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Historic Maps Meet Google Maps: The University of Louisville's Kentucky Maps Collection

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Introduction

Internet mapping sites have greatly aided the directionally-challenged in navigating from point A to point B. Meanwhile, historians, urban planners, genealogists, preservationists, and others make use of historic maps to investigate the natural and built environment of the past. At the University of Louisville Libraries, we have sought to provide online access to our invaluable historic maps through the familiar features of Google Maps. This article will give some background about our collections and digitization process, and then provide details about our implementation of Google Maps and offer ideas for further use of such technologies.

University of Louisville Libraries and Digital Initiatives

The University of Louisville Libraries, a library system comprised of six libraries on two metropolitan campuses of the University of Louisville (UofL) in Louisville, Kentucky, has grown in size and stature in recent years, joining the Association of Research Libraries (ARL) in 2002.

In addition to its collections of monographs, journals, and audiovisual materials, the system has an extensive collection of rare and unique books, ephemera, manuscripts, maps, photographs, prints, and sound recordings, which have been used by local and international researchers. The Internet broad-ened access to these materials, initially via finding aids, collection-level MARC catalog records, and the publication of *For Love of Learning,* a catalog of special collections and primary source holdings.[1]

In 2005, the Libraries made the strategic decision to create a Digital Initiatives program to provide free, online, item-level access to selected rare and unique holdings. Thanks to a library automation subgrant from the Kentucky Department of Libraries and Archives (KDLA), we were able to purchase CONTENTdm Digital Collection Management Software to manage the upload, search, and display of digital materials and information (metadata) about them.[2] Funding was also allocated for

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Figure 1: Plate 22 from 1884 Atlas of Louisville, Ky. and Environs, showing crumbling edges

Proposing an Online Map Collection

In the summer of 2007, an archivist in the Libraries' University Archives and Records Center (UARC) enquired whether an 1884 *Atlas of the City of Louisville Ky. and Environs*[5] could be scanned using the new overhead scanning setup. He frequently used this atlas as a reference tool, because it included details such as names of properties and owners for parcels of significant size; color-coding to denote construction materials of buildings; and locations of sewers, water pipes, cisterns, and fire hydrants. The city in 1884 was a thriving river port, with specialized industries such as bourbon distilleries and tobacco factories, and the names of some of the prominent landholders of the era continue to be reflected in street, neighborhood, and building names. However, the atlas' brittle, acidic pages crumbled more with each use, and he foresaw the need for a surrogate copy to reduce wear-and-tear on the original. He did not initially imagine making the scanned atlas available online.

The Digital Initiatives Librarian agreed to oversee the scanning of the atlas, but wished to make the project do double-duty and form the nucleus of a new digital collection for the website. She consulted with curators from UARC, Special Collections, and the main library's Map Collection to identify other out-of-copyright materials that could form a "Kentucky Maps" online collection. Not all of the maps proposed were in as dire need of preservation, but differences between them, such as

the purchase of an overhead scanning setup that could capture fragile and oversize materials, and for a new position, Digital Initiatives Librarian, to develop and coordinate standards and procedures for this endeavor. Digital Initiatives Librarian Rachel I. Howard started in 2006, and worked with collection curators, catalogers, programmers and systems administrators in the Libraries Office of Libraries Technology (OLT), and the web designer Terri Holtze, Head of Web Services, to launch the Digital Collections website[3] in May 2007.

Curators assist with the prioritization of collections to be digitized by completing Project Proposals, with which they assess the collection or materials, including their size/extent; dates and geographical regions represented; level of processing (readiness for metadata); physical condition (readiness for scanning); rights issues; and purpose for proposing. The latter has typically been to provide access based on demonstrated or perceived demand; to create opportunities for partnerships, including intra-library partnerships that digitally reunite related materials housed in separate units; or to aid in the preservation of the original material by providing a digital surrogate. The Digital Initiatives Librarian reviews the proposals and, if feasible, allocates resources to fulfill them and attempts to set realistic timelines for completion. Additional information may be required to determine the appropriate way to present the material; it is helpful to know at the onset of a project what the end result should look like, including the presentation format of the digital objects and special metadata requirements veering from the standard data dictionary.[4]

varying degrees of scope and detail, and the ability to observe changes over time, made the body of material valuable as a group. Providing access to the maps online would not only serve remote users, but even librarians, archivists, and on-site visitors would benefit from a unified entry point to materials that were housed in different units with differing degrees of cataloging and differing policies on research use.

Two other out-of-copyright atlases of Louisville and the surrounding county (from 1876 [6] and 1913[7]) were selected for the initial project, with others intended to be added later.

Digital Conversion of Maps

The summer proved a propitious time to embark on the scanning of the three atlases, since a summer intern was assigned to the department for one month, and another student worker worked two three-hour shifts per week, providing an ample workforce for the time-consuming but relatively routine task of producing large, high-quality scans using the overhead scanning setup.

The covers, title pages, front matter, plates, and back matter for each atlas were scanned by placing them on a copy stand, with a Linhof Kardan M camera bearing a BetterLight scan back lifted or lowered to the appropriate focus. Because both the 1884 and 1913 atlases were disbound, and the 1876 atlas consisted of a mere six maps, a book cradle was not required to prop open the pages as they were scanned. A 40-gigabyte hard drive connected the scan back to a computer with View-

Finder software, which read the scan and allowed for adjustments in resolution, line time, ISO, color, tone, exposure, and focus. Each scan was then opened in Photoshop to be rotated and cropped. We scanned everything as 600 ppi TIFFs, and typically, the other settings would remain consistent within one atlas, but the 1913 atlas provided additional challenges, since the maps were not of equal size, requiring constant readjustments. As we would later realize, the 1913 maps were also not of equal scale, posing additional challenges during the Google Map stage of the project (described below).

Once we had a complete set of TIFFs for an atlas, the Digital Initiatives Librarian imported them into CONTENTdm as a compound object. In order to do so, she had to ensure that the filenames could be read by the software in the appropriate order. Each map, or plate, bore a number which figured into the filename created by the student scanners, but the front matter had to be renamed in order to display in the appropriate order – that is, that the cover page would remain in front of the title page, which precedes the first map, etc. Once order had been established, and a collection with the desired metadata fields and "full resolution" setting created in CONTENTdm, the import could occur.

Using a JPEG2000 Acquisition Station, the files were pulled into the software as TIFFs, and then converted into lossless JPEG2000 files of Maximum quality. This format uses wavelet compression to render high-quality digital files a fraction of

the size of the TIFF originals.[8] In addition to reducing file size, JPEG2000s also increase functionality by making it possible to zoom in on the details of an image (an especially useful tool with maps!). The results have so impressed experts that there are studies underway to explore the feasibility of JPEG2000 as a preservation standard.[9]

Metadata for Access to Maps

As many librarians and archivists working to digitize collections can attest, the technical aspects of scanning and working with software are the easy part—it is the metadata, and the larger issue of how to best provide access to the digital materials to a variety of potential audiences for search and retrieval, that requires more time and decision-making.

We had already established a data dictionary for UofL Digital Collections, but were faced with the decision of whether to provide document-level (that is, a metadata record for an entire atlas) and/or page-level (a metadata record for every page within the atlas) information for the atlases and the maps they contained. In other collections with compound objects, such as a book, document-level metadata would suffice, especially when combined with optical character recognition (OCR), rendering the text fully searchable. However, since maps are largely visual rather than textual, OCR was not an option, yet access to a particular Louisville neighborhood was perceived to be desirable. Therefore, we opted to catalog every page of each atlas

Figure 2: Screenshot showing embedded Google Map and index of plates.

according to our exacting specifications. Fortunately, much of the metadata could be set up in a template to be repeated (the creator of an atlas remained the same, for example). The laborious effort came with the "Location Depicted" field (mapped to Dublin Core's Coverage.spatial element), where the neighborhood would be listed along with the city and county.

The Louisville/Jefferson County Information Consortium (LOJIC) created a map of official neighborhood names and the boundaries, which we have adopted as the authority on this matter.[10] However, their map is not terribly detailed, with only boundary streets named; this challenge, coupled with the fact that the physical and urban landscape has changed in the span of a century or more between the historic atlases and

the LOJIC map (street names have changed, highways have been built, etc.), made matching the two difficult. In a biweekly meeting of CONTENTdm team members, the Digital Initiatives Librarian bemoaned her efforts to accurately catalog each map to the neighborhood level, which involved comparing the JPEG2000 of a historic map to the LOJIC map and to a more detailed Google map set to the boundaries of the LOJIC map's neighborhood. The web designer, who attended these meetings and would be responsible for the design of the website, came up with a solution to aid with the metadata creation and with the usability of the completed website.

Fortuitously, the web designer had just discovered Google Maps, and it seemed to be a perfect fit for this project of

identifying Louisville's neighborhoods. Rather than having to work with three digital maps to identify locations, a customized Google Map of Louisville Neighborhoods could be created. By typing in an address from the historic maps, the Digital Initiatives Librarian could see which neighborhood it fell in, and enter that information into the metadata record for the related image. The time spent by the web designer to learn and apply Google Maps technology saved the Digital Initiatives Librarian a significant amount of time and effort (not to mention eye strain).

Just after finishing the neighborhoods Google Map, the web designer began working on creating a home page for the upcoming release of the Kentucky Maps Collection. Of course, the first thing most people do is

try to find where their house would have been on these early maps – which quickly led to the understanding that street-level metadata would be desired, not merely the neighborhood-level identifications so carefully re-searched. It would not be pos-sible to input every street name for every plate of every atlas, but we wanted to aid users in figuring out which map plate contained their address. Like the Digital Initiatives Librarian, users would benefit from typing in an address to identify which map plate to view, or to browse around a current map and have some idea what area was repre-sented by the historical map.

The Design Process

To make these atlases more us-able we took the approach of creating a Google Map for each atlas. Each atlas was given its own HTML page with an em-bedded version of the Google map and direct links (through the map and a list of plate num-bers) to each map plate.

For the 1876 and 1884 atlases, the web designer was able to work from the scanned images. This was due in part to the fact that those areas of the city had been developed quite a long time ago, and while extra roads have been added, the basic lay-out had been set over a century ago. With the 1913 atlas it got tougher. The city had expanded and the publisher included a much wider area, including ar-eas that bear little resemblance today to what the land looked like in 1913. While it's easy to distinguish streets that have ex-isted for a long time, it's tricky to plot points on a map where

Figure 3: Clicking on either the placemark labeled 17 or the area outlined beneath displays information about the map and a direct link to the map plate within the CONTENTdm compound object.

the landmarks have changed: streams dry up, rivers get re-directed, and new streets and subdivisions are developed that totally change the landscape. Furthermore, the 1913 atlas was not designed to scale. The web designer had to work directly with the original 1913 atlas to get a better sense of what area was represented.

Creating a Google Map

In order to create a Google Map, a Google account needs to be created and the creator should read through the Google Maps Terms and Conditions.[11] Under the My Maps designation, the option to "Create new map" leads to a template for provid-ing a title and description and to choose a public or unlisted setting for the new map. Pub-lic maps mean that the Google version of the map would be

accessible to people searching Google Maps or Google Earth. Even in the private setting the maps are not truly private as there is a public URL associated with the map.

Google Maps provides a num-ber of features to make map creation a simple process. In terms of the historical atlases, the challenge lay in the amount of information to be cataloged and the discrepancies between historical and modern Louisville. The general features of Google Maps which allow the user to zoom in or out on an area, to view streets or satellite versions, and to search for a particular address provide a good base for manipulating the maps eas-ily. The additional map creation tools are similarly intuitive:

• The hand button allows the creator to click and drag the map so that a particular area can be seen.
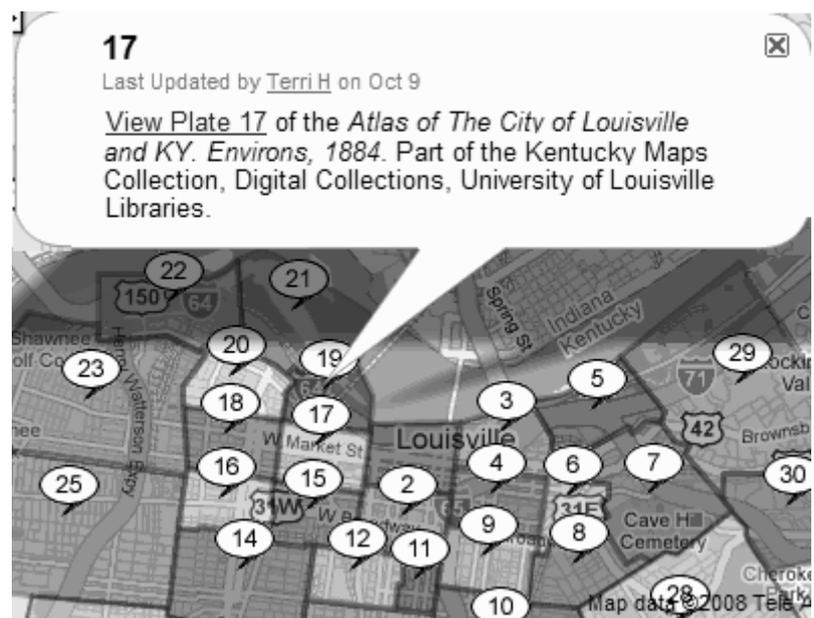
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• The placemark button pinpoints a particular spot. The creator clicks on the placemark button and then clicks the spot she wishes to flag.

• The line button can be used to draw a route.

• The shape button allows the map maker to outline a section of the map.

For the purposes of the historical map creation both the placemark and shape buttons were used frequently. They serve a dual function: highlighting the area and providing information to the user. Once placed, the map's creator can click on a placemark or an outlined shape and insert text, images, and HTML into an information box that will display when the user clicks on the placemark or shape. This provided a crucial piece in the accessibility of the maps. This is where a link could be added to take the user from the Google Map into the CON-TENTdm item record.

The default for placing a placemark, line or outlined area is to use the same image and color each time, but the map creator has the option to go in and change either the image used (for placemarks) or background and outline colors and opacity in outlined areas. Using different colors for adjacent areas greatly improves the ability to distinguish one area from another. One of the difficulties lies in the way the placemarks work. Since each placemark is actually an image, the placemarks do not scale when the map size changes. So the more placemarks used and the more the map is zoomed out, the more likely that the placemarks

will overlap. The 1913 map is a good example. With over one hundred map plates, the placemarks start to overlap if the user tries to view the whole area at once. Since the map plates were numbered in a very systematic way (horizontal rows), our approach was to include placemarks with plate numbers at every third plate. The pattern is pretty obvious and even the „unnumbered" areas can be clicked on to discover the corresponding plate number. The 1913 atlas also tested the limits of the Google Maps system in another way. In the beginning stages, when every area was both outlined and attached with a placemark, the number of plotted items on the page went well over 200. As a result, the Google Maps started listing items on a second page and effectively broke the map. The items on page one would show or the items on page two would show, but the items on both pages would not show at the same time. This was another factor in the decision to cut back on the number of placemarks.

Once each map was finished, the web designer used the Google Maps' "Customize and embed map" feature. This allowed the designer to create the map in the appropriate size and zoom level and then copy the coding into a web page inside CONTENTdm (See Figure 2). In this way the Google Map could be displayed and used from within CONTENTdm while still using the design elements that identify all our digital collections.

We realize that Google Maps does not provide sufficient added value in all cases. In July 2008,

we added 74 additional maps of or including the area that would become Kentucky, dating as far back as 1635. Because these maps covered large areas such as the state, continent, and hemisphere, the detailed view provided by Google Maps would not increase usability. As we intend to continue adding maps to this collection we will need to make the decision of whether or not to use Google Maps on a case by case basis.

Conclusion

Public reaction to The Kentucky Maps Digital Collection[12] has been overwhelmingly positive, with some users lavishing their praise on the mere fact of their availability, and others especially appreciating the innovative Google Maps interface.

The former camp included the Project Manager of Communications and Marketing, who took special interest in the blurb about the collection sent to her for inclusion in the daily campus electronic newsletter, and an unusually large number of on- and off-campus constituents wrote or called in to sing the praises of the site, which has, since its December 2007 launch, consistently ranked as one of the top-accessed collections on our site. This is especially interesting, given that the physical materials were not among the most requested items at our reference desks. Their digital presence has found an entirely new audience.

The increased interest in the maps instigated another improvement on the site which affected the usability of all the digital collections. From the vari-

ous notes received, it became obvious that people had interests, scholarly and personal, in particular areas of the city. This bore out the theory that people had a high interest level in neighborhood information and was the impetus for us to create even better ways to access that information. To help people find relevant maps, photographs, and documents focused on that area, catalogers began including street level cataloging for photographs, if an address was known. Then the web designer revised the browse page[13] to facilitate easy access to a list of neighborhoods and streets with links to custom queries.

Geographic Information Systems (GIS) specialists and others of a more technical bent have inquired about how to recreate the Google Map process or have suggested other enhancements. One suggestion involved using GIS coordinates to match the historical and current maps. The suggestion came from someone who wanted to be able to view the historical map plates with an overlay of the current map. This would be useful for many researchers and might make a good joint project with graduate students or faculty in the Geography Department.

The challenges of digitizing and providing access to historic maps have been more than amply compensated by their rewards, foremost being the in-terest and excitement users have had with discovering and working with these resources.

Endnotes

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