Disasters: What Bad News. What Good News

November 4, 1986, is the, twentieth anniversary of the Florence Flood. In the two decades since much has been learned about disaster recovery to assist those of us with responsibility for the preservation of cultural property, whether it is collected in museums, libraries or archives. The bad news is that disaster recovery has been learned on the job in response to calamitous events. The good news is that techniques have been developed, particularly for large numbers of paper-based collections, which offer the possibility of acceptable, even amazing recovery. Major disasters in the last few years have contributed enormously to this basic knowledge. Fires in libraries like the Los Angeles Public and the Dalhousie Law Library, and floods from Corning Museum and Library to the Stanford University Libraries to the Chicago Historical Society, tragic and challenging as they were, have offered important lessons. This paper will concentrate on those new methods for saving wet books and manuscripts, but the work by Klaus Hendricks, Debbie Norris and James Reilly will equally assist in the salvage of film-based media. Perhaps these innovations can someday be extended to include additional mass recovery procedures for works of art and artifacts so that there is a full body of tested knowledge to cover all our cultural heritage.

Damage from Disaster

The most consistently troublesome damage to books and manuscripts is caused by water. Even if fire is present, water will obviously also be involved, whether from sprinkler systems or fire hoses. Floods and weather-broken pipes, damaged roofs, leaky air-conditioning systems, garden irrigation, and human carelessness have all caused major water damage to collections in the past five years. Add to this the toll taken by fire and the results are sobering. 70% of all library fires are arson, including the horrendous one at the Los Angeles Public Library. Many facilities are not protected by sprinkler systems because we have been wary, and rightfully so, of damage from faulty sprinklers. But it is becoming increasingly clear that a single sprinkler or two could put out a fire which becomes fully involved and damages material far beyond what the sprinkler might have done. In addition recovery from water damage is far more assured than from fire. We all would be well-advised to examine protection systems carefully to select one which best suits the collections for which we are responsible, whether it is centrally-wired smoke and particle alarms, gas-based protection, or a variety of water based ones.

Two facts can be stated with certainty about water-damaged book s and manuscripts. In the presence of oxygen they will start to swell and will continue to distort until stabilized. And in the presence of temperatures over 70 degrees F and 65 percent relative humidity they will develop mildew after 72 hours, and sometimes before. Additionally, coated paper can be lost if it is not attended to within six to eight hours after wetting. Time and the right approach are of the essence in minimizing damage and ensuring acceptable results. There are numbers of fire publications available, and an extensive bibliography by Toby Murray of the University of Tulsa, which provide information about the logistics and techniques of disaster recovery. I would like to concentrate on two aspects for books and manuscripts. The first is stabilizing materials. The second is new methods for drying.

Disaster Recovery

Once books and manuscripts are wet, it is important to stabilize them to prevent further distortion, growth of mildew, running of inks, and the blocking of coated paper. This can be done in a variety of ways depending upon the amount and the

resources available. But putting them into as cold and dry an environment as possible is the key. If they are few in number and air-drying is to be attempted, the right drying technique combined with the proper environment will result in an acceptable though not necessarily aesthetically pleasing outcome

If materials are sodden and the numbers are large, the only sensible approach is to freeze them. Books and manuscripts can stay frozen for long periods of time with no noticeable damage, and may actually dry out very slowly in some cases. Freezing also retards the growth of mold spores. If frozen soon enough, i.e., within six to eight hours, coated paper can often be prevented from blocking. It is important to use a blast freezer, if possible, where temperatures are below minus twenty degrees F. This ensures small ice crystals and quick freezing, thus reducing the possibility of damage to the cellulose structure itself. Having the collections stabilized and safe then allows for intelligent and careful decisions about further recovery and conservation

Books, cloth, boards, and paper seem not to be harmed by careful handling and freezing. Leather and vellum are less sanguine. After wetting, old leather in particular tends to swell and then shrink with disastrous effect on boards and bindings. It is often difficult if not impossible to restore it. Vellum maintains a more open mind and with care can be recoverable if it has not been reduced to a gelatinous condition. Freezing of both leather and vellum appears, at least superficially not to contribute further to deterioration and buys time for careful decision making.

The methods for air-drying are described by Peter Waters and by Wilman Spawn in detail in several publications listed in the Murray bibliography, so they need no further explanation. Instead, looking at the newer techniques of freeze-drying, vacuum thermal-drying and vacuum freeze-drying will shed some light on them as choices. All are useful and one may be more appropriate than the other based on materials circumstances, damage, and fiscal resources.

Freeze-drying is the technique of drying items under controlled conditions in a freezer adapted for the purpose. This is particularly appropriate for a moderate number of books (up to 500) or documents which have not suffered severe water damage and where air-drying is not possible or necessarily the best method. The process is slow but effective if guidelines are followed. Cost is relatively low after the initial investment of the freezer. Material may be removed easily during the drying process from the freezer for examination and treatment. However, loss of coated paper due to blocking may be a problem.

Vacuum thermal-drying takes place in a vacuum chamber into which a source of fairly high heat is introduced. The materials may be placed in the chamber frozen, but thaw as they gradually dry. The length of the drying cycle depends upon the sophistication of the vacuum equipment, the heat, the kind of material, and the amount of water to be pulled. Cost is more than in freeze-drying because of the equipment required, but large amounts of material can he dried this way. There is some distortion of bound material, and leather and vellum do not react well to the cycling of heat. Unbound records dry quite well, although cockling may be a problem. Water-soluble inks may be lost, and coated paper tends to block irretrievably. This kind of drying may be entirely suitable for material valuable for its information, but with no intrinsic artifactual value. Examples are business records, books collected for relatively short term use such as in a public library, easily replaced items, newspaper collections, and so on.

Vacuum freeze-drying also takes place in a vacuum chamber, where a low source of heat is usually introduced to encourage drying. The difference lies in the fact that there is a greater vacuum pulled, the internal heat of the material is low, the frozen material never thaws, and the physical process of sublimation takes place. In other words, the, ice crystals pass directly to water vapor, which is collected on a cold panel in the chamber, and melted off after the material is dry and removed. The advantages of vacuum freeze drying for books and paper are that there is less distortion, less

apparent damage to leather and vellum, reduced loss of water-soluble inks and a good recovery rate for coated papers. The disadvantage is that the process is more costly because of the equipment and power required. The process is especially appropriate for research collections, rare materials, and the unique items found in archives and historical societies.

A word of caution is appropriate here. Vacuum chambers do not restore materials. The physical condition material is in when placed in the chamber will be the same when it is removed, except of course it will be dry. Badly distorted, mildewed, stained, smoke-and fire-damaged collections will still be badly distorted, stained and damaged. The initial response to a disaster, and the time and care taken to move swiftly and correctly contribute tremendously to an acceptable recovery.

The three described methods of drying water-damaged collections offer greater opportunity for recovery from disaster than ever before. More testing and experimentation continue as disasters force us to find better ways of coping creatively. New techniques of dealing with blocked, coated paper, leather, vellum and other materials will contribute to the literature of disaster recovery to provide sound and satisfactory results for the collections we are charged with preserving.

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