

## EMERGENCY MANAGEMENT

### 3.6 Emergency Salvage of Wet Books and Records

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The recovery of books and records after exposure to a water-based emergency can be successful and cost-effective if staff and management are prepared ahead of time and react in a timely way. Many libraries and archives have recovered in splendid form because staff knew precisely what to do in an emergency. However, if decisions and actions are delayed more than a few hours, collections may be lost or so seriously damaged that recovery becomes a major undertaking. Funds must be diverted from other projects. Service for the public and scholars is interrupted, and public relations suffer. The key steps for a satisfactory emergency recovery include:

- Timely initial response
- A detailed disaster plan
- Educated staff
- Committed management
- Effective communication
- Quick, informed decisions

Rapid response is essential for an effective recovery effort. Paper-based collections begin to distort physically immediately after becoming wet. Books swell and distort; paper cockles; inks and pigments run; coated papers begin to adhere to one another. Materials that could be dried easily and relatively inexpensively if attended to quickly become candidates for rebinding, expert conservation, or discard. Unfortunately, many librarians believe that replacement of water-damaged materials is the best solution, only to find that many items are not replaceable. Or they are replaceable in formats that are not acceptable to users or compatible with service goals. Collections of some breadth and depth may never recover their former distinction.

If environmental conditions are poor after a water problem, mold will begin to bloom in as little as 2-3 days, developing first in the gutters and spines of bound materials, and spreading rapidly thereafter. Once established, mold is extremely difficult to control and eradicate, frequently causing problems in the facility for many months after the recovery effort is concluded.

Recovery from exposure to water is more successful if collections and facilities are stabilized as soon as possible. This means that the immediate environment must receive attention. Water must be removed; temperature and humidity controlled; and dry collections protected. At the same time, wet books and records should, in most instances, be removed from the site following accepted procedures, and stabilized by freezing.

After a serious water emergency, questions often arise that deserve attention. Are any of these materials expendable because they no longer are used, have no relationship to the current collection development plan, or have no value? Can they be purchased in another format that will be acceptable to users? Would the purchase in another format create hidden expenses in the future? For example, will there be a need to upgrade equipment, hardware, or software to access the information? Does the institution have obligations to the region or even the world's library?

For books and records that have been water damaged, there are several drying techniques which have been tested and perfected over the past decade. The selection of one or more of these depends upon the extent and severity of water damage, the composition of the materials affected, the expected use and retention of the collections, and the documented facts related to the overt and hidden costs of recovery using various drying methods. These will be described briefly with comments about the kinds of damage and the specific collection materials for which they were developed as well as the short- and long-term costs of employing them.

Advice from a preservation manager or a conservator experienced in disaster recovery can be helpful before making final decisions. If rare books or unique materials are involved, a conservator

should always be consulted so mistakes can be avoided. Successful recovery operations over the past decade have demonstrated repeatedly that if sound recovery methods are followed, it is less expensive to dry original collections than to replace them.

It is important to understand that no drying method restores collections. If time must be taken to make critical decisions and materials have distorted badly, that is the way they will look when dry. However, if collections are stabilized quickly, they can often be dried and returned to the shelves with little discernible damage.

### Air Drying

Air drying is the oldest and most common method of dealing with wet books and records. It can be employed for one item or many, but it is most suitable for small numbers of damp or slightly wet books and documents. Because it requires no special equipment, it is often believed to be an inexpensive method of drying. But it is extremely labor intensive, it can occupy a great deal of space, and it usually results in badly distorted bindings and textblocks. It is seldom successful for drying bound volumes with coated paper. The rehabilitation costs after air drying tend to be extensive because most bound material requires rebinding. Single sheets are often distorted requiring flattening and rehousing. It is not unusual for mold to develop during extensive air-drying operations. Another hidden cost of air drying is the extra amount of shelf space required for collections. Depending upon how quickly wet materials are stabilized, the minimum amount of additional space required after drying will be 20%-30%.

### Dehumidification

Drying by dehumidification has been employed for many years by business and industry to dry out buildings, the holds of ships, and mammoth storage containers. Large, commercial dehumidifiers are placed in a facility with all the collections, equipment, and furnishings left in place. Temperature and humidity are carefully controlled to specifications. This drying method is especially effective for library or archives buildings that have suffered extensive water damage to the structure itself. It can be used for collections that have suffered only slight to moderate water damage, but is not safe for water-soluble inks or pigments. Slightly damp coated paper may be dried this way if swelling and adhesion have not taken place before the process is initiated. The number of items that can be treated with dehumidification is limited only by the expertise or the equipment of the company. This drying method has the advantage of leaving the collections in place on the shelves and in storage containers, eliminating the costly step of removal to a freezer or vacuum chamber. Dehumidification is especially effective in conjunction with other drying methods and for stabilizing the building and environment.

### Freezer Drying

A modest number of books and records that are only damp or moderately wet may be dried quite successfully in a self-defrosting blast freezer if left there long enough. The temperature in the freezer must be maintained no warmer than -10 degrees F. Materials should be placed in the freezer as soon as possible after becoming wet. Books will dry best if their bindings are supported firmly to inhibit initial swelling. One method is to support books between clear acrylic "boards" with holes drilled in them to facilitate drying. The book and boards can be wrapped with a strong elastic cord which will keep them firmly supported as the books dry and shrink slightly. Documents may be placed in the freezer in stacks or spread out for faster drying. Small numbers of leather and vellum bindings can be dried successfully this way. Expect this method to take from several weeks to many months, depending upon the temperature of the freezer and the extent of water damage, because it is a passive technology. Caution is advised with coated paper as leaves may adhere to one another while drying. If items are placed in the freezer very soon after becoming wet, additional shelf or storage space will be held to a minimum.

### Thermaline or Cryogenic Drying

This is the copyrighted name for a new drying technique currently being tested and revised to meet special needs. Intended primarily for rare book and manuscript collections, the process was developed to address the difficulty of drying large numbers of rare books bound in leather or vellum. It employs blast freezers at very low temperatures and is an advanced variation of the Freezer Drying method described above, using sophisticated technology to hasten the drying in a more active approach. Because books receive a great deal of individual handling to ensure the most

effective drying with the least amount of damage, this process is the most expensive of the drying methods. It is safe for water-soluble media and for coated papers. As with vacuum freeze drying, if carried out properly, Thermaline Drying never distorts materials as a result of the process.

### **Vacuum Freeze Drying**

This process calls for sophisticated equipment and is especially suitable for large numbers of wet books and records as well as for water-soluble inks and for coated paper. Frozen books and records are placed in a vacuum chamber. The vacuum is pulled, a source of heat introduced, and the collections, dried at temperatures below 32 degrees F, remain frozen. The physical process known as sublimation takes place--i.e., ice crystals vaporize without melting. This means that there is no additional wetting, swelling, or distortion beyond that incurred before the frozen materials were placed in the chamber. If materials have been stabilized quickly after becoming wet, very little extra shelf or storage space will be required when they are dry. 10% additional shelf space is a sound estimate to use for planning.

Many coated papers can be difficult to dry without adhering once they are wet. Because it is nearly impossible to determine which paper will block, all coated papers should be treated the same way for the purpose of vacuum freeze drying: before any drying takes place, and ideally within six hours of exposure, materials should be frozen at -10 degrees F or lower. They may then be vacuum freeze dried with a high potential for success. Rare and unique materials can be dried successfully by vacuum freeze drying, but leathers and vellums may not survive. Although this method may initially appear to be more expensive because of the equipment required, the results are often so satisfactory that additional funds for rebinding are not necessary, and mud, dirt and/or soot are lifted to the surface, making cleaning less time-consuming. If only a few books are dried, vacuum freeze drying can be expensive. However, companies that offer this service are often willing to dry one client's small group of books with another client's larger group, reducing the per-book cost and making the process affordable.

### **Vacuum Thermal Drying**

Books and records that are slightly to extensively wet may be dried in a vacuum thermal drying chamber into which they are placed either wet or frozen. The vacuum is drawn, heat is introduced, and the materials are dried just above 32 degrees F. This means that the materials stay wet while they dry. This method is used extensively in the food industry for freeze drying certain foods. It is an acceptable method of drying wet records that have no long-term value. The method often produces extreme distortion in books, and almost always causes blocking of coated paper. For large numbers of collections, vacuum thermal drying is easier than air drying and almost always more cost-effective. However, extensive rebinding or recasing of books should be expected as should the need for expanded shelf or storage space.

### **How to Air Dry Wet Records**

Wet records may be air dried if care is taken to follow guidelines suggested by preservation experts. The technique is most suitable for small numbers of records that are damp or water damaged only around the edges. If there are hundreds of single pages, or if the water damage is severe, other methods of drying will be more satisfactory and cost-effective. Stacks of documents on coated, or shiny, paper must be separated immediately to prevent adhesion, or they must be frozen to await a later drying decision. Care must be taken with water-soluble inks as well. Records with running or blurred inks should be frozen immediately to preserve the written record. After the items are frozen, conservators can be contacted for advice and assistance.

If records must be air dried, the following steps will help achieve satisfactory results. Wet paper is extremely fragile and easily torn or damaged, so care must be exercised. Once wet, records will never look the same, and at least some cockling should be expected.

1. Secure a clean, dry environment where the temperature and humidity are as low as possible. The temperature must be below 70 degrees F. and the humidity below 50%, or mold will probably develop and distortion will be extreme.
2. Keep the air moving at all times using fans in the drying area. This will accelerate the drying process and discourage the growth of mold. If materials are dried outside, remember that

prolonged exposure to direct sunlight may fade inks and accelerate the aging of paper. Be aware that breezes can blow away single records. Train fans into the air and away from the drying records.

3. Single leaves can be laid out on tables, floors, and other flat surfaces, protected if necessary by paper towels or clean, unprinted newsprint, or clotheslines may be strung close together and records laid across them for drying.
4. If records are printed on coated paper, they must be separated from one another to prevent them from sticking. This is a tedious process that requires skill and patience. Practice ahead of time will prove useful. Place a piece of polyester film on the stack of records. Rub it gently down on the top sheet. Then slowly lift the film while peeling off the top sheet. Hang the polyester film up to dry on a clothesline using closepins. As the document dries, it will separate from the surface of the film, so it must be monitored carefully. Before it falls, remove it and allow it to finish drying on a flat surface.
5. Once dry, records may be rehoused in clean folders and boxes, or they may be photocopied or reformatted in other ways. Dried records will always occupy more space than ones that have never been water damaged.

### **How to Air Dry Wet Books**

Air drying is most appropriate for books that are only damp or wet in limited places such as along the edges. Books that are soaking wet should be frozen and vacuum freeze dried to minimize cockling of pages and distortion of the text block and binding. Books containing coated paper should be frozen while still wet and vacuum freeze dried for best results. Books with running or blurred inks must be frozen immediately to preserve the contents.

Refer to steps 1 and 2 in the section How to Air Dry Wet Records.

1. Interleave every few pages, starting from the back of the book, turning pages carefully. For interleaving, use paper towels or clean, unprinted newsprint. Be careful to avoid interleaving too much or the spine will become concave and the volume distorted. Complete the interleaving by placing clean blotter paper inside the front and back covers. Close the book gently and place it on several sheets of absorbent paper. Change the interleaving frequently. Turn the book from head to tail each time it is interleaved.
2. When books are dry but still cool to the touch, they should be closed, laid flat on a table or other horizontal surface, gently formed into the normal shape, with convex spine and concave front edge (if that was their original shape), and held in place with a light weight. Do not stack drying books on top of each other. In no case should books be returned to the shelves until thoroughly dry; otherwise mold may develop, particularly along the gutter margin.
3. Dampness will persist for some time in the gutter, along the spine, and between boards and flyleaves. This is particularly true of volumes sewn on an oversewing machine. Check often for mold growth while books are drying.
4. If the edges of the book are only slightly wet, the book may be stood on end and fanned open slightly in the path of a flow of air (as from a fan). To minimize distortion of the edges, lay volumes flat under light pressure just before drying is complete. Paper or cloth-covered bricks work well for weights.
5. If you can establish an air-conditioned room capable of maintaining a constant relative humidity of 25 to 35% and temperature between 50 and 65 degrees F, books with only wet edges can be dried successfully in approximately two weeks without interleaving. Do not try to dry books printed on coated paper by this method. In most cases, the only chance of saving such books is to freeze them while they are wet and dry them by vacuum freeze drying.

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