CHAPTER 1

An Ounce of Prevention

Basic Principles for Preserving Physical Collections

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One of the most memorable photographs taken during the devastating 2022 flooding in Lismore, New South Wales, was an image of wet and damaged books being piled up outside of the Lismore Public Library. It was shared widely online as a symbol of the destruction that nature can cause. In response, libraries and individuals around the country sent new and secondhand books to replace the ones that had been lost. Australians face large-scale natural disasters on a regular basis, from floods to bushfires, and the destruction can seem insurmountable. Although the Lismore flooding required mass restocking of the collection, many types of minor disasters are preventable to a great extent. This chapter will identify some of the dangers inherent in physical items typically held in library and archival collections (because of the materials from which they are made) and some of the most common external threats to those collections. It will also recommend best practices for

preventing or minimizing the deterioration and damage that can be caused by these dangers and threats so that costly restoration or replacements are avoided, and collections remain safe and accessible to researchers.

Specific Formats and Their Inherent Dangers

Books and Bound Volumes

The ingredients of a book or bound volume may include organic and animal-based materials. Works produced from the invention of the printing press up until the Industrial Revolution were made of organic materials—paper made from linen or cotton rags, linen thread, and parchment or leather bindings. Paper made from rag generally lasts a long time because cotton or linen has a lower level of acidity than wood pulp, which was used later to make paper. If the text block was gilt-edged, this protects the pages from dust. Leather or parchment bindings, as biological animal products, are particularly prone to "red rot" (caused by gaseous pollution), mold (facilitated by high humidity levels), or cracking (caused by low humidity levels).

From the late 19th century to the mid-20th century, books were printed on cheaper wood pulp paper, which deteriorates quickly due to the inherent acidity of the paper. A paperback novel from the 1950s, for example, now has brittle and yellowed paper.

Modern paperbacks are manufactured using glue in the binding and a plastic coating on the cover. Now that the use of alkaline paper is standard for many publishers, however, books bound in hardback using a stitched binding can be expected to last a long time if kept in stable conditions. Cloth bindings can be susceptible to mold due to the porous nature of the fabric, so their condition should be monitored.

Smaller books (up to 30 cm) can be shelved vertically, while larger volumes should be stored horizontally so that gravity does not cause their heavier text blocks to pull away from the binding. If a book is fragile or damaged, it should be housed in a box made from archival-quality board. The ideal storage environment is between 62 and 73 degrees Fahrenheit (17 to 23 degrees Celsius) and 50 percent relative humidity.

Paper Documents

Paper documents or manuscripts have followed the same manufacturing trajectory as the paper used in books. Although rag paper from the early modern era lasts far longer than paper made from wood pulp, the ink commonly used at that time was made from iron salts and tannic acid from a vegetable source, usually oak galls ("iron gall ink"). This ink worked well for writing with a quill pen, but it is acidic and can eat into the paper if not kept in an ideal environment.

Paper from the mid-20th century was subject to wartime manufacturing standards and is, therefore, thinner and of poorer quality. The standard typewriting ink of the period, however, lasts much longer than the ink used in later copying techniques.

The second half of the 20th century saw the development and expansion of office copying techniques. Stencil copiers, such as mimeograph machines (the best known used the brand name Gestetner) used a stencil to make copies. Spirit duplicators, or roneo machines, used mineral spirits to make copies and can be identified by their smell and purple-tinged ink. Modern copier toner is a polymer powder, which is fused to the paper using heat during the copying process.

The office technology that produced the worst kind of document, from a preservation perspective, was the fax machine. The thermal paper used is coated with a chemical layer (leuco dyes, organic acids, sensitizers, and stabilizers), which is designed to change color when exposed to heat. It is particularly sensitive to heat and UV light, and faxed documents from the 1980s and 1990s have been found to have faded away completely to a blank page. One of the ongoing preservation projects in many archives is to identify records on thermal paper and to copy or transcribe them to acid-free paper before they fade completely.

Paper documents should be stored in buffered archival quality manila folders or wallets. The ideal storage environment is between 62 and 73 degrees Fahrenheit (17 to 23 degrees Celsius) and 50 percent relative humidity.

Photographs

Black and white photographs are made from three components: the base layer (usually paper), the emulsion layer (e.g., gelatin or

albumen), and the image (silver particles suspended in the emulsion). Kodak developed a method for color photographs that uses three layers of emulsion for the red, green, and blue elements (Archambault 2023). The emulsion layer is particularly prone to expansion or contraction caused by fluctuations in the relative humidity of its storage environment and can easily be damaged by fingerprints. Albumen prints and color photographs are susceptible to fading caused by light exposure. All enclosures used for photographic media, including glass media (lantern slides and glass plate negatives), should have passed the Photographic Activity Test (Image Permanence Institute n.d.).

Most photographic formats benefit from cool or cold storage, although this is not always practicable for smaller institutions. If cold storage is not available, then the same environmental conditions as paper will suffice. An in-depth guide to the identification of photographic formats, with further advice on storage, can be found in the British Library's guide, *Preservation of Photographic Material* (Clark, 2021). More detailed information about preserving photograph collections is also provided in Chapter 2 of this volume.

Magnetic Media

The main preservation challenge of magnetic media (cassette tapes, reel-to-reel tapes, and VHS video tapes) is format obsolescence, as the machines required to play them are becoming scarce. The tape itself, made of plastic with a magnetic coating, is prone to mold growth in humid environments and can easily be wiped of its content if brought into proximity with a magnet. The focus of managing a collection of magnetic media currently is to transfer the content to a digital file. Until this happens, the tapes should be stored upright (so that gravity does not pull the tape off the reel) in cool storage (between 44 and 48 degrees Fahrenheit [7 to 9 degrees Celsius]), or, if this is unavailable or too expensive, in stable air conditioning.

Film

Cellulose nitrate film was produced extensively between 1889 and 1939 and used up to around 1950 for negatives and motion picture film (Clark 2021). It is particularly prone to "silvering out" if stored in

a warm or humid environment and is highly flammable. In the 1950s, "safety film" made from cellulose acetate was invented. Although less flammable, it is prone to deterioration of the acetate into acetic acid in a condition known as "vinegar syndrome." Vinegar syndrome can spread to surrounding films, so any film suffering this deterioration should be put into a separate storage area. Photographic negatives are made of the same types of film. As with magnetic media, the ideal storage is cold storage (between -4 and 50 degrees Fahrenheit [-20 to 10 degrees Celsius]). Due to format obsolescence, the priority for this media would be digitization. Any nitrate film should be digitized as a high priority, and the film should then be destroyed or stored away from other collection items in a fire-safe location. More information about the vulnerabilities of film (specifically, microfilm) is provided in Chapter 6 of this volume.

External Threats to Collections

Temperature

The ideal temperature range for books and paper documents is between 62 and 73 degrees Fahrenheit (17 to 23 degrees Celsius). The main concern is avoiding fluctuation, so it is best to aim for stability even if the air conditioning cannot be set to this level. A well-insulated building can help maintain temperature stability even without air conditioning.

Humidity

The ideal humidity range for books and paper documents is 50 percent relative humidity, plus or minus 5 percent. As with temperature, the main aim is to provide a stable environment with minimal fluctuation. Higher humidity will facilitate mold growth and is a major concern for libraries in tropical or subtropical regions. Low humidity is mainly a concern for books with leather or parchment bindings, which can become cracked in dry air. Humidity can be monitored using a digital hygrometer thermometer, available from

archival supply stores. Additional practical advice on climate control in storage environments is provided in Chapter 3 of this volume.

Particulate Pollution

The main reason books and other items should be kept free of dust is not solely to keep them pleasant for use by patrons. It is to prevent the dust from becoming ingrained and causing permanent deterioration and to prevent the dust from becoming a gateway for mold. If the environment is too humid, mold spores can grow on dust more easily than on a clean surface. The best way to prevent dust is to keep shelving and storage areas sealed from the outdoors and regularly cleaned.

Gaseous Pollution

Fumes from paint, carpet glue, or furniture polish are damaging to all formats but are a particular threat to leather bindings. These fumes cause "red rot," which causes the surface of the leather to degrade. It is irreversible and can only be allayed by clean air in the storage environment. When making renovations involving new paint or carpet, collections should be removed and not returned until at least three weeks after the work has been completed, allowing the fumes to dissipate fully.

Pests

All pests are a concern for libraries and archives, although the most damaging pests are silverfish (*Lepisma saccharinum*) and woodworms (multiple species of wood-boring beetles). An integrated pest management program should be implemented, involving regular spraying of the building, thorough cleaning, and the use of insect traps with regular monitoring. Donated items should be examined for pests and rehoused where appropriate before they are added to the collection. If live plants are used in public spaces for aesthetic purposes, the plants should be carefully monitored for pests, but, from a preservation perspective, live plants are not recommended.

Other Preventive Measures

Proper Storage

The ideal shelves are made from powder-coated steel, as they are sturdier and less prone to warping than wood. The building which houses a library should be well insulated, with good plumbing and electricity and as much climate control as possible. Ideally, the walls and roof are constructed of a material with a high thermal capacity (National Archives of Australia 2014). Although natural light may be desirable for patrons, it should never be allowed to shine directly onto collections, as the UV radiation from the sun will cause fading. Library storage areas should also have a robust fire protection system, with heat and smoke detection equipment. Doors and walls should have a two-hour fire rating.

Proper Handling

The main thing to keep in mind when handling rare books and other special collections is to move slowly, take care, and keep the items on a sturdy, flat surface. For books or bound volumes, pay attention to any damage to the binding and how tightly the volume is bound. Do not force a book to open further than it seems comfortable with. Use a cushion to support the book, and use "snake weights" to gently hold it open.

A common misconception about handling rare books is that one should use gloves. Despite widespread images of curators wearing white cotton gloves, gloves are, in fact, bad for the books. They reduce feeling in the hands so that tearing the pages, especially at the edges, becomes more likely. Clean, dry hands without gloves are best for handling rare or fragile books and paper documents. When handling photographs or any object made of metal or glass, however, wearing nitrile gloves is recommended to prevent leaving fingerprints.

Disaster Preparedness

A disaster preparedness plan can help library staff think through the risks that pose a threat to the collection and prepare them to act quickly in the event of a disaster. As climate change causes more severe and frequent weather events, the likelihood of a disaster affecting a library collection increases. A disaster management plan should outline possible risks (e.g., fire, flooding) and their likelihood, based on location and regional climate history. It should outline steps to mitigate those risks as far as possible, such as regular gutter cleaning, and list current contact information for relevant services (emergency services, plumbing, carpet cleaning). Clear instructions on what to do in the event of a disaster should be included and easily findable in the document, and staff should be trained regularly in the appropriate responses. *Be Prepared: Guidelines for Small Museums Writing a Disaster Preparedness Plan* (Heritage Collections Council, 2000) is an excellent guide to preparing a disaster management plan. Advice on developing such a plan (as well as other preservation activities) for small libraries with limited resources is offered in Chapter 4 of this volume.

Maintaining a disaster bin can help in dealing with smaller disasters, such as spills or minor internal flooding. A bin with wheels can be moved easily to the site of the disaster. It should include personal protective equipment (disposable gloves, masks, safety glasses), cleaning equipment (mops, sponges, plastic sheeting), and items for record recovery (paper towels, blotting paper).

Conclusion

It is easy to feel overwhelmed by the range of things that can go wrong. This chapter has identified some of the most common threats—both inherent and external—to the longevity of library and archival collections and offered practical advice for guarding against them. An ounce of prevention is, indeed, worth a pound of cure. With a little forethought and planning, it is possible to keep some problems at bay and address effectively those that do occur, from a spilled drink to a major flood. In a nutshell, the most important aspects of preservation are cleanliness and sturdy protection from the outdoors, which

are goals that do not require expensive measures. Even taking basic measures can facilitate the ongoing use of library and archival collections into the future.

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