repository libraries can test our experimental practices for themselves and assess if these protocols might set a precedent for industry-wide standards.

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White, Phil & Erik Radio (2021) Mapping Search Queries to GeoLibrary Metadata Fields, https://outpw.github.io/slides/geometa.html

Appendix 1: MARC to GeoBlacklight mapping for digitized maps

GeoBlacklight label	GeoBlacklight URI	MARC field	Default value for maps
Rights	dc_rights_s		Default "Public"
Title	dc_title_s	245 $a, $b	
Provenance	dct_provenance_s		Default "Johns Hopkins"
Schema Version	geoblacklight_version		Default "1.0"
Bounding Box	solr_geom	034 $d, $e, $f, $g	
Creator	dc_creator_sm	100s, 700s	
Description	dc_description_s	520; 500s	
Language	dc_language_sm	008 byte 35-37; 041	
Publisher	dc_publisher_sm	260 $b; 264 $b	
Type	dc_type_s		Default "Image"
Date Issued	dct_issued_s	008 byte 07-10; 008 byte 11-14	
Spatial Coverage	dct_spatial_sm	650 $z; 651 $a, $z	
Temporal Coverage	dct_temporal_sm	034 $x, $y	
Geometry Type	layer_geom_type_s		Default "Image"
Suppressed	suppressed_b		Default "False"

Appendix 2: GeoBlacklight element by "MARC to GeoBlacklight Roadmap" step

Element	Step 1	Step 2	Step 3	Step 4	Step 5	Step 6	Step 7
Bounding Box	Transform		Extract			Complete	Reorder
Description			Extract	Clean		Review	Done!
Format						Complete	Done!
Geometry Type				Done!			
Identifier							Done!
Provenance							Done!
Rights				Done!			
Schema Version							Done!
Slug							Done!
Spatial Coverage			Extract		Transform	Review	Done!
Subject						Complete	Done!
Title			Extract	Clean		Review	Done!
Type				Done!			
Creator		Validate	Extract	Clean		Complete	Done!
Date Issued			Extract			Complete	Done!
Is Part Of				Done!			
Language			Extract			Review	Done!
Publisher		Validate	Extract	Clean		Complete	Done!
Solr Year						Complete	Done!
Suppressed				Done!			
Temporal Coverage			Extract			Complete	Done!