

**LIBRARY OF CONGRESS  
NATIONAL DIGITAL LIBRARY PROGRAM  
and the CONSERVATION DIVISION**

**CONSERVATION IMPLICATIONS OF DIGITIZATION PROJECTS**

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## 1. Background and Rationale for Collaboration

The collaboration of the Library of Congress National Digital Library Program (NDLP) with the Conservation Division is a fitting partnership because the mission of the institution highlights both access and preservation. The Conservation Division has been integrated into the National Digital Library Program since its beginning in 1995. The NDLP is a program whose primary goal is access, but one of the key aims is the preservation of the collections, both through converting and reducing handling of fragile and vulnerable materials and by ensuring that the process of scanning is safe for the collections.

The major components of the collaboration have been in the planning and specification of equipment, training in care and handling of materials, necessary treatment to stabilize objects, and rehousing design for both image capture and storage. The result of this collaboration over the last five years can be found in selected collections whose conditions have been improved for the future. The aims of the NDLP and of the Conservation Division were considered to be parallel and to support each other. It has been a successful collaboration and one which continues to grow and change just as the technology continues to change and as expertise of the staff evolves.

The National Digital Library selects collections for the American Memory Web site based on intrinsic historic, visual and educational interest. Other selection criteria include, determining the need for copyright permissions, privacy or content concerns, and assessing handling and security risks. Unlike many digitization projects, difficult to use materials, such as over-sized posters and architectural drawings, and collections that present a security risk, such as baseball cards, are included. Over time, we will be able to assess whether digitizing and providing access to surrogates via digital technologies serve to protect these 'difficult to serve' collections by reducing wear from improper and excessive handling.<sup>1</sup>

The NDLP has digitized and continues to digitize manuscripts, photographs, books, sound recordings, moving image materials, posters, prints, drawings and cartoons, manuals, pamphlets, sheet music and images of three-dimensional objects. For each class of materials there is a clear benefit in providing broader and better research access for multiple users. However, a major program assumption is that digital surrogates provide efficient access to the content but are not intended to replace originals which remain secure and protected in appropriate storage.

Whenever there is handling of original collections, there is a need for the application of conservation knowledge and practice. From the beginning, it was clear that conservation would be a necessary player in a successful digitization program, particularly for paper, book and photographic materials. It is widely recognized that improper handling by staff and users is one of the greatest causes of damage to library and archival materials. The primary means of assuring appropriate

protection and conservation of collections is in the policies regarding their use and handling.

The digitization service contracts, described and defined in "requests for proposals" (RFP's) specify the production requirements and contain many conservation concerns as part of the contract language. It is essential to have that outline of expectations in the contract and in any statements that outline work procedures, so that preservation concerns and their possible attendant costs can be factored into contractor or vendor proposals as well as into the overall plan of work for a digitization program.

The Conservation Division/NDLP collaboration begins with a dialogue in the early stages of planning and communication continues throughout the process of planning, writing, evaluating, awarding and implementing the NDLP contracts and subsequent production work. Conservators have the knowledge and experience to assess the fragility of and risks to the originals so that solutions may be designed which will help protect the originals through the handling they will receive during scanning. As a result, through our many interactions with the NDLP staff and the contractor scanning staff over these past years, we have devised procedures and practices together, which not only protect, but also expedite scanning.

This collaboration has had an impact on normal conservation services that can be provided for the Library of Congress collections. In recognition of the time that is involved in planning, training, reviewing collections and treating items and collections for digitization, the NDLP funded two and a half staff positions in the Conservation Division. These staff are responsible for paper, book and photographic conservation. With this addition of staff hours, we have been able to provide the necessary collections conservation treatment, consultation and training support for the NDLP program in a timely fashion.

An added direct benefit of this collaboration for the Library's collections has been the large number of items that have received stabilization and rehousing in the best materials that we can now provide for their future preservation. In many cases the new housings used for the NDLP scanning will provide support for any future handling that the collection items may receive.

## 2. Consultation on Space and Environment

Library security regulations, and the high value of some of the materials scheduled for scanning, preclude sending most original materials off-site for scanning. However, because of the difficulty of moving some of the necessary equipment, some of the photographic materials were sent off-site. All of the microfilm is being scanned off-site. Flat paper materials (including maps) and bound volumes from the special collections divisions are all scanned at various scanning stations in the three Library buildings on Capitol Hill. The contractors provide staff and all scanning hardware and software. The Library provides space and facilities support. On-site scanning is a distinct advantage from the point of view of Conservation as we do not have to concern ourselves with the conservation requirements for transport of materials outside of the buildings and security and environmental conditions in another location.

What was required of the Library was identifying and securing for each scanning site a large clean area which could accommodate sufficient table space to allow for the safe handling of materials. We plan for table space six times the size of the largest object to be scanned in order to have enough free space to allow for the proper assembling of materials before capture and landing space after capture. This amount of horizontal space serves to mitigate our concerns over maintaining the order within collections, keeping housings at hand, and allowing scanner operators enough room to handle an object a minimum number of times.

Concern has been expressed about light exposure levels during scanning projects, while it is actually the heat generated by the equipment and light that is, in fact, the greater problem. Heat buildup can distort and damage fragile materials, including leather, parchment, and photographic film and photographic prints. For this reason careful consideration needs to be given to the issue of environment before choosing a site for the equipment.

Each scanning site must have adequate cooling and air-circulation to counteract heat that builds up from the equipment, and lights when using overhead capture devices, as well as for the comfort of the staff. This has been a significant problem, as normal HVAC settings and airflow in secure Library sites that have been selected for digitization work stations were not designed for the 5 to 15 degrees of heat that can be generated by equipment and personnel. Secure scanning areas tended to be small and required retrofitting to provide adequate ventilation or space.

The reduction of the amount of light an item will be exposed to, from both ambient and scanning equipment light sources, is an important conservation concern. Lights, whether they are room lights, stand lights or part of the equipment should be UV filtered or give minimal UV readings. Current research seems to indicate that exposure to light and UV energy from scanning is minimal,<sup>2</sup> and that light

exposure from scanning must be seen in relation to an object's cumulative exposure to light over its lifetime. Exposure times during scanning are generally short, from seconds to a few minutes, but may increase if re-scanning is necessary for adequate image capture. The use of UV filters for all light sources and the use of flat bed scanners with no UV energy in the light source can minimize concerns about light exposure levels.

### **3. Consultation on Equipment/Hardware**

One of the most practical and basic considerations is to specify project by project, equipment which can be used for different types of collection materials, particularly for the paper scanning contract, which includes books (vs. photographic images, microfilm, motion picture, video, or audio for which there are separate contracts or service purchases). In most cases, we found that for paper and book items, an overhead capture device served conservation concerns best. The reason for this is that nothing touches the originals except the supports, book cradles and the hands of the scanner operator.

Scanning hardware has been developed primarily for business and commercial uses and the cultural heritage sector is a small percentage of the entire digital conversion field. We examined equipment that was available and which was proposed by contract bidders, but found many pieces were inappropriate initially. Since that time, the current NDLP document scanning contractor has assembled a number of devices which are appropriate for the diverse materials being scanned.

Prior to writing the RFP for paper and book scanning, Conservation and NDLP staff met with many scanner manufacturers to examine and discuss the effect their equipment would have on materials. For books, it did not take long to come to a mutual understanding that inverting them was inappropriate and potentially damaging for most bound volumes. It was actually much more time-consuming and difficult for the operators as well. Conservators worked with the current contractor as well as with other scanning equipment manufacturers by providing advice regarding appropriate designs for book cradles. In addition, after conservation review, a small number of books which were determined to be of small size, robust and flexible, were scanned on a "book-edge" scanner, which did require repeated inversion of the volume. Disbinding or guillotining text blocks, which the Library has historically only done when material is no longer serviceable, and thereafter removed from circulation because it has been converted to another format, was not a procedure used for NDLP collections scanning.

For unbound materials, scanners with sheet feed devices were examined, but it was determined that the risk was greater than the attraction of speed. Many old and worn single sheet items, such as play scripts, and dog-eared single leaf documents, would be put at great risk by moving them through the transports of such scanners.

For overhead capture devices we found that a fixed light source, rising up at an angle from the edge of the scanning bed made it difficult to accommodate oversized materials. Some flatbed scanners, which are designed for oversized originals, have indented areas and a cover, which can damage originals if they are even slightly larger than the bed size. On the other hand, after conservation review of both the originals and the scanner, it was determined that large drum scanners for architectural documents, that feed the large sheets over a roller could be used to scan a fairly homogenous architectural drawing collection that was in good condition, on sturdy support paper, and that had well-adhered, non-friable inks.

The broad and complex nature of the collections to be scanned and their conservation concerns requires that conservators evaluate the handling and other characteristics of contractor equipment by participating in specifying the type of equipment which can be used by contractors both at the Request for Proposal (RFP) stage and also after award, each time the contractor decides to bring in different scanning equipment. For the NDL work, this meant that the contractor needed to make several types of scanners available for the contract: overhead digital camera scanners, flatbed scanners and bound volume scanners. Only if the collection was uniform in every way, was it possible to recommend that only a single piece of equipment be used to scan that collection.

Book and paper conservators participated in the evaluation of parts of the document scanning proposals which were submitted in response to the paper scanning RFP. After contract award, we turned our attention to the training of NDL and contractor staff in the handling of the objects, which remains the greatest variable in the project and therefore the most important area of training. As a part of the production planning process, NDLP project leaders consult with the NDLP conservation liaisons and conservation staff for decisions regarding how items are to be scanned and on which devices. For example, recommendations are made about the degree to which a bound volume can be opened, based on its condition, robustness, and type of binding. This could be 180 degrees, which is rare, or 120 degrees, 100 degrees or 90 degrees. For a flat document, the decisions include whether it can be inverted and scanned on a scanner platen or scanned only by an overhead device; whether a polyester film enclosure is required to protect an item during scanning; or, if interior folders should be used for handling during scanning. These decisions are incorporated into pre-scanning preparation procedures.

#### **4. Training Contractors and NDLP Staff at the Library**

The Conservation Division holds training sessions in collections handling both for the contractor scanner operators, as well as for staff hired by the NDLP. We offer workshops of one or two hours on a regular and as-needed basis when new operators or staff are hired. We also provide one-on-one training when necessary for collections with more special handling requirements. For an outline of the course and handouts, please see Appendix I.

The first group to be trained were staff who worked for the NDLP in the conversion group operations and in the special collections areas. Through such training conservators are able to serve the goals of preservation by guiding project staff in the assembling, management and handling of the physical objects as they design production plans. These plans include determining the arrangement and housing of the collection to be scanned with the goal of minimizing the number of handlings that an object receives.

NDLP staff focus on preparing the collections item by item and recording bibliographic and descriptive information. Many of the collections also require conservation condition surveying and rehousing. Because the NDLP staff often were handling each item, to identify and record descriptive and bibliographic information, they also performed much of the conservation condition surveying and the rehousing required.

Each collection is initially surveyed by a conservator who prepares a 'Conservation Work Sheet' tailored to the needs of the collection. The NDLP staff is trained to use the form to identify the items needing treatment. They are also trained to rehouse the collections with materials which are specified and purchased through the Conservation Division. A typical rehousing involves placing single leaf items in individual acid-free folders. During this item review process, items in need of conservation treatment are sent in batches to the Conservation Division for treatment prior to scanning.

Conservators also train the operators who scan the collections, as is required in the contract. The contract requires staff to exercise utmost care in handling, even if that increases the time. Lines of communication between the NDLP staff, scanner operators and Conservation are opened through the training and the operators are encouraged to consult with conservators throughout the scanning process.

It has been of the utmost importance to ensure that the collections are not harmed in any way during processing and conversion. We found for example that the human hand is the most sensitive way of holding pages open and books in place -- far more sensitive than robotic arms and strapping devices, etc. Scan times are in fact short enough that this has worked well. The operators for this project have been very sensitive to handling collections materials and their skills and dexterity

continue to improve as they handle and scan a greater number and variety of materials through the course of the program.

## **5. Conservation Review for Scanning**

The initial conservation review occurs most often before the final selection of a collection for scanning. Based on the types of items (book, paper or photo) the appropriate conservators review a sampling of materials. Generally, the problems that appear in each collection are quite distinct and specific to the type of material being scanned. Often the housing of documents and photographs needs to be changed to ease handling for the scanner operators and also to provide more protection for the materials. See Appendix I, Part 3, for the "Review Sheet to Select a Scanner for Books."

We prepare a Conservation Work sheet for each item in a collection that allows the NDLP staff to separate out items that need conservation treatment before scanning. For a description of the typical criteria used for determining whether an item needs conservation work, please see Appendix I, Part 1. Typically, the databases used for production also include this information. Based on the amount of conservation treatment required, the production work-flow is designed and the collection is scheduled for scanning.

## **6. Conservation Treatment**

The major criterion determining the level of treatment for the NDLP is to ensure that the textual or visual information can be accurately captured by the scanner without compromising the item. There is neither time nor funds available to treat each item fully, following standard Library of Congress conservation practices. The goal for this program is generally the minimum treatment that provides the requisite clarity and security. The concern for aesthetic presentation is secondary, though the aims are not mutually exclusive. The stabilization and treatment of collections for digitization is only different in that clarity and legibility of information is so critical.

We know that each item will need to be handled by the scanner operators, perhaps repeatedly, if re-scanning is required, so for flat items each item must have individual support. Anything sent to the scanner in encapsulation, is required to remain in the encapsulation throughout scanning. This seems to work better with overhead capture than with flatbed scanners. Because of the appearance of Newton-like rings in the digital images when polyester film is used with flatbed scanners, we put as few items as possible in polyester film. Instead, in these cases we have had to rely on the sensitivity of trained operators at the scanning device.



Treatment work that is performed is necessary and critical to the stability of the materials. About one-half of the treatments could be considered minimal stabilization. Examples include: humidifying and flattening foldouts in books; ensuring that no text is obscured by creases; mending tears selectively; dry-cleaning where necessary; mending weak and torn folds where handling might cause further damage; and placing very thin and iron-gall ink damaged sheets or mold damaged materials into polyester film encapsulations.

Full treatments have been carried out on some pamphlets, music scores, and small bound items, such as manuals, with brittle paper or covers, which require complete rebinding in order to be scanned safely. Flat paper items receive full treatment when the minimum acceptable treatment will take the same amount of time. Photographs mounted on brittle and curved boards also require more treatment, both for handling and aesthetic reasons. The normal treatment is stabilization of boards by mending breaks, filling losses and providing additional support for the boards. Mounted photographs and most books are scanned with an overhead camera to minimize risk to their fragile structures.

It has not been necessary during this program to refuse scanning for any item or class of materials because of the close collaboration and trust that has developed between the curatorial, conservation and NDLP staff who handled the original materials. We do attempt to complete treatment for enough material in advance so as not to impede scanning. However, we do not allow scheduling to compromise the conservation treatment work. With proper planning, treatment and production can move forward at a complementary and efficient pace. Different collections require different levels and amounts of time in treatment. A few collections have required post-scanning treatment, to place the items in more appropriate long-term housings. A constant challenge has been scheduling to meet the goals for each scanning contract with a large number of objects from broad collections with varying conservation needs.

## **7. Materials at Risk for Loss**

For the Library of Congress, digitization continues to be explored as a preservation strategy for materials that must be reformatted or converted. Examples of this include particular collections that are in a severe state of deterioration, where the digitization process may in fact capture the information before it disappears, and where money to restore or reformat by traditional means is not available.

One example is a pilot project for severely channeled and buckled cellulose diacetate black and white negatives which became more readable in the digital form because the distortion was flattened out in the converted image, and much of the information in the channel was captured. In this case it is possible that the scanned images could be used to create a new hard-copy image surrogate which would

preserve the informational content. The original materials could then be moved immediately to cold storage for long term preservation.

Another specialized case is magnetic media in both sound and video recordings. The original substrate of magnetic tape has an extremely short life of an estimated 30 to 50 years,<sup>3</sup> and magnetic tape onto which one can convert is possibly an "endangered species" as the industry moves away from producing the various magnetic tape formats. This area is currently being explored by the Motion Picture, Broadcast and Recorded Sound Division of the Library of Congress.

## 8. Conclusions

Conservation requirements were integrated into the specifications for contracts, evaluation of equipment and processes, and production work flow of the National Digital Library Program. Many materials received treatment and rehousing which will extend the life of the original. Most importantly, the goal of causing little or no harm to the collections during conversion continues to be met in the NDLP program. As we continue to explore the use of new technologies and new approaches in preservation, we will continue to collaborate and use approaches and methodologies developed in conservation to inform the decisions that will need to be made in future digital projects.

The following people worked on the NDLP/Conservation team. From the NDLP program: Carl Fleischhauer, Tamara Swora-Gober, Nancy Eichacker, Phil Michel, and Jan Lancaster. From the Conservation Division: Alan Haley, Yasmeen Khan, Andrew Robb, Ann Seibert, and Mary Wootton.

<sup>1</sup>. The use of original materials in the Library of Congress reading rooms is not tracked uniformly by collection and item, so future assessment will be based on subjective evaluation of a reduced need for remedial treatment to the originals for those collections accessible via the web.

<sup>2</sup>. Tim Vitale, "Light Levels Used in Modern Flatbed Scanners." In *RLG Diginews* 2, no. 5(October 15, 1998), available online at <http://www.rlg.org>.

<sup>3</sup>. Mary T. Baker, "Lifetime predictions for polyurethane-based recording media binders: Determination of the shelf-life of videotape collections." In *Resins: Ancient and Modern*, ed. M. M. Wright and J. H. Townsend. (Edinburgh: The Scottish Society for Conservation and Restoration, 1995), pp. 106-110.