

## **The Preservation of Archival Materials in Archaeological Collections**

Molly Gleeson, Emily Williams, Pam Young

Department of Conservation  
The Colonial Williamsburg Foundation  
P.O. Box 1776  
Williamsburg, VA. 23187

*Archaeologists have come to realize the importance of preserving the artifacts that they excavate. Most are familiar with the need to provide adequate environmental parameters and archival quality packing materials. However less thought is often given to what to do with the records in the collections. Archival materials such as site maps, slides, negatives and site notes form a very important part of nearly every archaeological collection. They contain information that is critical to elucidating the site both now and in the future. This paper will offer tips for ensuring the long-term preservation of this material and offer several case studies.*

Over the years most historical archaeologists have become familiar with the need to preserve the artifacts they excavate, yet there is often less awareness about the preservation requirements of the archival materials that make up the site documentation. The reasons for this are varied: archival preservation is seen as something that is the provenance of historical societies, museums and libraries not of small businesses or of universities; the material used to record archaeological data is modern and, therefore in many eyes, more likely to survive; or it is seen as a “temporary” record—something to be entered into the digital site archive or published in a site report but not necessarily to be preserved. However, archaeological documentation and archives are arguably the skeleton off of which the archaeological collections hang and should be given the same level of care as the collections themselves.

Archaeological archives are typically multi-component collections consisting of photography, film negatives, drawings, supplementary materials such as journals and field notes, and increasingly digital media. Materials may be loose or bound. Each of these materials and criteria has its own preservation needs and concerns. These needs have given rise to individual specialties and a rich literature that is impossible to compress into the scope of a twenty-minute talk. Rather than attempt to do that, this paper will summarize some of the universal needs of these collections and offer tips for extending the life of archaeological documentation.

### ***Environmental Concerns***

As with any other collection, the environment within which archaeological records are stored is one of the most critical factors in their preservation. Although environmental factors, such as temperature, relative humidity (Rh) and pests, are often dealt with individually it is very important to remember that they are interconnected and that developments in one area can affect other areas, both positively and negatively. For example a fall in temperature, can lead to a spike in relative humidity and contribute to mold growth within the collection.

### **Temperature:**

When a document is created, typically the paper on which it is written, or printed, appears to be quite healthy. However, over the years, a number of chemical processes occur that will cause deterioration—the organic dyes in inks will slowly become oxidized and may discolor, atmospheric acids will attack the fibers of the paper causing them to become brittle and prone to tearing. As with all chemical processes these changes will be accelerated by the introduction of heat. In fact, it has been suggested that every 10° F rise in temperature halves the life of paper. On the other hand, cold temperatures are not particularly good for collections either. They can cause discomfort to staff and visitors which may result in poor handling and physical damage such as tears. Finally, whenever the temperature falls the relative humidity tends to rise—a phenomenon, which may seem alien to us in the Chesapeake where winters are dry and summers are humid and moist. However, it is important to remember that Relative Humidity is an indication of the percent of water vapor in the air to the amount of water vapor it could hold if fully saturated. Cold air can hold less moisture; therefore, relative humidities tend to be higher. The optimal range for storing paper-based materials is therefore considered to be between 55° F and 64° F.

### **Relative Humidity**

Below 40% Rh the cellulose fibers in paper can become dehydrated and embrittled. As this happens, shrinkage takes place which causes buckling and distortions and tension begins to build which can cause flaking of inks or pigments. Above 70% Rh, conditions are ideal for mould growth. A Relative humidity of 65% Rh or above can promote swelling of the gelatin substrate in photographic material, which can lead to interruption of the image and can also serve as a food source for mould. Therefore, a relative humidity between 50-60% is ideal for archaeological documentation. Large and/or rapid fluctuations in Rh should be avoided. Since paper is hygroscopic the fibers will absorb moisture and expand in periods of higher humidity and contract as the rh drops. This can lead to the cracking and loss of surface material such as the emulsion layer in photographs.

While temperature is relatively easy to control, Rh is much harder. Some archaeological organizations may be fortunate enough to have HVAC systems that can regulate the humidity. Others may need to rely on a system of humidifiers in the winter and dehumidifiers in the summer. Keep a hygrothermograph in the room to give you quick visual readouts of what is happening and if possible a data-logger in order to show you trends over time. Both hygrothermographs and data-loggers should be placed at about chest height in the middle of the room to get a good reading. Make sure that they are not blocked by anything as this can result in the monitoring of only a pocket of air rather than entire room. Windows tend to promote pockets of colder or warmer air in a room and making it harder to control the space additionally they do allow air to exchange between the exterior and interior. In order to prevent this from happening, windows should be double-glazed. If that is not practical and the room is not used often, consider placing plywood boards over the interior of the window. Not only will this help to insulate the room somewhat but it will also help to eliminate light.

### **Light:**

Prolonged exposure to light can cause severe damage to archival materials such as paper, photographs, slides and negatives. Ideally, one's archive should be located either in an isolated room, where lights are off when no one is consulting the archive or they should be stored in boxes or map cases to minimize the amount of light exposure they receive. Although file cabinets may be used, acid-free document boxes are generally preferred for several reasons: they are of a standard size and afford more support for fragile documents and finding a document in one generally involves less handling (the tendency to rifle through a filing cabinet is high).

**Pollutants:**

Pollutants, from both external and internal sources, pose great risks for paper collections. Internal pollutants tend to come from acidic materials, chemicals and sizes used in the production of the paper. Cheap modern paper is often made with mechanically ground wood pulp, which has a high lignin content. The acids from the lignin attack the fibers of the paper, which becomes brittle and disintegrates. Papers with a pH of 5.5 or less require treatment by a paper conservator. External pollutants, particularly sulphur dioxide, are present in the air and can enter the archival storeroom through windows and holes. They will speed up the deterioration of the paper. As a result, windows should be kept closed and a good seal should always be maintained around any equipment such as window air-conditioning units that might penetrate an external wall. Because storage materials such as Hollinger boxes and acid free folders will absorb acids from the environment it is important to change them periodically. The rate of absorption is dependant on how heavily polluted the area is, and how well the room is sealed. If they are not replaced they can transfer acids to the documents one is preserving. Therefore it is necessary to test the pH of the storage materials one every five to ten years.

It is possible to test for Acids in papers by a number of techniques. The easiest one is to use a PH test pen (see appendix one). In the presence of acids the ink will change color. This technique is suitable for testing storage materials and for testing whether copy paper is acid-free but should not be used on archival documents themselves.

**Mold**

Dust is the most prevalent medium that supports fungal growth (Florian: 128). If there is a dust layer anywhere and the humidity rises above 70% Rh, the chances of having mold growth in that area are greatly increased. Therefore dust accumulation needs to be avoided wherever possible. Techniques for dust removal may include vacuuming with a HEPA (High-efficiency Particulate air) filtered vacuum or dusting with brushes into a HEPA filtered vacuum. The archive should be dusted or vacuumed at least once a month. Sharing the responsibility ensures that a burden does not fall on any particular person and ensures that all members of staff are thinking about the care and condition of the materials. Good air circulation and low Rh within the room will discourage mold growth.

**Pests**

Pests such as mice, rodents, silverfish and other insects can cause significant damage to archival collections. Rodents are the most destructive and the easiest to detect. They tend to chew on the materials and may take large pieces of documents to line nests with.

Silverfish are prevalent in this area and tend to eat the sizing first and then go for the paper. Cockroaches and spiders can cause damage because their droppings are acidic and can cause staining. Even bees and wasps can cause damage as they excrete oxalic acid, which can cause bleaching of the paper.

Flowers and live-plants can attract pests. These should be removed if possible. Additionally, any food-related activity should be limited to one area and the trash should be taken out at the end of the day.

Pests prefer rooms that are seldom entered and not very well maintained. One way to deter them is to have an active cleaning program. The easiest way to detect pest activity is to place sticky traps in the room near places where pests may enter. Typically placement near baseboards and windows is best. Check the trap once a month to see which insects have been caught. Record the activity so that you can compare the results month by month. Inspect shelves and drawers regularly to make sure there has not been any activity. Inspect baseboards and windows to make sure that there are no holes that can permit entry. If there are, address them as soon as possible. If there appears to be a serious problem call a pest control firm but make sure they understand the nature of the collection and the materials that comprise it so that there is no risk of pesticide induced damage. In some cases it may make sense to contact a preventive conservator and have them deal with the pest control firm as both will speak the same language and the chances for a disastrous misunderstanding will be much smaller

### *Access*

Obviously, an archive, particularly an archaeological one, that is not accessible is little better than useless. However, one must give very careful thought to who is using what, when and under what circumstances. If the same document (or even similar types of documents) is being accessed repeatedly this will of course have an effect on condition. Consider making copies of frequently accessed materials so that the copy bears the brunt of the handling and the original is preserved.

Think about where documents are being used. It makes no sense to maintain a clean, pest free environment in the documentation storage room if researchers can take the documents back to their desk and use them while eating their lunch. It is easier to control the handling of documents and limit their loss if use is restricted to one area. Copies of slides should be made for talks. Otherwise it is too easy for the slide to become part of someone's canned talk about the site or the project and never make it back into the documentation space.

### *Additional tips*

All color photography is inherently unstable, even when kept in the dark. If one wants to preserve a picture for the long-term one should use black and white film that has received additional washing to remove any excess chemicals left over from the printing and developing process. Color prints should be checked for tonality at least once every 10 years.

As more and more images and supporting materials are being created using digital techniques it is very important to consider how both the digital information will be stored and how it will be output. Digital files can quickly become obsolete unless they are migrated each time that software is upgraded. Additionally, choosing the right printer is very important. If one is planning to print color images or color diagrams, and needs them to be archival, they should be printed on a printer that uses pigment based ink rather than dye based ink since dyes are generally less stable than pigments.

Paper can suffer significant damage from rusting, paper clips, staples or pins. It is therefore best to avoid these. If documents need to be kept together consider housing them within a folder made of acid free, lignin free folder stock. If they *must* be clipped together use either brass or plastic paper clips or tie bundles of paper together with unbleached cotton tape. Do not use rubber bands. Rubber bands decompose fairly rapidly and in as little as ten years they can become sticky and gooey and cause permanent staining of the paper.

Never stack boxes of records or the records themselves on the floor. Although often done as “temporary measure” materials stacked on the floor often become semi-permanent and are at risk from leaks (from plumbing, air-conditioning or even humidification systems), flooding and even floor-cleaning activities within the building. Always make sure the boxes are at least 6 inches above the floor.

When using documents or photographs in exhibits consider the amount of light exposure they will receive over the course of the exhibit, how they will be displayed and how long they will be on display. The maximum recommended light level for paper and photographs is 50 Lux. Although 50 lux is sufficient for reading most archival material, placing the material on a dark background can make it look gloomy. Lighter walls can make it easier to see the piece because they will reflect light back to the viewer. Ideally archival material should not be on display for more than six months at a time. In order to accommodate this during a longer exhibit, many museums rotate artifacts that are on display, substituting in a new piece every six months. If this is not a possibility consider using a copy rather than an original.

Always label the side of any box used to store archival material rather than the lid. Not only is it often easier to read but it also ensures that boxes do not get mixed.

Maps should be stored flat in map cases. Avoid stacking them to high in the drawer as this can lead to damage as maps are pulled out from the bottom and shoved back in. Also in order to avoid the top map curling and getting caught in the drawer above, it may be advantageous to use small weights to hold down the corners of the map. Small pieces of polyethylene shot placed in a polyethylene ziplock bag are ideal for this as they are not too heavy and spread the weight. Oversized maps may be rolled around a large tube and supported horizontally on a shelf and racking system. The disadvantage of rolling materials is that they must be unrolled in order to be used. Generally the humidity in this region is such that if materials are left unrolled on a flat surface for 48 hours and the

corners are lightly weighted they will be sufficiently relaxed to study and use or even to store flat.

When considering archival papers look for lignin-free paper. Although a number of craft stores and even large office supply stores offer acid-free papers it is better to purchase directly from archival supply stores, such as Gaylord or University Products, as the material has been tested and shown to be archivally suitable over the long-term.

Always store like materials together. For example in a map drawer devoted to one site that may contain a mix of hand-drawings, tracings and diazo prints one would want to separate each type of material into an individual acid free folder. By containing materials and creating a barrier between them it is less likely that harmful by-products, such as acids, will be transferred from one to the other. Additionally this approach tends to be tidier and to make it easier to find documents, significantly reducing the amount of handling they receive.

Never use “scotch” tape or other commercially based pressure sensitive tapes to mend torn documents. These tapes tend to use either nitrate or acetate film carriers and rubber and resin adhesives that can transfer acids and other degradation products to the paper. Instead, use acid-free mending tapes for temporary mends. These tapes, developed for use in circulating libraries, have been extensively tested and found to be non-damaging.

If it is impossible to maintain an adequate archive consider transferring all originals to another repository and keeping a set of copies.

Site records and archives are very important and small actions and a little awareness can greatly help in their long-term preservation. In this case, an ounce of preservation really is worth a pound of cure, or its alternative!

**References:**

Florian, M.L. (1997) *Heritage Eaters: Insects and Fungi in Heritage Collections*. London: James and James.

*Appendix One:*

## **Source Sheet for Archival Materials**

### **References for Archives Preservation**

Appelbaum, B. 1991. *Guide to Environmental Protection of Collections*. Madison, WI: Sound View Press, 270 pp.

Bachmann, K. 1992. *Conservation Concerns: A Guide for Collector and Curators*. Washington, DC: Smithsonian Institution Press, 149 pp.

### **Websites with additional information:**

<http://www.nedcc.org/leaflets/leaf.htm> A number of useful leaflets on the preservation of documents produced by the Northeastern Document Conservation Center.

<http://www.archivists.org/index.asp> The website for the American society of archivists.

<http://www.archives.gov/welcome/index.html> The website for the National Archives and Records Administration

<http://www.cdncouncilarchives.ca/about.html> The website for the Canadian Council for Archives

### **Supplies**

#### **Acid Free Folders**

Folders manufactured from acid-free and lignin-free paper stock, buffered to pH 8.0-8.5 with 3% calcium carbonate.

Suppliers: University Products <http://www.archivalsuppliers.com>  
Gaylord <http://www.gaylordmart.com>

#### **Acid-Free tissue**

Contains no harmful acids. Useful bulking material for boxes, or for interleaving between materials. Buffered acid free tissue is particularly useful for documents

Suppliers: University Products <http://www.archivalsuppliers.com>  
Gaylord <http://www.gaylordmart.com>

#### **Corrosion Intercept® CD® Storage Insert**

Corrosive gasses that can adversely affect the metallic layer of CD's are neutralized, preventing the loss of data. The insert also provides padding.

Supplier: University Products <http://www.archivalsuppliers.com>

### **CD cases made of polypropylene**

Polypropylene is stable and non offgassing. It is also durable and will not crack or break easily.

Suppliers: Gaylord <http://www.gaylordmart.com>

### **Coroplast Boxes**

Made of lightweight, corrugated polypropylene/polyethylene copolymer sheets. Used for storing archival materials.

Suppliers: University Products <http://www.archivalsuppliers.com>  
Hollinger <http://www.hollingercorp.com/products.htm>  
Or contact Coroplast <http://www.coroplast.com/contact.htm>  
for distributors

### **Document Repair Tape, Filmoplast P**

Transparent mending tape that is acid free. Allows tears to be repaired without further damage. Produced under both the name "Filmoplast P" and "Document Repair Tape"

Suppliers: University products <http://www.archivalsuppliers.com>

### **PH Testing Pen**

Pen designed to test whether paper is acidic or not. Used to determine whether paper is adequate for archival storage

Suppliers: University products <http://www.archivalsuppliers.com>  
Gaylord <http://www.gaylordmart.com>

### **Slide Storage Pages – "Safe T Store"**

Polypropylene pages, which safely store board, plastic, metal or glass mounted slides. Rigid page design minimizes wear from movement.

"Ultra-strong polypropylene pockets fit slide mounts snugly, in essence locking them in place and 'suspending them in air' for all-round protection. The translucent pages are ideal for light-table viewing, so the slide does not need to be removed from its pocket."

Suppliers: University Products <http://www.archivalsuppliers.com>  
Gaylord <http://www.gaylordmart.com>

### **Addresses:**

University Products  
517 Main St, P.O. Box 101  
Holyoke, MA 01041-0101  
Tel: (800) 628-1912  
Fax: (800) 532-9281  
[www.universityproducts.com](http://www.universityproducts.com)

Gaylord Bros  
P.O. Box 4901  
Syracuse, NY 13221-4901  
Tel: (800) 488-6160  
Fax: (800) 272-3412  
[www.gaylord.com](http://www.gaylord.com)