DIGITAL TECHNOLOGY MADE SIMPLER

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Abstract

This leaflet has three purposes. It first defines digital technologies from the perspective of communication and coding. Then it describes the key components of a digital imaging system and the most important steps in the digital imaging process. Finally, it asks some big questions that ought to be considered as libraries and archives move from experimenting with the technology to using it as a tool for transforming the way they do business.

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Introduction

We are living in a digital world. The evidence is everywhere. Keyboards outnumber office workers. Everybody has a web page. Nobody carries cash. We are hearing words like "bitzlag," "jitterati," "NIMQ," and "CGIJoe" in everyday conversation. Billionaire technologists seem to own all the digital copies of all the art that matters. There seems to be a growing concern in libraries and archives that if we are not going digital, being digital, or dreaming digital, then we are relegating ourselves to the great museum of paper.

And yet, it may be that our biggest challenge may not be embracing digital technology but rather building a common language to describe the transformations that are having such a phenomenal impact on our everyday lives. A shared vocabulary is the key element in the development of a community of practice and a shared vision of the future among those of us who have responsibility to shepherd the nation's cultural resources. Jim Taylor and Watts Wacker note that "Looking backward, the true legacy of Neil Postman's Amusing Ourselves to Death or Tom Peters's Thriving on Chaos may turn out to be not the worldviews but the words." Nowhere have the words mattered more than in our view of the place of preservation in the digital world in which we live.

Fundamental Digital Concepts

At their most fundamental level, digital technologies are an extension of the long history of the way we communicate with each other. The desire to communicate provides the motive and the ultimate rationale for the development of technologies of all sorts. Today's digital world is concerned with creating, sharing, and using information in digital form. Digital information is data that are structured and manipulated, stored and networked, subsidized and sold.

Information takes many forms. One way to think about these forms is to distinguish between symbolic information and coded information. Let us illustrate this by looking at the many ways that the most common letter in the roman alphabet—the "E"—can be represented, beginning with the early symbols of the printed alphabet.

A History Lesson

The period from the time Gutenberg invented in the middle of the fifteenth century, through the year 1500 is referred to generally as the period of incunabula. During this time printers and book designers went to great lengths to make their products—type faces, format, and layout—look and function much like the manuscript books of the preceding centuries. Only when a theory of the alphabet and a theory of the book emerged around the time of Geoffrey Tory's classic treatise on the structure of the roman alphabet were book designers able to begin taking full advantage of Gutenberg's technological innovation.
He described a comprehensive numerical system in which all calculation can be expressed in combinations of 1 and 0—the identical approach that all digital technologies use today.

We are living in an era of digital incandescence—a period marked by frenetic efforts to make our digital products look and behave like their analog relatives do. Only when we have developed a theory of digital representation of information will we begin to take full advantage of Leibnitz's mathematical innovation. That theory is emerging today.

Figure 2 is another symbolic pattern—Braille. Here the letter "e" is represented by large and small raised dots in a predictable grid. Note, too, that the same pattern can mean either the letter "E" or the number "5" depending upon the context in which the pattern is located. Context is another idea that is fundamental to the representation of information in digital form. With Braille, if you know the context and understand the pattern, communication is fast and efficient.

American Sign Language is a symbol as signal. It is a language in which the form and motion of the hands combine to convey meaning. Form without motion is only half of the picture. Communication depends upon a shared understanding of the meaning of both components of the language. Figure 3 is a static representation of the letter "E".

With semaphore, however, the pattern of motion is the symbol. The transformation from one formation of flags and arms to another establishes the communication link. Figure 4 is yet another static representation of the letter "E." Emerging theories of digital communication have yet to account fully for the multiple senses that we routinely use to communicate directly—the subtleties of body language, gesture, and inflection. As sophisticated as digital communication becomes, its dependence on machines is seriously limiting.

Some of the earliest modern forms of direct communication over long distances, however, have been digital in character. Figure 5 is an illustration of Lord George Murray's Visual Telegraph that operated for a time from London to Deal beginning in 1794.² The system consisted of raised platforms placed horizon to horizon. On each platform a large board had six large circular holes that could be closed by wooden shutters—strikingly familiar to the patterns of Braille—manipulated by a trained operator. Reports indicate that a message could reach along the chain of fifteen stations in a few minutes. But just think about the administrative overhead!
The route from the Visual Telegraph to modern digital communication is marked by successive transformations from symbol to code. Samuel F.B. Morse invented his digital code of dots and dashes as the language of his telegraph. The origins of radio—or wireless telegraphy—lie in the desire to extend the digital communication of Morse, where wires could not reach. An early application of the analog technology of continuous waves was the transmission of Morse’s dots and dashes to ships at sea. The modern coding of the letter “E” as the ASCII code 01100101 owes its lineage to the theories of Leibniz and the practical technology of Samuel Morse rather than to the technology of radio and television.

Code as Numbers—Some Building Blocks

A digital system uses numbers to represent a concrete object or an abstract idea. Digitization is the process of transforming the object or idea into a numerical code. The baseline of digital technology is a coding system with only two numbers—1 and 0—hence the term binary. Each numerical place in the system is a bit. In the digital world bits are things; they take up space; they take time to move from one place to another. A collection of bits can be described and counted, much like anything. The most common way to count the bits in a system is by “byte” or eight bits, even though computer technology abandoned the byte as a discrete object decades ago.

- Digital: using numbers to represent variables
- Digitalize: to treat with digitalia, a heart, medication
- Digitalize: to translate an analog measurement into a numerical description
- Binary: a number system in which each number is expressed in powers of two by using only two digits, specifically 0 and 1
- Bit: binary, digit
- Byte: eight bits

A bit-mapped image is a digital picture made up of row after row of bits in a grid. In a digital image, a bit is commonly referred to as a pixel, short for “picture element.” As objects, digital images are described in terms of three characteristics: resolution, dynamic range, and pixel size.

More recently, a fourth term, tonal value, has been applied to describe the characteristics of a “digital image,” confusing terminology about a digital representation of an image, such as a photograph. A bitmap is a digitally coded pattern, not a digitally coded symbol such as text we recognize through an alphabet.

- Resolution: number of pixels (in both height and width) making up an image
- Dynamic Range: number of possible colors or shades of gray that can be included in a particular image
- Pixel Size: the proportion of the pixel grid that can be detected and coded by a scanner
- Tone: the degree to which an image conveys the luminance ranges of an original scene

Resolution is the number of pixels (or dots) used to code a linear inch of surface horizontally and/or vertically. Visualize a piece of graph paper. The number of small blocks in a running inch up or down the paper is the resolution. The more pixels per inch the higher the resolution and the more accurately the patterns visible on a given surface can be represented digitally. The description of an image as 300 dots per inch (dpi) means that 300 pixels are used to represent each inch across the horizontal surface. It is sometimes (mistakenly) assumed that an image with 300 pixels horizontally will also be represented by 300 lines vertically. The actual structure of the digital grid depends on the capabilities of the scanning device.
Figure 6 is a 5 mm letter "e" at 600 dpi resolution scanned from negative microfilm at Yale University Library. Note that the digitally coded pattern occupies some 4,900 bits in the computer system compared to the eight bits required for the digitally coded symbolism of ASCII code.

Dynamic range refers to the number of possible colors or shades of gray that can be included in a particular image. Dynamic range is sometimes called "depth" and is commonly represented as bits per pixel. In bitonal scanning, the sampled image level for each pixel is rounded to 0 (black) or 1 (white). One bit of information is required to code the value of the pixel. In 8-bit gray scanning, the sampled image level for each pixel is rounded to one of 256 values, each representing successively lighter shades of gray. Eight bits of information are required to represent each pixel.

In full-color scanning, the three hues of the color system are represented by one of 256 possible shades and encoded as a total of 24 bits (8 bits per hue). The two predominant color systems are Red/Green/Blue for monitor projection and Cyan/Magenta/Yellow for digital printing.

Pixel size is an important measure of the capability of a given piece of scanning hardware to represent the patterns of a surface completely. The "real resolution" of a scanner is the proportion of the surface that is detected. The "addressable resolution" of a scanner is number of pixels in a running inch of an array without optical correction. Greater real resolution depends upon the quality of the electrical and mechanical engineering of a given device. Scanner manufacturers sometimes use software solutions (synthetic resolution) to compensate for limited real resolution. It is important to be wary of scanner manufacturer claims and to undertake rigorous testing and benchmarking before committing to the purchase of scanning equipment.

Tone reproduction refers to the degree to which an image conveys the luminance range of an original scene (or of an image to be reproduced in the case of digital imaging). According to Reilly and Frey, tone is the single most important aspect of image quality. Tone reproduction is the matching, modifying, or enhancing of output tones relative to the tones of the original document. Because all of the varied components of an imaging system contribute to tone reproduction, it is often difficult to control.

Resolution, dynamic range, real resolution, and tone reproduction combine to endow an image with quality. When defined and measured carefully, the terms can be used to describe the characteristics of an image, to compare quality characteristics of two or more collections of images, and to compare the digital image with its original source. The resolution and dynamic range values of a given image can also be combined to describe the size of an image in terms of the amount of data that is required to represent the image in digital form.

Describing digital objects. The description of an image or collection of images in terms of quality and quantity is but half the story of a digital image product. Equally important is the digital data that describes the digital object itself. In modern imaging systems, such descriptive data exist as a linkage of at least three components. The first are the technical data (often called the image header) that describe the format of the digital image and the ways in which the raw digital data are compressed to save storage space and transmission time.

The second component is data describing the characteristics of the digital object (which may consist of one or more digital images). Metadata is data about data and as such is fundamentally linked to the accessibility of an object. As mere bitmaps, digital images are stupid and cannot be found or understood without some level of metadata.

The third descriptive component is information that describes the relationships between or among digital objects. Structural indexes are a crucial component to any digital imaging system where the content is hierarchical in nature (such as archival collections, books, scrapbooks, classified photograph collections, and the like). It is a rare digital object whose accessibility cannot be enhanced through the use of structural indexes. Structural information may reside as separate data (e.g., an encoded finding aid) or be built into the metadata system itself (e.g., controlled
subject headings in a bibliographic record).

In summary, at the heart of the digital world is communication, which cannot happen without a shared vocabulary and a shared system of symbols. Digital imaging is representation by numbers of the world we can sense (see, touch, hear, smell, and taste). Images as bitmaps are pictures without intelligence. All meaning embedded in the digital technology system derives from layer up upon layer of numerical coding, most of which must be done by people rather than machines. In the end, then, digital imaging is more profoundly about us than about the tools we use.

Digital Imaging Process and Product

We shall now turn our attention to the digital imaging processes and products by examining two general models.

Imaging Process Model

At its most elementary, the conversion of a book, a manuscript, a photographic negative, or a reel of microfilm is straightforward and linear. Source objects appropriate for conversion are selected and prepared for scanning; conversion occurs via scanning technology that transforms reflected light signals to digital data; access to the digital data is through display of the stored digital data. This apparent simplicity masks great complexity at all phases of the process.

- **Sources:** Archives and libraries are legion for the complexity and variety of the collections eligible for digital conversion. Sources vary in size, format, medium, and condition; they may be text-based; they may contain illustrations that themselves may vary wildly in character. Sources may have significant color content.

  Not all digital conversion takes place from the original source. Film intermediates play an increasingly large role in a digital imaging system. Intermediates range in type from 35 mm color slides and high-contrast microfilm to full-frame microfiche, and large-format negatives. Michael Ester has underscored the importance of understanding the characteristics of film intermediates. "The digital image will only be as good as its photographic source; if visual detail or subtlety is not in the photographic medium, neither will it appear in the digital image."  

- **Conversion:** The conversion of source materials is--in equal parts--people and machinery. Equipment configurations are complex and rapidly evolving in capability. They consist of hardware, software, firmware (chip-based software), and storage systems. Imaging systems vary in their engineering sophistication; the quality of their sensory devices, the character of the software that is brought to bear to streamline the process, and the speed with which the system can carry out the conversion of a given source or collection of sources. It is crucial to test drive the equipment configurations before purchasing or leasing them. A visit to other libraries, archives, service bureaus, and other organizations that have similar operational systems is a good way to learn how conversion systems work.

  The digital conversion process is intensely labor intensive. At present, the quality and accessibility of the digital product largely depends upon the skills and talents that people bring to bear on the process of inspection, scanning, indexing, and data-file management. With enough effort, these skills can be obtained and maintained in-house. Today, it is more feasible than in the past to contract with companies that specialize in high-quality image conversion services.

- **Access:** At some level of abstraction, a digital product exists only if it can be found and viewed. Access systems for digital products are at least as complex as the systems that support conversion. Platforms (PC, Unix, Mac) vary in their capabilities; the adequacy of a network architecture can make or break an access system. Similarly, display technology (screens and printers) are vital to the ultimate use of the digital product.

Display technology is one of the main weak links in the entire system. Conversion technology is capable of generating far more data than can be usefully displayed by most of today's computer monitors.
Figure 7 is a schematic illustrating the elements of the process model. It is important to recognize that the complexity of a digital imaging system is only in part related to the complexity of the individual components. The elements of the process interact with each other to add complexity.

**Imaging Product Model**

The digital imaging process results in a product with its own characteristics that are distinct from the characteristics of the original sources. The biggest challenge in building an image product is to balance three issues: the characteristics of the sources, the capabilities of the technologies of digital conversion, and the purposes or expected uses of the end product.

**Sources — Technology — Products**

**Source Characteristics**
- Condition
- Visual complexity
- Size
- Format

**Technology Capabilities**
- Engineering rigor
- Sensory quality
- Software support
- Processing speed

**Product Uses**
- Protect
- Represent
- Transend

These relationships define quality, cost, and access.

Figure 8 is a schematic defining the issues and suggesting a set of relationships that must be managed to produce an image product with sufficient value built in that it will be worth the cost and effort of ensuring its long-term preservation.

Of the three sets of issues (source, technology, uses) in the model, the concept of varying product uses is perhaps the least generally understood. A number of researchers in the field, have begun to suggest that the quality of the end product can in some way be established through reference to one of three possible purposes that the product may serve for end users.

- **Protect Originals.** The most basic application of digital technologies in an archives or library is to create digital copies of sufficient quality that they can be used for ready reference in lieu of casual browsing through the original sources. Examples include image reference files of photographs, clippings, or vertical files that permit the identification of individual items requiring closer study. Preservation goals are met because the original documents can be protected by limiting access to them.

- **Represent Originals.** A digital system could be built that represents the information content of the original sources in such detail that the system can be used to fulfill most, if not all, of the research and learning needs of the end user.
potential of the original documents. High-resolution systems that strive for comprehensive and complete content and seek to obtain “full information capture” based on emerging standards and best practices, fit this definition. Systems of this intermediate level of quality open new avenues of research and use and have the capability to have a transformative effect on the services missions of those who create the products.

• Transcend Originals. In a small number of applications, digital imaging holds the promise to generate a product that can be used for purposes that are impossible to achieve with the original sources. This category includes imaging that uses special lighting to draw out details obscured by aging, use, and environmental damage; imaging that makes use of specialized photographic intermediates; or imaging of such high resolution that the study of archivial characteristics is possible.

Each of these applications places separate, but increasingly rigorous demands on digital technologies. In each case, the use of an intermediate film or paper copy to facilitate the scanning process may be necessary or advisable. Finally, the disposition of original sources (including undertaking preservation treatments before or after conversion) is a separate matter. Ultimately, the purpose of the digital product is driven by access goals, while preservation of original source documents should be determined by the preservation needs of the original sources.

Food for Thought

This leaflet has already suggested a number of issues with which librarians and archivists must wrestle if their digital initiatives will have lasting value. Here are five questions that transcend the specifics of digital imaging technology.

• Technology. Is digital imaging the tail or the dog?
Those who market digital imaging technology prefer to use the term “solution” to describe the value of the their products. This term implies that the customer defines the problem and buys a technology solution. Digital technologies are a set of tools that offer many choices and few solutions. It may be more appropriate to distinguish between imaging projects that experiment with the capabilities of the technology (and result in institutional learning) from those that transform the very nature of our information management strategies.

• Control. Is it a four letter word?
Fundamental digital technology is stable. The digital imaging market place, however, is large, complex and in a constant state of flux. Libraries and archives hold a small share of this market place. It is imperative that we seek to identify which elements of digital technology we can control, where our expertise is one of many important influences, and when we must accept the processes and products of the world in which we live.

• Selection. Are our digital collections useful and usable?
Choice is at the heart of digital technology applications; the choice of technology is just the beginning. The choice of content is equally important. Unlike traditional library and archives collection development strategic that result in one decision to acquire and a separate decision to preserve many years later, selection in the digital world is an ongoing process of assessment and evaluation. Few digital collections will warrant the costs involved in maintaining access over time without factoring in the value and the character of ongoing use.

• Quality. Are you willing to pay for it and will our readers?
In the past five years, librarians and archivists have made significant progress in defining their expectations for the quality of digital image products built from a variety of source materials. Quality is value that we add to our digital image products. Although important issues of quality measurement remain, the barriers to achieving quality do not appear to reside in the technology itself. Rather, the cost of creating and maintaining digital objects remains high; uncertainties persist about whether the overall costs of creating a product are declining.

• Preservation. Is any digital program NOT about preservation?
Costs are high; so is the risk of loss. Preservation in the digital world is knowing how to adapt preservation concepts to manage risk in the midst of rapid technological change. Digital imaging technology is more than another reformatting option. Imaging involves transforming the very concept of format, rather than creating an accurate picture of a book, document, photograph, or map on a different medium. Just as the invention of the vacuum tube created an entirely new form of mass communication—radio—instead of simply making point-to-point messaging possible without wires, digital imaging technologies create an entirely new form of information.

NOTES

1 This leaflet is based upon a presentation at the School for Scanning, an ongoing course of conferences developed by the Northeast Document Conservation Center. The author wishes to thank Steve Dalton for his concluding support and encouragement.


"Geoffrey Cory, Chump Flurry, translated into English and annotated by George B. Ives (New York: The Grolier Club, 1927)."


An excellent glossary is included in: Howard Reissner and Jennifer Trant, Introduction to Imaging: Issues in Constructing an Image Database (Santa Monica: Getty Art History Information Program, 1995).

http://www.giil.gmu.edu/giai/imaging/


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Image Scanning: A Basic Helpsheet

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See the text scanning helpsheet for information about optical character recognition.

The Electronic Text Center currently has four Hewlett Packard ScanJet 20XX, 3c, and 4c scanners, connected to Pentium PCs. Currently, we are using DeskScan software for graphics scanning and OmniPage Pro for text scanning (optical character recognition, or OCR). The ideas for these software packages are located on the desktop.

Additionally, one of the scanners has an automatic document feeder attachment for processing large amounts of text. As the scanners see a great deal of use the Electronic Text Center has placed sign-up sheets on each machine allowing users to reserve time in advance.

Image Scanning: The Process

The initial two decisions to make about any image scan concern the image type you need to create (greyscale, color), and the resolution at which you want it to be created, measured in dots per inch (dpi). In essence, you are determining how many dots per linear inch the scanner will record, and how much information each dot will record. The more dots per inch, and the more information in each dot, the bigger the file.

These decisions will be affected by the use you intend to make of the image. An item that has long-term viability—a scan of an original document that is part of an ongoing project—will need to be scanned at higher settings than a piece of clipart for a web-page.

Image Types

- 1-bit black and white (each dot can be either black or white)
  
  There is little reason ever to use 1-bit black and white scanning. The visual quality is poor—the image looks stark and edges of lines tend to be jagged—and the 1-bit file is also not amenable to JPEG, the best of the image compression schemes (see below).

- 8-bit greyscale (each dot can be one of 256 grey shades)

  8-bit greyscale works well for most non-color images, and gives a good, clear image. For archival images, you are better served scanning non-color images in 24-bit color (see Archival Imaging, below).

- 8-bit color (each dot can be one of 256 colors)

  8-bit color ("color phot") gives a less photo-realistic image than 24-bit color ("millions of colors"), and can look a little grainy at times. However, the 8-bit color file will be much smaller than the 24-bit color file in an uncompressed form, and you may be working with viewers and programs that do not allow you to use a 24-bit color image. Increasingly, image viewing software that does not support 24-bit color (or cannot display it through your monitor/color board combination) will translate the 24-bit image into an 8-bit one. 8-bit color may well be suitable for "clip art" and web page images.

- 24-bit color (each dot can be one of 16.8 million colors)

  24-bit color gives a much more photorealistic image, but results in a much larger file than 8-bit color. However, the JPEG process will reduce the filesize dramatically.

Resolution -- Dots Per Inch

The choice of dpi is ruled often by practical considerations. The higher the dpi number, the more information in the file, and the greater the ability to enlarge a detail from that image (if your viewing software supports such a feature). Note, though, that if the original image does not have much detail to enlarge, a high dpi setting may gain you little.
Raising the dpi value also increases the file size, sometimes beyond a size which your viewing software can cope with (or you can store). To take an extreme case, a 400 dpi, 24-bit color TIFF image that is as big as the bed of the scanner (8.5x14 inches) would be 55 megabytes in size (uncompressed -- see note on compression below). So, there is a degree of experimentation, and of tailoring the resolution to the purpose of the scan, in choosing a dpi value.

If the image will have its principal life on screen (such as an image for a web page), as opposed to being printed out, and if you do not need to enlarge details from it, there is no reason except archival concerns to scan at better than 100 dpi, because screen resolution is lower than this typically.

So, just as with image type, you need to match resolution to the purpose of the scan. A "clipart" image for a web page is fine at 100 dpi; an archival scan of a manuscript is not. Practical Considerations The following chart shows the size of an uncompressed 1" x 1" image in different types and resolutions:

<table>
<thead>
<tr>
<th>Resolution (dpi)</th>
<th>400x400</th>
<th>300x300</th>
<th>200x200</th>
<th>100x100</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-bit Black and White</td>
<td>20K</td>
<td>11K</td>
<td>5K</td>
<td>1K</td>
</tr>
<tr>
<td>8-bit grayscale or color</td>
<td>158K</td>
<td>89K</td>
<td>39K</td>
<td>9K</td>
</tr>
<tr>
<td>24-bit color</td>
<td>475K</td>
<td>267K</td>
<td>118K</td>
<td>29K</td>
</tr>
</tbody>
</table>

Image File Formats

At the scanner you are likely to create an image in an uncompressed format such as TIFF (works on all platforms), BMP (MS Windows only) or PKT (Mac only). The TIFF file has long-term archival use, but is usually too large as a file to work with effectively, especially if you want an image as part of an HTML document on the Web.

There are several digital image formats that save a file in a compressed form -- GIF, Group IV FAX compression, and JPEG being the most common. Group IV FAX is of use if you have black and white drawings (not grayscale or color); GIFs give moderate compression on grayscale or 8-bit color (256 colors); the most useful of all is JPEG, which gives extraordinary compression on grayscale, 8-bit, and 24-bit-color images. Note, however, that a JPEG compression does not simply store information in an abbreviated fashion; it also deletes (lossy) information from the file. If you are working with large color files, a practical working method may be to archive the original 24-bit color images in a rich but large format such as TIFF and work with JPEG versions that will be a fraction of the size. At normal size it is difficult to tell a JPEG from a TIFF, even though the former file size may be 10-40 times smaller than the latter. You will see, however, that as you begin to enlarge the two files the JPEG image begins to "break down" much sooner than the TIFF (its constituent pixels become visible).

Note About JPEG

You are better off scanning at 24-bit and then making a JPEG than scanning at 8-bit. This does not, of course, mean that you need to keep the 24-bit uncompressed file -- just use it as a stage towards making the JPEG.

Archival Imaging

This section is an excerpt from Special Collections Digital Image Creation.

At the scanner

- scan at 400 dpi by default. There may be cases where you will vary this depending on the amount of detail in the original, its physical size, and the predictable use.

- scan at 24-bit color by default. Even grayscale book illustrations and engravings look much more realistic at 24-bit color than at 8-bit grayscale, and the JPEG file produced from the 24-bit original is rarely any larger in KB than that made from an 8-bit original. You can always create a grayscale copy of the colour original if needed.

- Create a TIFF file at the scanner -- an uncompressed format that is as close as we've got to an archival form. The TIFF uncompressed archival copy is large (which means that it has a lot of information in it, which is good). Filesize should not be a deciding factor in image resolution or bit density, although at the upper extremes it may be necessary to use 8-bit grayscale. In our case currently, this off-line storage is on a tape archiving system.

- Use the automatic colour and contrast balance on the scanner. Do no additional colour correction on the archival TIFF; better to have them archived with a consistent and known bias -- the bias imposed by a particular device (e.g., a Hewlett Packard flatbed scanner). We need to avoid unrecorded and ad hoc correction of the originals, especially as the best we can do is to correct for a particular monitor. We might well consider the inclusion of a standard colour reference strip at the margin of each image.

Post-Scanning Processing
Before the TIFF is archived offline, create one or more JPEG images for current use — you might decide on a high-detail (low loss) and a low-detail (high loss) version. The precise settings are determined by the type of image — as a rule of thumb, aim to have the better copy come in at 300-500 KB and the poorer copy at under 100 KB. Do whatever colour correction is necessary on the JPEGs.

Taking the British Library's Beowulf Project as an example, I have turned a 21 MB TIFF file into a 600 KB and a 65 KB pair of JPEGs — the former allows a lot of flexibility of use (details can be enlarged several times without pixelation); the latter allows little in the way of flexibility of use, but is very useable at regular size and loads quickly even on low-end graphical systems.

Data Control

I strongly encourage that we also fill in a short tagged header template for each image or related group of images, saying how, when, and by whom it was created. The Electronic Text Center has modified the TIF header to fill this role; at worst, a set of HTML <meta> tags in the <head> section would be better than nothing.

I would also suggest that this header should be added into the binary code of the image file itself. The Electronic Text Center does this routinely now with book illustrations and Special Collections items, and is streamlining the process.

This data control adds to the creation time, but means that we have a searchable record of the item, a bibliographical header for future cataloging, and we keep track of what we have got. We should think of ourselves as building a text database to our images as we create the images. For some groups of images, a single header may do for all the images in a group — you may not need a different header for each specific image.

For more information, see Introduction to Imaging: Issues in constructing an image database by Howard Besser and Jennifer Trust.

Summary of questions to ask yourself when scanning an image

DPI

1) What is the primary purpose of this image? An item on a web page? An item in a printed document? If the former, the dpi can be lower (100 dpi) without the user seeing much difference.

2) Do I need to extract details and enlarge them — if so, you need to scan at a higher dpi in order to give your image this elasticity.

Image Type

1) Do I need color or grayscale?

2) Do I need high or low color content? If I am not able to use JPEG compression, can I afford to have high color content? That is, can I cope with the size of the file that 24-bit color produces?

3) File Format

What image file formats does my end-use software support? TIFF and BMP or PICT only? GIF and JPEG? If the latter, do I need to keep a TIFF master copy too (probably not if the image does not have long-term archival value, such as a picture of your pet or put on your Web homepage).

Image Scanning: the software

The PCs at the Electronic Text Center use Deskscan and Photoshop to scan images.

- Open Photoshop by double-clicking on its desktop icon.
- From the File menu, select Import... TWAIN_32. This will prompt Deskscan to open automatically and preview what's on the scanner bed.
- After the initial preview, you will most likely want to change the settings for the Image Type and the Resolution.

Setting the Image Type (the bit density)

Deskscan's simplified scanning terminology can cause problems, because it is not always obvious which image type to use. "Black and white drawing" is the most descriptive of all — use it for an image that has no shading — just black and white (a pea
and ink sketch, perhaps).

<table>
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<tr>
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<th>300x300</th>
<th>200x200</th>
<th>100x100</th>
</tr>
</thead>
<tbody>
<tr>
<td>B &amp; W Drawing (1-bit B&amp;W)</td>
<td>20</td>
<td>11</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>Color Drawing (1-bit color)</td>
<td>158</td>
<td>89</td>
<td>39</td>
<td>9</td>
</tr>
<tr>
<td>B &amp; W Photo (8-bit grayscale)</td>
<td>158</td>
<td>89</td>
<td>39</td>
<td>9</td>
</tr>
<tr>
<td>Color Photo (8-bit color)</td>
<td>158</td>
<td>89</td>
<td>39</td>
<td>9</td>
</tr>
<tr>
<td>Millions of Colors (24-bit color)</td>
<td>475</td>
<td>267</td>
<td>118</td>
<td>29</td>
</tr>
</tbody>
</table>

Note: The Halftone settings are infrequently used for specialized printing purposes, and the low quality of this image type does not provide any advantage. We don't recommend this setting.

![Image Resolution options](image.png)

### Setting the Image Resolution

Because of the simplification of scanning terminology DeskScan uses, you need to remember the following if you decide to change the dots per inch setting:

- To change the dpi (up to 400 dpi), go to the Custom menu, then choose the Print Path option, and do it manually.
Starting the Scanning Process

After you have specified dots per inch and image type, click on the Preview button. This will scan your item and send the output to the screen.

1. You must now select an area to be scanned (using the mouse to draw a box around all or part of your image)

2. Click on the Zoom button to see if your box is drawn accurately;

3. Click on the "yin/yang" button between the contrast and brightness slider bars to perform an automatic contrast/brightness balance.

Note that above the Preview button there is a counter that shows the size your file will be in an uncompressed format.

4. Once the image is ready to save, click on Final. This will prompt Deskscan to scan the image with your adjusted settings and send the file into Photoshop for processing and/or conversion to another format (such as GIF or JPEG).

It is usually most efficient to do all your scanning in Deskscan, then all your processing in Photoshop. It is possible to maintain several files open at once in Photoshop while you continue to scan. To scan your next item, simply place it on the scanner bed, click on Preview, and repeat the process articulated above. After you have finished scanning, exit Deskscan.

Quirks of the Program

DeskScan tends to run a little dark, especially on darker images and photographs. If this happens, nudge the brightness control up a little. DeskScan can also slightly favor green in color images with a lot of white, cream, or yellow in them (a manuscript page, for example). To compensate for this, go to the Tools menu, select the "Color Adjustment" option, and move the pointer away from the green area a little.

Saving Your Files

- From the File menu in Photoshop
• select Save As...
• Name your file
• select an image format from the Save As drop-down menu
• be sure to save only in C:\data.

Note about saving gifs:

• If you have scanned an image as an 8-bit image type (such as Sharp Color Photo or Sharp Black and White Photo), you can select Compress GIF as a format from the Photoshop Save As menu.
• If you have scanned an image as a 24-bit image type (i.e. Millions of Colors), you will need to export the file as a GIF. To do this, select Export and GIF69a Export... from the File menu.
Reformatting Services

The following list of companies that offer reformatting services for libraries and archives. These services include digital imaging, preservation microfilming, preservation photocopying and magnetic media reformatting.

Each entry includes the company's name, mailing address, phone number and website address (when available). For information about sources of related supplies and equipment consult the latest version of the SOLINET technical leaflet, Conservation and Preservation Services and Supplies.

Inclusion in this list does not imply SOLINET endorsement, nor does the omission of any supplier indicate censure. Most of the firms included have experience working with libraries and archives, so they are likely to be sensitive to the special requirements of these collections. However, it is always beneficial to ask for references before entering into a contract with a company for consulting or a service.

Acme Bookbinding Co.
100 Cambridge St.
Charlestown, MA 02129-1228
617-242-1100
preservation photocopying, library binding, custom book boxes
Apex Data Services, Inc.
160 Presidents Plaza
196 Van Duren St.
Herndon, VA 20170-5338
703-709-3000
www.apexdata.com
data conversion
Bostic Photo Imaging
20 Newbury St.
Boston, MA 02116
617-267-4086
www.bostic.com
imaging services for photographic materials
Chase Productions, Inc
215 Victory Blvd.
Burbank, CA 91522-2349
818-842-8346
audio tape transfer, digitization of audio
Digital Techniques, Inc.
7001 Peachtree Industrial Blvd.
Suite 202
Norcross, GA 30092
770-242-9852
imaging services for photographic materials
Hazeline Vaults
7601 Hazeline Avenue
North Hollywood, CA
818-781-7049
cold storage vault, microfilm storage
Image Conversion Systems
1895 Suite K
Norcross, GA 30091
770-449-3270
data conversion
Amitech Corporation
5501 Backlick Rd.
Suite 200
Springfield, VA 22151
703-255-2020
technology
Bay Area Video Coalition
111-175th St.
Santa Clara, CA 95054
415-861-3282
video transfer
Bridgeport National Bindery, Inc.
104 Ramah Circle South
P.O. Box 289.
Agawam, MA 01001
413-789-1981
preservation photocopying, custom book boxes, library binding
Challenge Industries, Inc.
402 East State Street
P.O. Box 599
Hunting, NY 14551-0599
607-272-8909; 607-277-7865
www.challenge-industries.com
preservation microfilming and duplication
Film Technology Company, Inc.
726 North Cato Avenue
Hollywood, CA 90038
323-464-3456
motion picture film restoration
Hollywood Vaults
742 Seward Street
Hollywood, CA 90038
213-461-6464
www.hollywoodvaults.com
cold storage vaults, microfilm storage
Image Graphics, Inc.
917 Bridgeport Ave.
Shelton, CT 06484
203-926-6156; 888-464-6243
www.imagery.com
imaging services
Image Processing Systems, Inc.
Corporation Headquarters
1669 Wall Street West, Suite 179
Lyndhurst, NJ 07071
212-635-0110
imaging services

Information Conservation Inc. (ICI)
6204 Corporate Park Drive
Brown Summit, NC 27214
550-375-1202
conservation treatment, custom book boxes, preservation photocopying, library binding

JIT, Inc.
1610 West Ave.
Austin, TX 78701
512-447-6743
www.jit.com
data conversion

Kestrel Associates, Inc.
5205 Leesburg Pike
Suite 905
Falls Church, VA 22041
703-379-2201
imaging services

Milverts Systems Technology, Inc.
4600 Forbes Blvd.
Suite 164
Lanham, MD 20706
301-731-9130
www.milverts.com
imaging services

Northern Micrographics
2004 Kramer St.
LaCross, WI 54602
608-781-0850
imaging services

Picture Elements Incorporated
410 22nd Street
Boulder, CO 80302
303-444-6767
www.pictureml.com
bookbinding equipment

SPECs Bros.
P.O. Box 5
Ridgefield Park, NJ 07660
800-852-7732
magnetic media restoration and reformating

University Bindery
2818 Como Ave., S.E.
Minneapolis, MN 55414
612-626-1516
preservation photocopying

Visual Information, Inc.
1009 Grant St.
Suite 202
Denver, CO 80203
303-864-0490
imaging services

ZFB (Zentrum fur Bucherhaltung GmbH)
Mommsenstrasse 7
D-04329
Leipzig, Germany
www.zfb.com
deactification, paper splitting, preservation microfilming, imaging services, paper treatment, disaster recovery

Image Processor, Inc.
1744 Portland Avenue
Walla Walla, WA 99362
509-222-2471
microforms scanning, microform printing onto paper

Intelex Corp.
P.O. Box 858
Charlottesville, VA 22902-0859
804-970-2266
data conversion

Kentucky Underground Storage, Inc.
3850 High Bridge Road
Wilmore, KY 40390-4988
606-858-4988
cold storage, microfilm storage

Luna Imaging
1315 Innes Place
Venice, CA 90291-3617
310-452-6970
www.lunaimaging.com
imaging services

Northeast Document Conservation Center
100 Brickstone Square
Andover, MA 01810-1494
978-470-1010
conservation treatment, preservation field services, microfilming, consulting

PFA, Inc.
9980 Glen Oaks Blvd.
Suite E
San Valley, CA 91352
619-224-0224
imaging services

Preservation Resources
Nine South Commerce Way
Bethlehem, PA 18017-8016
610-758-8700; 800-772-7222
www.preservation.org
imaging services, preservation microfilming

Systems Integration Group
9701 Philadelphia Court
Lanham, MD 20706
301-731-3900
imaging services

VidiPax
450 West 31st St.
4th Floor
New York, NY 10001
212-563-1990; 800-653-8434
www.pax.com/vidipax
magnetic media restoration, magnetic media reformating, consulting

Xerox Corporation
William Crocco
100 Willowbrook Office Park
Fairport, NY 14450
716-583-7803
www.xerox.com
technology "Bookmark 35" edge photocopier
Disaster Planning: Before you write the plan

Identify the hazards
- Natural
- Man-made
- Facility

Locate Resources
- Information
- Disaster response specialists
- Local, federal and state agencies
- Local and regional suppliers and vendors

Set Priorities
- For your collections and records

Authority
- An executive-level directive for planning and implementation is necessary.
- Identify who has the ultimate responsibility for planning and response.
- Establish a planning and response team
- Identify who will write the plan

Elements of a Disaster Plan

- Introduction: stating the need and authority for the plan
- Prevention plan
- Initial response instructions
- Response team list
- Communications plan
- Emergency contacts
- Building plan

- Resource list
- List of collection priorities
- Salvage and recovery strategies according to document types
- Insurance information
- Rehabilitation plan
- Forms to track actions
Do You Have a Collections-Threatening Emergency?
Call Northeast Document Conservation Center

Call (775) 470-1010, day or night, seven days a week. After Center hours, you will be referred to a second telephone number to reach a staff member. Please do NOT request disaster assistance via email, since it is not monitored 24 hours a day.

As part of its Field Service program, NEDCC offers an emergency assistance program for institutions and individuals with damaged paper-based collections. NEDCC staff members are available 24 hours a day to provide telephone advice as needed. This service is provided at no charge thanks to a grant to NEDCC from the National Endowment for the Humanities (NEH).

This service does not normally include on-site assistance. Information provided includes advice on drying wet collections and dealing with damage from fire, pests, or mold. Referrals to commercial disaster recovery service providers experienced with library and archives collections can also be provided.
Flood Unleashed at City Hall

By Kaitlin Swan
Valley News Staff Writer

LACONIA — Thousands of gallons of muddy water flooded into City Hall yesterday morning, allowing water, industrial solvents, oil and greases, and debris to spread through the building and seep into the basement.

City Hall remained closed and will be closed for at least a week.

The flood that poured into at least 1 foot of water into the basement level of City Hall and several offices in main office areas began around 8:45 a.m. when a water main break on Washington Street flooded the building.

City Hall Manager John McCarthy said the water main break caused the water to enter the building through a basement window and seep into the main office area.

"It's still pretty difficult to tell the amount of damage, but it's extensive," McCarthy said.

The water entered the building through a window in the basement, and water continued to pour into the building until the main break was repaired.

Although the flood caused extensive damage to the building, McCarthy said the main break was quickly repaired and the water was stopped.

Valley News (Lebanon, NH) May 24, 2001
Broken Water Main Floods Lebanon City Hall

CONTINUED FROM PAGE 1

McSweeney said damage included wet paper and draped electrical wires. Carpets were soaked with water and a layer of mud. The wires of the city's main computer server got wet and while it is disconnected, all city employees are without e-mail and Internet access.

McSweeney said pumps outside City Hall, such as police, fire and public works, are still able to use their computers for their internal work, he said.

McSweeney was unsure what papers had been damaged, but the lower level of City Hall, where the water was deepest, is brine to documents including old birth certificates, old planning board files and historical paper-

work from Lebanon's early days as a town. Six inches of brown water remained in the halls and rooms of the basement more than two hours after the main break. Some boxes were half submerged. The boiler room had 3 feet of water at one point, and McSweeney worried that the relatively new boiler would be damaged.

Residents throughout the city experienced a drop in water pressure. When the main was ruptured, McSweeney said, but most should have regained water service fairly quickly. He said his wife called from home to say she had no water. McSweeney had more than he could handle.

The Carter-Washburn Center closed yesterday because of a lack of water. The Upper Valley Senior Center didn't have water until 7 p.m., but remained open. The Carter Community Building was without water late in the afternoon, but remained open.

The water that pushed from the broken pipe, is about 15 feet of what the city says, in a day. Firefighters from Hartford, Hanover and Etna helped out, and it seemed everyone had a joke about the flooding, giving the city the new swimming pool it needs.
EMERGENCY MANAGEMENT
SUPPLIERS AND SERVICES

This list is not exhaustive, nor does it constitute an endorsement of the suppliers listed. We suggest that you obtain information from a number of vendors so that you can make comparisons of cost and assess the full range of available products.

A more complete list of suppliers is available from NEDCC. Consult the Technical Leaflets section of NEDCC's website at www.nedcc.org or contact NEDCC for the most up-to-date version in print.

- CLEANING SERVICES, FUMIGATION, FIRE AND SMOKE RECLAMATION
- COLD STORAGE FACILITIES
- CONSULTING SERVICES
- DRYING FACILITIES
- ENVIRONMENTAL STABILIZATION
- EQUIPMENT AND TRANSPORTATION RENTAL
- PEST MANAGEMENT
- SALVAGE - ELECTRONIC DATA AND EQUIPMENT
- SALVAGE - MAGNETIC MEDIA
- SALVAGE - MICROFILM
- SALVAGE - PHOTOGRAPHIC MATERIALS
- SUPPLIES
- WATER ALARMS

CLEANING SERVICES, FUMIGATION, FIRE AND SMOKE RECLAMATION

ECS Companies, Inc.
19 Wheeling Avenue
Woburn, MA
Telephone: (800) 696-4054 (24 hrs.) or (617) 935-4455
Contact: Andy Bromine

Clean-up after fire and water damage

Pro-Care
3 North Maple Street
Can help with the clean-up after a fire or water emergency; including mold removal. They also offer air-duct cleaning services. Uses compressed air and HEPA filtration to clean both supply and return duct work.

Servpro
PO Box 328
Lawrence, MA 01842
Toll Free: (800) 535-5322
Telephone: (978) 688-2242
Fax: (978) 687-7706
Email: ServproLawrence@aol.com
URL: www.servpro.com
Disaster restoration specialists handling fire, smoke, water damage, and odor removal.

UNICCO Service Company
275 Grove Street, Suite 3-200
Auburndale, MA 02461
Telephone: (617) 527-3222
Fax: (617) 969-2210
Email: marketing@unicco.com
URL: www.unicco.com
Contact: Paul B. McAleen
Hours: 8:30 am - 5:00 pm M-F
Offers a variety of maintenance, operations, and engineering services and can provided highly specialized cleaning services to libraries.

COLD STORAGE FACILITIES

Millbrook Cold Storage
9 Medford Street
Somerville, MA 02143
Telephone: (617) 354-3800
Fax: (617) 661-4134
Contact: Charlie Petrie (home phone [617] 729-9348)
Hours: 7:30 am - 4:30 pm M-F
Located near East Cambridge, the building's capacity is 840,000 cubic feet. Operating temperature is between -4 degrees & +4 degrees. As with many cold storage facilities, business is seasonal and space is not always available.

CONSULTING SERVICES

Conservation Center for Art and Historic Artifacts
264 South 23rd Street
Philadelphia, PA 19103
Telephone: (215) 545-0613
Contact: Ingrid Bogel, Executive Director

CCAHA Field Services can provide advice about recovery of various types of collections, specializing in conservation of paper-based materials. Conservators are able to advise on special collections. Photographic conservator on staff. Consultation services over the phone are free; the rate for on-site work is $70/hr.

Federal Emergency Management Agency (FEMA) Headquarters
500 C Street, SW
Washington, DC 20472
Telephone: (202) 646-4600
http://www.fema.gov

Free publications relating to emergency preparedness.

National Fire Protection Association
1 Batterymarch Park
Quincy, MA 02269-9101
Toll Free: (617) 770-3000
Fax: (617) 770-0700
E-mail: custserv@nfpa.org
http://www.nfpa.org

Fire prevention information and standards.

Northeast Document Conservation Center
100 Brickstone Square
Andover, MA 01810-1494
Telephone: (978) 470-1010 (24-hr.)
Fax: (978) 475-6021
Contact: Steve Dalton or Karen Brown
http://www.nedcc.org

Able to provide basic advice and references in the event of an emergency. Staff conservators are also available for expert consultation. The field rate for conservation is $530/day. There is no charge in case of dire emergency.

Peabody Museum
Conservation Department
11 Divinity Avenue
Cambridge, MA 02138
Telephone: (617) 495-1027
URL: www.peabody.harvard.edu
Contact: T. Rose Holdcraft

Conservators at the Peabody Museum will consult or advise on the recovery and treatment of archaeological, ethnographic, and historic objects and textiles.

Straus Center for Conservation
Fogg Art Museum 28 Quincy Street
Cambridge, MA 02138-3382
Telephone: (617) 495-2392
Fax: (617) 495-0322
Offers consultation for paper artifacts, objects, and paintings. Treatment for damaged items can also be arranged. No assistance for textiles is provided.

Williamstown Art Conservation Laboratory, Inc.
Clark Art Institute
225 South Street
Williamstown, MA 01267
Telephone: (413) 458-5741
URL: www.clark.williams.edu/web5.htm
Contact: Lottie van Handel
Hours: 9:00 am - 5:00 pm M-F. Nights and weekends call the Clark Art Institute and specify nature of emergency: (413) 458-9545.

Field service provides basic recovery information. Specializes in the conservation of paper, paintings, furniture and wooden objects, as well as sculpture and the decorative arts. Not a source for textile information. Fees are charged on a case-by-case basis. Generally there is no charge for emergency consultation services.

DRYING FACILITIES

American Freeze-Dry, Inc.
39 Lindsey Avenue
Rutledge, NJ 08078
Telephone: (856) 346-0777
Contact: John M. Zioance
Hours: 9:00 a.m. - 5:00 p.m. M-F

American Freeze-Dry is able to vacuum freeze-dry 50 cubic feet of wetted library materials (approximately 625 volumes) at a cost of $5.50-60 per cubic foot. The company can also make arrangements for larger quantities with McDonnell Douglas (thermal vacuum drying) or a Canadian company with a 500-cubic-foot vacuum freeze-dry chamber.

Blackman-Mooring Steamatic Catastrophe, Inc.
International Headquarters
503 Arthur Street
Fort Worth, TX 76107
Toll Free: (800) 433-2940; 24 hr. hotline Telephone: (817) 332-2770
Fax: (817) 332-6728
URL: www.bmscat.com
Hours: 8:00 am - 5:30 pm M-F

Disaster recovery services, odor removal, vacuum freeze drying

BMS-Cat provides extensive recovery and restoration services and is able to handle almost any size emergency. Recovery services include paper based materials as well as electronic equipment and magnetic media. Book and document collections are vacuum freeze dried for approximately $40 per cubic ft. based on a 500 cubic foot (approx. 6,250 volumes) load. BMS Cat offers a free standby service agreement that
creates a customer profile, capturing information that is vital in an emergency prior to an event. Portable blast freezer available.

Disaster Recovery Services
2425 Blue Smoke Court South
Ft. Worth, TX 76105
Toll Free: (800) 856-3333 (24-hr. hotline)
Telephone: (817) 535-6793
Fax: (817) 536-1167
Hours: 8:00 am - 5:00 pm M-F; 24-hr hotline

Disaster recovery and recovery planning services, vacuum freeze drying

Document Reprocessors
5611 Water Street
Middlesex (Rochester), NY 14507 Telephone: (716) 554-4500 Toll Free: (888) 437-9464; 24-hr. hotline Fax: (716) 554-4114
Email: chito@iname.com
URL: www.documentreprocessors.com
Hours: 8:00 am - 5:00 pm M-F

Vacuum freeze-drying, disaster recovery of computer media, microfiche and microfilm, books, business records.

Uses vacuum freeze-drying to recover water damaged materials. The vacuum freeze-dry chamber has an 800-cubic-ft. capacity which translates to approximately 10,000 volumes. The rate for freeze-drying varies but is generally about $60 per cubic foot. Also has a thermal freeze-drying process that employs heat and a cold trap. During the drying operation materials cycle from -40 to 60 degrees.

Midwest Freeze-Dry, Ltd.
Midwest Center for Stabilization and Conservation
7326 North Central Park
Skokie, IL 60076
Telephone: (847) 679-4756
Fax: (847) 679-4756
Email: mfdfz28@aol.com
http://www.midwestfreezedryltd.com
Hours: Open by Appointment M-F; 24-hr. call monitoring

Freeze-drying of historical volumes, manuscripts, microfilm, blueprints. Uses vacuum freeze-drying to salvage wet books and documents. Their chamber will hold 150 milk crates (approximately 2,500 cubic feet, or 31,250 volumes). The cost to dry materials is based on the amount of water extracted from materials. Please call for price.

Munters Corporation - Moisture Control Services
79 Mouroe Street
Amesbury, MA 01913
Contact: Barry Kray
Toll Free: (800) 959-7901; 24-hr. hotline
Telephone: (978) 241-1100
Fax: (978) 241-1218
URL: www.muntersmcs.com
Hours: 7:30 am - 8:00 pm M-F

Disaster recovery services, building dehumidification, drying services, microfilm drying services. Will dry to customer's specifications or will recommend an appropriate method. Choices include: vacuum freeze-drying, in-situ drying through dehumidification, or stabilization by freezing materials to be dried at a later time. The vacuum freeze-dryer has a 100-cubic-foot, or 1,250 volume, capacity. Cost is approximately $50 per cubic foot with a reduction for quantities greater than 500-cu-ft.

Solex Environmental Systems
P.O. Box 460242
Houston, TX 77056
Contact: Don Hartsell
Toll Free: (800) 848-0484; 24-hr. hotline
Telephone: (713) 963-8600
Fax: (713) 461-5877
Hours: 8:00 am - 6:00 pm M-F

Disaster recovery, dehumidification, building drying services. Specialty is drying wet materials. Solex's cryogenic dehydration chamber can accommodate a 40-ft. trailer of materials. Solex also offers vacuum freeze-drying and additional services, such as dehumidification of large spaces. The vacuum freeze dryer has a capacity of 1000 cubic feet (12,500 volumes) at $40 per cubic foot. The minimum job is 250 cubic feet.

ENVIRONMENTAL STABILIZATION

Munsters Corporation - Moisture Control Services
79 Monroe Street
Amesbury, MA 01913-4404
Toll-Free: (800) 797-5020 (24-hr.)
Telephone: (978) 241-1100
Fax: (978) 241-1218
URL: www.munstersmacs.com Hours: 7:30 am - 8:00 pm M-F
Contact: Barry Kray

Known for drying out buildings after water emergencies. Structural drying is one of their specialties. Charges for drying vary widely based on the type of structures to be dried and the type of equipment used.

World Wide Drying
Silver City Restoration
24 Weir Avenue
P.O. Box 750
Taunton, MA 02780
Toll Free: (800) 442-1911
Telephone: (508) 823-0189
Fax: (508) 823-9374
Email:
URL: www.worldwidewater.com
Contact: Kathy Zoll
Specialize in dehumidification and restoration services. Use portable refrigerating dehumidifiers in a wide range of sizes in conjunction with forced air movement. Focus and experience is with the structural and interior drying of buildings, although the companies also offer salvage of books, documents, and magnetic tape. Fees vary based on the type of equipment used and the type of job.

EQUIPMENT AND TRANSPORTATION RENTAL

AMI Leasing
416 West Boylston Street
P.O. Box 986
Worcester, MA 01613
Toll Free: (800) 468-9993
Email: info@amileasing.com
URL: www.amileasing.com
Hours: M-F 7:00 am - 5:00 pm, Saturdays 8 am - noon

Can supply 18 ft. refrigerator trucks. Weekly rental is $500. Must have commercial driver's license (Class 'B')

Budget
311 Lowell Street
Andover, MA 01810
Toll Free: (800) 527-0700
Telephone: (978) 497-1801
URL: www.budget.com
Hours: 7:00 am - 6:00 pm M-F

Budget rents trucks of various sizes and types. No refrigerated trucks are available.

C. J. & J. Leasing
5 Claflin Street
South Boston, MA 02210
Telephone: (617) 423-5695
Fax: (617) 737-3792
Contact: Rocky Hicks
Hours: 7:00 am - 6:00 pm M-F

There is no guaranteed evening or weekend availability. However, a 24 hr. road service can try to expedite rental arrangements; call (617) 423-6720 to page Rocky Hicks. An affiliate of ThermoKing, this company can provide electric or diesel refrigerated trailers and trucks which can operate below 32 degrees Fahrenheit. Drivers are also available on a limited basis.

Century Leasing Corporation
366 Second Street
Everett, MA 02149
Telephone: (618) 387-1000 or (617) 844-5780
Fax: (617) 389-7105
Contact: Joe Panniello
Hours: 8:00 am - 4:30 pm M-F. No evening or weekend availability
Century Leasing can provide electric or diesel 40 ft. refrigerator trailers that can operate below freezing.

Cummings Northeast, Inc.
100 Allied Drive
Dedham, MA 02026
Telephone: (781) 329-1750
Contact: Vinco
Hours: 8:00 am - 5:00 pm M-F

For the rental of both diesel and electric generators, as well as other types of equipment:

Fire Equipment
88 Hicks Avenue
Medford, MA 02155
Telephone: (781) 391-8050
Fax: (781) 391-8835
Hours: 8:00 am - 4:30 pm M-F

Fire extinguishers/detectors

Rent-a-tool
777 North Shore Road
Revere, MA 02151
Toll Free: (800) 272-8484
Telephone: (617) 289-3800 (24 hours)
Email: rent@rentatool.com
URL: www.rentatool.com
Hours: 7:30 am - 5:30 pm M-F, Saturdays 8 am - 5:30 pm

Rent HEPA & Euroclean U2-930 vacuum cleaners.

PEST MANAGEMENT

Archos
126 Prospect Street
Cambridge, MA 02139
Telephone: (617) 492-8621

Chicora Foundation, Inc.
P.O. Box 8664
861 Arbutus Drive
Columbia, SC 29202-8664
Telephone: (803) 787-6910
http://palimpsest.stanford.edu/borg/chicora/chicpest.htm

Pest control, environmental consulting, architectural consulting. While telephone consultations are free, more in-depth consulting is offered on a for-fee basis. Call for more information on services and the associated costs.

Insects Limited, Inc.
Fumigation Service & Supply, Inc.
16950 Westfield Park Road
Westfield, IN 46074
Telephone: (317) 896-9300
Fax: (317) 867-5757
http://www.insectslimited.com/insects.htm

Specializing in bio-rational means of pest control, pheromones and other least toxic measures as well as advanced fumigation techniques.

Keepsake Systems Inc.
59 Glenmount Park Road
Toronto, ON M4E 2N1
Canada
Telephone: (416) 703-4596
Fax: (416) 703-5991
E-mail: keepsafe@interlog.com
http://www.interlog.com/~keepsafe
Contact: Jerry Shiner, President

Supplier of anoxic packaging materials and services, barrier films, bags, "Ageless", etc.

Pest Control Services
14 East Stratford Avenue
Lansdowne, PA 19050
Telephone: (610) 284-6249
Fax: (610) 622-3637

IPM inspections and development of IPM programs for museums, historical societies, libraries and archives. Services also include mold remediation.

Society for the Preservation of New England Antiquities
Haverhill, MA
Telephone: (978) 521-4788
Contact: Gary Rattigan

Fumigates using a carbon-dioxide bubble. The 2-week process has a 95% kill rate. The remaining 5% are usually eggs or adult carpet beetles. The bubble is 11' x 11' x 8'.

SALVAGE - ELECTRONIC DATA & EQUIPMENT

ACS Data Recovery Service
42-220 Green Way, Suite B
Palm Desert, CA 92211
Telephone: (760) 568-4351
Fax: (760) 341-8694
Email: aver@averdrivetrionics.com http://www.averdrivetrionics.com/acs-data-recovery.html

In business since 1979. Specializing in repairing damaged data caused by hardware failure, virus contamination, and user error.
Data Mechanix Services
18271 McDurmott Street, Suite B
Irvine, CA
Toll Free: (800) 886-2231
E-mail: help@datamechanix.com
http://www.datamechanix.com

Specializing in the rescue of lost data from hard disk drives and other storage media.

Data Recovery Labs
85 Scarsdale Road, Suite 100
Toronto, ON M3B 2R2
Canada
Toll Free: (800) 563-1167
Toll Free: (877) datarec
Telephone: (416) 510-6990
Toll Free Fax: (800) 563-6979
Fax: (416) 510-6992
Telephone Support: 8 am - 8 pm EST
E-mail: helpme@datarec.com
http://www.datarec.com

Provides custom-engineered data recovery solutions and data evidence investigations. Free pre-recovery analysis.

Data Recovery and Reconstruction (Data R&R)
P.O. Box 35993
Tucson, AZ 85740
Telephone: (520) 742-5724
E-mail: datarr@datarr.com
http://www.datarr.com

A charge of $75.00/per drive is required for decontamination of fire- or water-damaged drives. Offers a $150.00 discount for non-profit organizations. No charge for preliminary diagnostics.

ECO Data Recovery
4115 Burns Road
Palm Beach Gardens, FL 33410
Toll Free: (800) 339-3412
Telephone: (561) 691-0019
Fax: (561) 691-0014
Email: info@eco-datarecovery.com
http://www.eco-datarecovery.com

Specializing in electronic data retrieval and restoration of failed hard drives.

ESS (Electronic System Services)
239 South Lewis Lane
Carbondale, IL 62901
Toll Free: (800) 237-4200
Toll Free: (888) 759-8758
Charges no evaluation fee, and can provide 24-hour turnaround. Disks may be sent
to the address above with or without prior approval. Please enclose your contact
information with your hard drive.

**Excalibur**
101 Billerica Avenue
5 Billerica Park
North Billerica, MA 01862-1256
Toll Free: (800) 466-0893
Telephone: (978) 663-1700
Fax: (978) 670-5901
Email: recover@excalibur.ultranet.com
Contact: http://www.excaliburdr.com

A computer recovery service that can recover data from loss caused by many types
of disaster. They have experience working with many types of media and more than
twenty operating systems.

**Micro-Surgeon**
6 Sullivan Street
Westwood, NJ 07675
Telephone: (201) 666-7880
After 5:00 PM EST: (201) 619-1796 (please enter "#" after leaving your number)
E-mail: info@msurgeon.com
http://msurgeon.com/

Offers evaluations based upon a flat rate of $75 per drive and includes all
diagnostic services related to determination of recovery feasibility. Special
discouts for the educational market are offered.

**Ontrack**
6321 Bury Drive
Eden Prairie, MN 55346
Toll Free: (800) 872-2599
Phone: (952) 937-5161
Fax: (952) 937-5750
http://www.ontrack.com

Offers emergency and on-site data recovery services as well as Remote Data
Recovery (RDR);

**Restoration Technologies, Inc.**
3695 Prairie Lake Court
Aurora, IL 60504
Toll Free: (800) 421-9290
Fax: (708) 851-1774

Offers a broad range of cleaning services, from cleaning and disinfecting heating
ventilation and air conditioning systems (HVAC), to computer media. However their
speciality is electronic equipment, including computers, printers, video tape
recorders, cameras, etc.

TexStar Technologies
3526 FM 528, Suite 200
Friendswood, Texas 77546
Telephone: (281) 282-9902
Fax: (281) 282-9904
Email: texstar@texstartech.com
http://www.texstartech.com/index.html

Specialises in data recovery, computer security, software design, systems
integration, and Internet services.

SALVAGE - MAGNETIC MEDIA

Film Technology Company, Inc.
726 North Cole Avenue
Los Angeles, CA 90038
Telephone: (213) 464-3456
Fax: (213) 464-7439
E-mail: filmtech@primenet.com
URL: www.filmtech.com/~filmtech

Nitrate movie film duplication

John E. Allen, Inc.
116 North Avenue
Park Ridge, NJ 07656
Telephone: (201) 391-3299
Fax: (201) 391-6335

Nitrate movie film duplication

Karl Malkames
1 Sherwood Place
Scarsdale, NY 10583
Telephone: (914) 723-8853

Nitrate movie film duplication

Restoration House
Film Group, Inc.
PO Box 298
Belleville, ON K8N 5A2
Canada
Telephone: (613) 966-4076
Fax: (613) 966-8431

Nitrate movie film duplication

Smolian Sound Studios
1 Wormans Mill Court
Frederick, MD 21701
Telephone: (301) 694-5134
Contact: Steve Smolian

Well known for offering all types of audio tape restoration. Also works with acetate and shellac discs.

Sound Studios, Inc.
1296 East 48th Street
Brooklyn, NY 11234-2102
Telephone: (718) 338-8284 or (212) 870-1694
Contact: Seth B. Winner

Consulting and treatment of audio tape collections. Able to work with a variety of formats.

SPECS Brothers
PO Box 5
Ridgefield Park, NJ 07660
Toll Free: (800) 852-7732
Telephone: (201) 440-6589
Fax: (201) 440-6588
Email: info@specsbros.com
URL: www.specsbros.com
Contact: Peter Brothers

Specializes in the recovery of videotapes after any type of disaster. Offers recovery advice, assistance, as well as cleaning and copying services for affected tapes. SPECS Bros. also cleans and copies archival video and audio tapes.

SALVAGE - MICROFILM

Eastman Kodak Company
Disaster Recovery Laboratory
1700 Dewey Avenue
B-65, Door C, Room 340
Attention: Howard Schartz
Rochester, NY 14650-1819
Toll Free: 800-EKC-TEST (352-8378)
Telephone: (716) 253-3907

Represents original camera films (only Kodak brand) free of charge. There is no limit on the number of rolls. Films should be packaged according to Kodak's instructions which are given when Kodak is notified.

New England Micrographics
750 E. Industrial Park Drive
Manchester, NH 03109
Toll Free: (800) 340-1171
Telephone: (603) 625-1171
Fax: (603) 625-2515
SALVAGE - PHOTOGRAPHIC MATERIALS

Conservation Center for Art and Historic Artifacts
264 South 23rd Street
Philadelphia, PA 19103
Telephone: (215) 545-0613
Contact: Virginia Rawnsley

Provides advice about recovery of various types of collections. A photograph conservator is on staff to advise on recovery and treatment options for photographic collections.

Northeast Document Conservation Center
100 Brickstone Square
Andover, MA 01810-1494
Telephone: (978) 470-1010 (24 hrs.)
Fax: (978) 475-6021
Contact: Steve Dalton or Karen Brown
http://www.nedcc.org

Has 3 photographic conservators with a wide range of knowledge of the various photographic formats. Conservators are available for expert consultation, advice, and treatment of collections involved in natural or other disasters.

SUPPLIES

Abbott Box Co., Inc.
10 Campanelli Circle
Canton, MA 02021
Telephone: (781) 821-8200
Fax: (781) 821-1919
Hours: 8 am - 2 pm. Although there is usually someone available after 2 pm, they do have voice mail.

Can supply corrugated boxes in various sizes. Cubic-foot boxes (file #104) are $0.75 for 250 to 499 boxes, and $0.69 for 500 to 999 boxes.

Gentle Giant
29 Harding Street
Somerville, MA 02143
Toll Free: (800) 466-8844
Telephone: (617) 661-3333
URL: www.gentlegiant.com
Hours: 8:00 am - 5:00 pm M-F

Moving company that has 1.5-cubic-foot boxes available @ $1.25 a piece.
Gold Star Trucking
2449 Massachusetts Avenue
Cambridge, MA 02140
Telephone: (617) 254-5543
Fax: (617) 497-4551 Hours: 7:00 am - 5:00 pm M-F

This moving company has small moving boxes available @ $2.50 per box (20 or more).

Protext
3315 Leland Street
Baltimore, MD 20815
Telephone: (301) 718-1659
Fax: (301) 654-6159
Contact: Linda Nains

Source of innovative emergency supplies, including the Rescue, a collapsible corrugated plastic container that is sturdy and durable.

The Quality Rubber Company
P.O. Box 71
Salina, MO 65302-0071
Toll Free: (800) 597-9947
Telephone: (660) 205-4681
Toll Free Fax: (800) 676-5807
Fax: (660) 207-0713
Hours: 8:30 am - 5:00 pm M-F

Sponges for soot removal

Rentacrate
39 Rumford Avenue
Waltham, MA 02154-3844
Telephone: (781) 999-4477
Fax: (781) 999-4695
Contact: Michael Shanley

Stocks a variety of stackable plastic crates, dollies, and carts. Rental of a 1.6-cubic-foot crate costs $2.00 per month. (Arrangements can be made for longer periods.)

WATER ALARMS

Gaylord, University Products, and some of the other archival suppliers also sell water alarms:

Dorlen Products, Inc.
6615 West Layton Avenue
Milwaukee, WI 53220
Telephone: (414) 282-4840
Fax: (414) 282-5670
Email: Dorlen@Execpc.com
URL: www.wateralert.com
Manufacturer and distributor of Water Alert detectors

PRG (Preservation Resource Group, Inc.)
Box 1768
Rockville, MD 20849-1768
Telephone: (301) 309-2222
Fax: (301) 279-7885
Order Desk: (800) 774-7819
URL: www.prGINEC.com

Distributor of Waterbug detector

Datasonic, Inc.
255 East Second Street
Mincola, NY 11501
Telephone: (516) 248-7330

Distributor of Flood Alert Water Sensing Alarm

Direct Safety Company
7815 South 46th Street
Phoenix, AZ 85044
Telephone: (800) 528-7405
Fax: (800) 760-2975
Email: directsaf@aol.com
URL: www.directsafety.com

Raychem Corporation
TraceTek Products Group
300 Constitution Drive
Menlo Park, CA 94025
Telephone: (650) 361-4602
Telephone: (650) 361-5579

Distributor of water-sensing cable

Retawmatic Corporation
149-11A 41st Avenue Flushing, NY 11355
Telephone: (718) 886-0502
Fax: (718) 886-0502

Distributor of surface water detectors

Sonin Inc.
301 Fields Lane #201
Brewster, NY 10509
Toll Free: (800) 223-7511
Outside U.S. Telephone: (845) 277-4646
Fax: (845) 277-8154
URL: www.sonin.com

Manufacturer of SONIN Water Alarms
WORKSHEET FOR OUTLINING A DISASTER PLAN

by Karen E. Brown
Field Service Representative
Northeast Document Conservation Center

A. Institutional Information

Name of Institution ____________________________

Date of completion ____________________________

Date of next update of this form/plan ...

List all locations where this plan is on file (on and off premises)

__________________________

__________________________

Staff members to be called in case of disaster:

<table>
<thead>
<tr>
<th>Position</th>
<th>Name</th>
<th>Home Phone</th>
<th>Specific Responsibility in Case of Disaster</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chief Administrator</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Disaster Recovery Team Leader</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Person in charge of building maintenance</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cataloger/Registrar</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preservation Administrator/Conservator</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In-house disaster recovery team members:

<table>
<thead>
<tr>
<th>NAME</th>
<th>HOME PHONE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>


Who on the staff has a copy of this plan and is familiar with its contents?

B. Services Needed in an Emergency

<table>
<thead>
<tr>
<th>Service</th>
<th>Company and/or Name of Contact</th>
<th>Phone #</th>
</tr>
</thead>
<tbody>
<tr>
<td>In-house Security</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fire Department</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Police or Sheriff</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ambulance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Civil Defense</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Professional Advice/Conservator</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Insurance Company</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Freezer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Freeze-dry Service</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Document</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recovery/Salvage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Computer Records</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recovery/Salvage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Microfilm Recovery/Salvage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Videotape Recovery/Salvage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Computer Emergency</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Legal Advisor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electrician</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plumber</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carpenter</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exterminator</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fumigation Service</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Locksmith</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Utility Companies</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electric</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gas</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Telephone</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Architect or Builder</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Janitorial Service</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Glass Company</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Photographer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

C. In-house Emergency Equipment (List locations and attach floor plans with locations labeled)
1. Keys

2. Main Utilities
   a) Main electrical cut-off switch
   b) Main water shut-off valve
   c) Main gas shut-off

3. Sprinkler system

4. Heating/cooling system

5. Fire extinguishers
   a) Wood, paper, combustible (Type A)
   b) Gasoline and flammable liquid (Type B)
   c) Electrical (Type C)
   d) All routine types of fire (Type ABC)

6. Master fire alarm (pull box)

7. Smoke and heat detectors

8. Cellular telephone

9. Portable pump

10. Extension cords (30 ft., grounded)

11. Flashlights

12. Camera with film

13. Battery-operated radio

14. Tool kit (crowsbar, hammer, pliers, screwdriver)

15. Brooms and dustpans

16. Mop, bucket, sponges

17. Wet-vacuum

18. Metal book trucks

19. Portable folding tables

20. Portable fans

21. Protective masks/glasses

22. Hard hats

23. Rubber boots

24. Rubber or plastic aprons

25. Gloves (leather, rubber)

26. Drying space

D. In-house Emergency Supplies (List locations and attach floor plans with locations labeled)

27. First aid kit

28. Heavy plastic sheeting (with scissors and tape)

29. Paper towel supply

30. Plastic garbage bags

31. Polyethylene bags (various sizes)

32. Waxed or freezer paper

33. Absorbent paper (blank newsprint, blotter, etc.)

34. Dry chemical sponges (for removing soot)

   Clipboards (also paper pads, pencils, waterproof pens, large self-adhesive labels)

35. Emergency funds
   a) cash
   b) purchase orders
   c) institutional credit cards
Are all staff familiar (by tour, not map) with location of a copy of this plan, the location and use of numbers 1-36 above, thermostats, regular exits, fire exits, fire extinguishers, flashlights, radio, and civil defense shelter?

E. Additional Sources of Emergency Equipment and Supplies

<table>
<thead>
<tr>
<th>Item</th>
<th>Supplier</th>
<th>Phone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wet vacuum</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sand bags</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Portable dehumidifiers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Portable electric fans</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Portable generator</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Portable pump</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Refrigerator trucks</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nearest off-site phone</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nearest CB radio</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Portable lighting</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Extension cords (50 ft, grounded)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Metal book trucks</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plastic (milk) crates</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sturdy boxes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heavy plastic sheeting</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plastic garbage bags</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Polyethylene bags (various sizes)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Freezer or waxed paper</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dry ice</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drying space</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Portable tables</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Absorbent paper</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(blank newsprint, blotter, etc.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Paper towels</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plastic buckets and trash cans</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water hoses with spray nozzles</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brooms and dustpans</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mops, buckets, sponges</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Monofilament nylon (fishing) line</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hard hats</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rubber boots</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rubber and/or plastic aprons</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gloves (rubber/leather)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Protective masks/glasses</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Photographic equipment/supplies</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Portable toilets</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Construction materials (wood, screws, nails)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ladders</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Extra security personnel</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

F. Daily Upkeep Checklist

The following should be checked during opening and closing procedures, and included in overnight security patrols.
Keys are secure and accounted for
Vaults and safes are secured
Doors that are supposed to be locked are locked
Evidence of tampering with locks or access points
Evidence of tampering with major utilities
Anyone hiding in the building
Central panels or local monitors for trouble indicators
Doorbells, buzzers, intercom are working
Lights are working (including emergency lighting)
Surveillance equipment is operating
Alarms are armed or disarmed as required
Equipment is operating properly
  HVAC
  Water tanks
  Pumps
  Special equipment

Unusual or off-hours activity
Construction/renovation areas
Unusual smells or sounds
Evidence of water leakage (walls, ceilings, floors)
Known problem areas
Refrigerators and freezers are plugged in and operating
Small appliances are unplugged
Sinks and toilets are in working order

G. Weekly Upkeep Checklist
Emergency numbers are posted near every telephone  
Fire extinguishers are updated and operable  
Smoke and/or heat detectors are operable  
Sprinkler system is operable  
Water detectors are operable  
Halon or other fire suppression system is operable  
Fire alarms are operable  
Internal detection devices are in working order  
Internal alarms are in working order  
External detection devices are in working order  
External alarms are in working order  
Back-up systems have been tested  
Emergency lights  
Power  
Alarm panels  
Incident reports have been reviewed  
All keys are accounted for  
Flashlights are operable  
(one in each dept., public desk, and civil defense shelter)  
Transistor radio is operable  

H. Other Emergency Issues  
Date of last fire drill:  
Frequency:  
Required? (Y/N)  
Next scheduled date:  

Date of last inspection by local fire department:  
Frequency:  
Required? (Y/N)  
Next scheduled date:  

Date of last civil defense drill:  
Frequency:  
Required? (Y/N)  
Next scheduled date:  

Date of last analysis/update of insurance coverage  
Frequency:  
Required? (Y/N)  
Next scheduled date:  

Photographs of interior and exterior stored off-site? (Y/N)  
Frequency:  
Required? (Y/N)  
Next scheduled date:  

Is there an off-site record (microform, computer tape) of the collection? (Y/N)  
Frequency of update:  
Location:  

(Insert copies of last inventory report and insurance policies here)
I. Salvage Priorities

Compile a list of items that should be salvaged first following a disaster for each department, area, and/or office. Keep these considerations in mind when setting priorities.

- Is the item critical for ongoing operations of the institution?
- Can the item be replaced?
- Would the cost of replacement be more or less than the cost of restoring the object? (Replacement cost figures should include ordering, cataloging, shipping, etc. in addition to the purchase price.)
- Is the item available in another format, or in another collection?
- Does the item have a high or low collection priority?
- Does the item require immediate attention because of its composition (coated paper, vellum, water-soluble inks)?

J. Procedures

Compile and attach a detailed list of procedures to be followed in case of disaster. These should accommodate your institution's particular needs and collections. Consult the NEDCC Technical Leaflet "Emergency Management Bibliography" for sources of information.

Acknowledgements

This material is based on statewide disaster plans developed by the State Libraries of Wyoming and Iowa, and "Guidelines for Protecting Your Organization's Memory From Disaster," by H. Holland, Provincial Archives New Brunswick, and is used with their kind permission.
EMERGENCY INSTRUCTION SHEET

This sheet should contain in brief and easy-to-read steps all the instructions that any staff member, volunteer, or student needs to follow in case of an emergency affecting the collections. Copies of this one-page sheet should be posted near all staff telephones and at public service desks. All staff should receive instruction in its use. Examples of what it might contain are listed below.

FIRE

1. Call Fire Department Phone _______________________

2. Assist in evacuation of building

3. Notify
   - Disaster response leader Phone _______________________
   - Immediate supervisor Phone _______________________
   - Library Director Phone _______________________

WATER

1. Call
   - Disaster response leader Phone _______________________
   - Plumber/facilities staff Phone _______________________
   - Immediate supervisor Phone _______________________

2. Cover stacks with plastic located OR
   Move books higher on shelves OR
   Move books off shelves using a booktruck OR
   Carry books to another location.

Continue to list brief instructions relevant to the building, collections, and location. Make them clear, so that even excited staff will understand and know what to do.

Acknowledgements

Modified from a document kindly provided Sally Buchanan, 1992.

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DISASTER PREPAREDNESS

Updated: Monday, March 31, 1997

Records custodians may think of disasters as large, catastrophic events such as tornadoes or floods—dramatic natural events over which there is little, if any, control. Yet many disasters are events that only affect records within a single repository. But whether large or small, disasters can threaten the security of records. A single fire or flood can erase substantial portions of a community’s unique recorded history.

Caretakers of official records are responsible for safeguarding holdings from all varieties of threats. Preparing for disasters requires an ongoing commitment to:

- Reduce potential risks.
- Develop a plan of action for response to disasters.

To prepare for a disaster, we must first become aware of the potential dangers records face.

FIRE

Fire is a serious threat to records. Even if records do not burn completely, heat from the fire can char paper and melt plastic, rendering paper documents, photographic film, and audio, video, and computer tapes unintelligible. Smoke and soot leave behind odors and stains. Moreover, firefighting efforts may do considerable damage to records, from both the pressure and quantity of water used to extinguish a blaze.

ARSON

Arson is the single greatest cause of fires in records repositories throughout the United States. Because records centers represent government, they may be targets of deliberate or random violence. In some cases, the arsonist is someone known to staff. Arsonists may use whatever combustible material is to hand or they may collect combustible material and bring it to their chosen site.

Take all threats of arson seriously and immediately report them to the police. If the threat is made by telephone, carefully record details of the call. Monitor any areas in your building where individuals can linger without the supervision of staff. Install intruder alarms and make sure that they work. Test all alarm systems frequently. Sometimes incendiary devices are thrown through windows; an intruder alarm may be the first defense against fire.

Fires from Small Appliances

Portable electric heaters and coffeemakers are common sources of fires. Their high electrical demand frequently overloaded older wiring, and they are often accidentally left on after staff have gone home for the day. Restrict coffeemakers to break rooms or other areas away from records. Check appliances frequently and verify that they are unplugged at the end of the day.

Smoking and Fire Risk

Smoking within a records facility is unrelated to any function or operation, and literally brings fire into the building. Prohibit smoking within all record centers and courthouses for the protection of records and for the health and safety of individuals.

WATER DAMAGE

Water distorts paper and causes ink and other media to run or even disappear. Wet records can grow mold within 48 hours, so even a small water disaster requires a prompt response.
Pipes

Water pipes typically run throughout a building and may well be located directly over areas where records are stored. Any water from a leaking pipe will run to the lowest level in the building, making all areas beneath a leak susceptible to damage. Know where pipes run directly over stack areas.

Do not store records in boxes directly on the floor. Set boxes on pallets (plastic, if possible) that are 5" higher than floor level. Install water alarms in basements or other low-level areas to warn of rising water during times when the building is closed. Link all alarm systems to a security office or other location that is staffed 24 hours a day.

Alert all staff to the location of water cutoff valves within the building. Ensure access to these valves at all times. If it takes an hour to find a person who knows how to turn off the water, then what started out as a simple job for a mop and bucket can develop into a major flood.

Keep rolls of plastic sheeting handy to cover shelving and cabinets in the event of a leak. Do not, however, use plastic sheeting as a permanent covering for records; it will prevent good air circulation and create a potential climate for mold.

Immediately air dry or freeze wet records to prevent further damage and mold growth. Being prepared for disasters means developing contacts with the appropriate consultants and vendors beforehand, not after the fact.

The Roof

Know the age and current condition of your roof. Roof weaknesses are usually discovered in the middle of a rainy season, just when protection is needed most. Regularly inspect roofs and roof drains to ensure that they are not clogged. Note that flat roofs tend to collect debris which may clog the drains.

Roofs have limited life spans. If your roof was guaranteed to last 15 years and has passed its tenth year, begin making plans to replace it.

RENOVATION

Statistics indicate that disasters are more likely to occur when a building's mechanical or structural systems are being renovated. Construction projects also provide workers access to stack and storage areas of the building, reducing records security. Do not permit workers to wander freely about the building. Ensure that fire detection and security systems remain active at all times during any renovation project. Be involved in your renovation project.

Coordinate your institution's day-to-day work with the work of the renovation. Allow staff to share their concerns about the project. Transfer records to a safe location before work begins.

SECURITY

Unfortunately, theft is a common threat to records. To prevent thefts:

- Establish written policies that stipulate exactly how a user may interact with records.
- Never permit users to browse stack areas and retrieve records for themselves.
- Do not label a record box with a list of contents; a user who gains unauthorized access will readily find whatever item is sought. Label record boxes with location numbers known only to staff. Exclude location information from user finding aids.
- Limit the number of records that a user can view at one time.
- Photocopy or microfilm popular historic records and limit access to the originals.

By providing controlled access for current users, you help to ensure availability of records for future generations.

YOUR DISASTER PLAN

After potential risks have been assessed, the next step in preparing for disasters is to develop an organized plan for responding when a disaster actually occurs.

This plan will include:
• Locator maps for firefighters that show the location of vital records within the building.

• A telephone tree of staff and volunteers from your community who can be counted on to provide help in the event of a disaster. Include contacts within the Georgia Department of Archives and History.

• An inventory list of emergency supplies and their location.

• An established chain of command for coordinating the recovery effort, based upon tasks to be performed.

• The names and telephone numbers of your pre-established contacts at freezer storage and disaster recovery services.

Update your plan annually, and distribute copies of the disaster plan to all staff. Remember to keep a duplicate copy of the plan at home. Your recovery plan will be of no use if it burns up inside your desk at work. Practice and reevaluate your plan regularly.

MICROFILMING VITAL RECORDS

Even the best-laid plans cannot prevent every possible disaster from happening. Accordingly, the safest way to secure the information in records is to create another copy to store off-site. Microfilm all vital records. Be sure to include inventories and finding aids which are a part of your vital records.

BACKING UP COMPUTER RECORDS

Create backup copies of all computer records. Store the backup copy off-site in a secure location.

RESOURCES AND PUBLICATIONS

Preparing for disasters requires an ongoing commitment to ensure that potential risks are minimized and that a workable plan exists for active response. Even a small disaster can deprive today’s Georgians and future Georgians of a significant portion of their history. For more information, please call 404-656-3554 to contact the Conservator at the Georgia Department of Archives and History, a division of the Office of Secretary of State.

OTHER RESOURCES


Order from: Publications Distribution Center, P.O. Box 2012, Jessup, MD 20794.

Telephone: 1-800-480-2520.


Available from: Publications and Distribution Staff (NEDC) RM. G-9, National Archives, Washington, DC 20408.
CONSIDERATIONS FOR PRIORITIZING

by Sherelyn Ogden
Head of Conservation
Minnesota Historical Society

Most institutions have many preservation needs that require a variety of actions to meet. Resources in an institution are always limited and every action cannot be accomplished. It is crucial to determine which actions are the most important so that those receive consideration first.

Prioritizing is the process of deciding which actions will have the most significant impact, which are the most important, and which are the most feasible.

Systems of risk assessment and management are being developed. These offer a highly pragmatic approach as is required by the large and diverse natural history collections for which they were first developed. These are geared toward setting collection care priorities and, when coupled with the complementary systems of collection profiles and categories of specimens, show promise for prioritizing actions. Training in this methodology is available from the Canadian Museum of Nature in the form of interactive one-and two-day workshops for institutions, groups of institutions, and organizations.

Presently the easiest way for staff of most institutions, especially smaller ones, to prioritize preservation actions is by carefully considering specific criteria, weighing appropriate collections-related factors, and making informed value judgments before reaching a decision.

CRITERIA FOR PRIORITIZING

It is helpful to consider these criteria when prioritizing preservation actions.

1. The first is impact, the extent to which an action will improve the preservation of the institution's collections. In her manual on preservation planning for libraries, Pamela Darby describes high impact actions as those that will result in dramatic improvement in the present condition of materials, substantial decrease in the rate of deterioration, substantial increase in efficiency of current preservation activities, or considerable savings of time, energy, or money. To evaluate impact, consider the following questions. To what extent will implementing a specific action improve preservation of the collections? How great is the immediate impact and what is the potential impact of implementing this action? The greater the impact of an action, the higher its priority.

2. The feasibility of implementing an action should also be considered. Actions vary in the amount of time and resources required to implement them. Some are easy to implement, while others are impossible. Factors to look at include staffing levels and expertise (availability of technical and management capability), financial implications (capital outlay, expenditures for materials and services, ongoing operating costs, fundraising potential), and policy and procedural changes (if these are required and who can make them). The political feasibility of various actions must also be realistically evaluated. If it is not likely that you can implement an action, it may be given a low priority even if its impact is high.

3. Another criterion to consider is urgency of an action. Darby explains that an action can be regarded as urgent if waiting to implement it would cause further problems or would mean bypassing an opportunity. All other factors being equal, those actions requiring immediate implementation would be given highest priority.

FACTORS INFLUENTIAL IN PRIORITIZING

The use, storage, condition, and value of the materials in the collections are influential in prioritizing actions and are important to consider.

1. The amount and type of use items receive is significant. Items on permanent exhibition have different needs from those in storage. Items that are used frequently for research purposes have different needs from those that are consulted only infrequently. Items that are used heavily or in a damaging way are at higher risk and in more urgent need of attention.
Housing of collections is important. Materials that are stored under poor environmental conditions or in harmful containers, or are susceptible to theft, vandalism, fire, or other disasters, also are at higher risk.

Those problems are particularly threatening to materials in poor or fragile condition, making the risk factor even greater for those vulnerable items. Actions that would mitigate those risks may be a high priority for implementation.

Yet another factor to consider is the value of the materials. The nature of the value of items (monetary, intrinsic, association, bibliographic), their rarity, their provenance, and their significance to the institution need to be considered.

For how long materials need to be preserved and in what form they need to be preserved are additional important considerations.

IMPLEMENTATION PRIORITIES

The implementation priorities for an institution are the most important priorities. They are the high-priority actions that are achievable. To determine these, it is helpful to consider the criteria of impact and feasibility together for each action. A device that is useful for this is a grid developed by Pamela Darling, which is shown here in a modified form. The impact and feasibility of each action are plotted on the grid shown on the following page.

Darling explains that those actions that are of high impact and can be implemented with little difficulty are placed in box #1. Those actions that have high impact but are difficult to implement go into box #3.

Those actions that are not difficult to implement but will have little impact go into box #2. Those actions that are difficult to implement and have little impact go into box #4.

Darling goes on to explain that those actions in box #1 probably deserve highest priority, since they can be easily accomplished and will have significant impact. Those in box #4 can often be postponed or even disregarded because they achieve little while requiring great effort. Many of those in box #2 can also be eliminated because they accomplish little, though some may be worthwhile because they are easy to do. Box #3 items need careful consideration; despite their difficulty, they deserve implementation because of their high impact.

FEASIBILITY

High  Low

IMPACT

High  Low

REMEMBER

One of the most difficult aspects of preservation planning is prioritizing. Planning requires significant people skills and an understanding of the organizational dynamics of the institution. Nowhere is this more evident than in prioritizing. You need to bring all your interpersonal skills to bear on discussions of priorities with your colleagues. You need to listen to what the issues of other departments are and be able to focus on what best serves the needs of the institution as a whole rather than just on the needs of your particular department or area of expertise. In the long run, this will best serve your needs as well. At the same time, you need to be a skillful negotiator and a good sales person. As with most other dealings with people, a good sense of humor will ease the process.

NOTES


5 Darling and Webster.

6 Darling and Webster, 30.

Acknowledgements

The grid was adapted and reproduced with the kind permission of the Association of Research Libraries. This technical leaflet is from Preservation Planning: Guidelines for Writing a Long-Range Plan, by Sherilyn Ogden, produced by NEHCC with the assistance of the Institute of Museum and Library Services. It is available from the American Association of Museums.

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