Contingency Planning for Cartographic Archives

by GILLES LANGELIER and SANDRA WRIGHT

In the past few years, there have been several serious emergencies in such cultural institutions as archives, records centres, libraries, galleries and museums. While these disasters have reinforced in the minds of curators and administrators alike the potential for the large-scale destruction of their precious and irreplacable collections, most institutions have been singularly unenthusiastic about contingency planning. This negativism is due partly to the fact that most archives in times of constraint prefer not to allocate a large portion of their manpower and budgets to the development of contingency plans which may never be used and partly to the perception that disaster planning is a difficult, thankless task with more than its share of headaches. Thus, many curators and administrators appear to trust that when the unthinkable does happen, it will happen to someone else.

Unfortunately, the odds are that eventually most archives will be the victims of a serious emergency that requires time-consuming, involved and expensive salvage operations. The simplest definition of a disaster is "an event whose timing is unexpected and whose consequences are seriously destructive."[1] The disaster may be a fire, an extensive water spill caused by a broken main, or wind and water damage from a serious storm; it may be an "act of God" in the case of an earthquake or a flood or an "act of man" in the case of severe vandalism. The agent damaging archival collections may be fire, smoke, water, mud, oil, sewage or even shattered glass.

It is difficult to comprehend the shock and utter confusion in an institution experiencing such a disaster if no contingency planning has been carried out. To meet any serious emergency in an archival institution it is absolutely necessary that there be a clearly drawn contingency plan and a team of archivists who understand their functions in a disaster. In the words of Hilda Bohem, a librarian with the University of California and the author of one of the most helpful guides to contingency planning, "the first battle is won if well-prepared members of a disaster recovery team can move to appropriate action the moment a disaster strikes."[2] The

---

1 Hilda Bohem, *Disaster Prevention and Disaster Preparedness (Berkeley: University of California, 1978)*, p. 1.

2 *Disaster Prevention*, p. iii.

quick action and careful handling of materials by staff who understand the disaster plan can result in a far higher percentage of collections salvaged and in far lower restoration costs.

Every institution involved in the preservation of archival collections should have a contingency plan based on the requirements perceived by the curators responsible for the holdings, not on the wishes of the administrators. This is not to say that all the different areas of the archives should not be involved in planning for a disaster. Ignoring the administrative and technical operations can result in the development of "adversary relationships" which will work against the smooth development of an effective, institution-wide contingency plan.[3] But the impetus must come from the curators who know their collections' physical state and sensitivities and who can decide what priorities for salvage must be set.

The purpose of the contingency plan should be "to create the operational mechanisms to cope with a serious emergency."[4] The plan should have as its first aim the development of an attitude of readiness so that all staff members are aware of what might happen in an emergency, what their roles will be and who will be in charge; it should also give clear, step-by-step instructions for the stabilization of collections and their recovery after a disaster strikes. The plan should not be primarily concerned with the evacuation of people and their safety since most institutions already have instructions for the efficient movement of staff and patrons in the event of an emergency. The keystone of the plan should be that contingency planning is based on two fundamental concepts—disaster prevention and recovery operations. Consequently, the contingency plan is not merely a document to be dusted off in times of crisis, but rather an integral part of the day-to-day operations of the archives. Indeed, it is this ongoing characteristic which can determine the success or failure of the plan since there is a strong temptation after the completion of the final draft of the document to downplay the continuing preparedness aspects as less crucial to the operations of the archives than its normal, existing programmes.

The steps followed in the development of a contingency plan for an archives are essentially the same from institution to institution although naturally the document must be tailored to fit the particular administrative and operational requirements of each specific archives. To start, it is recommended that a small working group of staff representative of all the curatorial, conservation, property management, personnel, and financial services areas be constituted. In small institutions, this group may actually consist of a few people who have several responsibility areas. In other cases, small institutions may choose to band together and share expertise in the development of regional contingency plans that can be applied to several archives. Following this approach makes it possible for institutions with, for example, no in-house expertise in conservation to make use of facilities and knowledge from a neighbouring archives. Once the group has been assembled, a

---

3 Richard G. King, "Development of a systemwide disaster plan," Paper presented to the 43rd Annual Meeting of the Society of American Archivists, p. 6.

4 "Archives Branch Contingency Plan," unpublished report of the Conservation Committee of the Public Archives of Canada, July 1981, p. 2. The Archives Branch Contingency Plan was prepared by Sandra Wright in cooperation with Duncan Cameron, Gilbert Gignac, Micheline Morisset, Dawn Monroe, Raymond Tremblay and Peter Yurkiw.

good, basic model of a contingency plan is needed. One of the best guides available is Bohem's work which can easily be adapted to suit almost any archival institution, regardless of size and complexity of organization.

The Bohem model highlights the two organizational structures that must be developed for the prevention and recovery aspects of the contingency plan. She recommends the formation of two distinct units – the disaster prevention team and the disaster action team. The disaster prevention team is responsible for doing the groundwork to ensure that the staff of the archives are prepared for any eventuality and that emergency supplies and facilities have been located. Some more specific responsibilities of this group might be: to ensure that quarterly checks of fire and safety protection equipment are made; to set up regular visits by local fire fighters; to prepare, update, and distribute lists of members of the prevention and action teams, resource persons such as plumbers and electricians who can be called on in the event of an emergency, and emergency facilities and supply sources; to establish lockable emergency cabinets in stack areas; to establish stock piles of supplies to be used immediately in the initial stages of a recovery operation; and to arrange for staff to be educated in a wide variety of disaster-related subjects, from proper use of fire extinguishers to first aid and cardiopulmonary resuscitation (CPR) training to management of employees in high-stress situations. This group must be tied into the existing organizational structure of the institution with a requirement that it report in writing regularly to management to ensure that the prevention activities are being carried out as planned. It cannot be stressed too strongly that all of the lists of staff, resource people, emergency facilities, and suppliers to be notified in case of emergency must be kept updated. Furthermore, any contingency recommendations made by curators regarding their collections must be followed up on a regular basis to ensure that something is being done about their implementation.

The disaster action team is a small, cohesive group of people and their alternates identified far in advance of any emergency so that everyone in the institution will be aware of who will be responsible for what duties and who will take over what functions during and after a disaster. In larger institutions this group would consist of a recovery director, a curator involved in conservation or a trained conservator, a cataloguer or control archivist, representative archivists who have great familiarity with the collections, and a staff member who can provide expertise in such administrative, technical support areas as building services, staffing, procurement of supplies and so on.

In smaller institutions, it might be possible to get alternate members for this group from other archives in the region so that in the case of an emergency there would always be someone of particular expertise available. The key person on the disaster action team is the recovery director who is in charge of the whole operation from start to finish but who is freed from involvement with the continuing operations of the archives. It is absolutely crucial to the success of the recovery operation that there be one person in charge at all times and that there be no interference from the existing organizational structure. Therefore, it is very important that time be spent in advance of any disaster drawing up a list of possible candidates for the post of recovery director. The candidates may come from the archives itself or from another cultural agency. It is a definite advantage if the persons on the list of candidates have a background in conservation, but this is not

the most important characteristic of a good recovery director. Above all, the person chosen must have proven abilities as an administrator, must be able to manage successfully a major, complex project which may well last for several months. Close consultation between the recovery director and the management of the institution is necessary at all stages of the salvage operation, but it must be stressed again that, aside from reporting to the most senior levels of administration in the archives, the director is most effective when completely free from normal administrative duties.

Once the organizational structures have been set up and everyone knows who will be involved in a recovery operation, the next stage of contingency planning is to draw up the step-by-step procedures to be followed in case of a disaster. First and foremost is the emergency notification system: who gets called and by whom? Here, it is essential that there always be alternates available so that the proper areas of the archives and the members of the disaster action team can be reached at all times. During the actual emergency itself, liaison with fire and police authorities must be maintained and this function should be clearly delegated to one staff member. It is important to impress upon fire and police personnel that the recovery team members must gain access to damaged stack areas as soon as it is safe in order to begin the salvaging of materials. This is particularly crucial in the case of water-damaged collections since the general rule of thumb for paper is that after 48 hours mould and mildew start to spread through the materials; this "safe" period will be shortened considerably if the disaster takes place during the hot, humid days of summer or if non-paper collections such as oil paintings, photographic films, and tapes are involved. At the same time, while gaining early access to damaged areas, it is absolutely necessary to establish and maintain tight security against theft or vandalism and to prevent people from wandering into dangerous areas and harming themselves or the collections.

The next stage of the contingency planning deals with the actual recovery of damaged collections. When preparing for a disaster, it is best to assume that the absolute worst situation will arise. If the resultant plan permits staff to deal with catastrophe, then it will also help them manage a mere disaster! To simplify the step-by-step description of the recovery operation, it is also a good idea to base the plan on specific types of damage, not causes. Since most archival disasters will involve water whether as the cause of the emergency or as a control agent, it is therefore wise to develop a plan for the recovery of water damaged collections. The first step in the actual recovery operation is an assessment of the level of damage as soon as the fire and police authorities permit access by the archives staff to the involved stack areas. It is worthwhile having a photographer stand by at this stage and during the later steps of the recovery operation to record the type and level of damage. Once the damage has been assessed, then the evacuation of collections should be carried out in a logical, planned manner. Here, as in all stages of the recovery operation, the guiding rule should be "Make haste slowly!" All of the collections housed in the damaged stack areas should be removed, particularly where water damage has occurred, in order to ensure that mould and mildew do not spread into documents not initially harmed. While the assessment and evacuation procedures are being carried out, a designated member of the "disaster action team" should be contacting the emergency facilities and suppliers that have been identified previously as part of the prevention side of the plan so that the recovery of the damaged collections can continue with no delay; these facilities might include

secure space in which documents can be spread out for drying, freezers or refrigerated trucks, vacuum drying chambers, and photographic laboratories for reprocessing water-damaged films. Attempts should be made to reinstitute the environmental controls in the damaged stack areas as soon as possible. The relative humidity must be lowered through the drainage of standing water and the use of extra fans if an air conditioning system is not functional and ventilation must be increased or serious mould growth will develop. Chemicals may have to be added to sterilize standing water.

The general rule for water-damaged archival collections is that they should be placed in a freezer as quickly as possible to stabilize their condition and give the archivists responsible time to arrange for drying and restoration. It is during this stage of the recovery operation that the control archivist is particularly important. This member of the disaster action team is responsible for keeping records of the location of all items at all times, whether in the freezer, in the drying rooms, or in the restoration labs. Records should also show which items have been "pre-selected" for possible destruction and are not being salvaged. Unfortunately, most archives with their unique holdings do not have the luxury of deciding that some of their collections can be disposed of instead of salvaged; this choice is more often one which libraries can make since in many instances the institution, particularly if it is insured, knows what the replacement value of a book is and can decide that it is far cheaper to re-purchase than recover and restore. In a similar vein, if an archives has in security storage master negatives of duplicating copies of its microfilm collection, it is generally cheaper and easier to replace damaged films rather than to try to recover them. One of the best sources for simple, clear instructions on how to recover water-damaged archival materials is Peter Waters' *Procedures for Salvage of Water-damaged Library Materials.*[5] Copies of this manual or one similar in content should be made available to members of the disaster action team.

After all of the materials have been removed from the stacks and placed into freezers, taken into manual drying facilities or simply shelved unharmed in secure, environmentally controlled alternate stacks, the rehabilitation of the storage areas themselves should be started. All stack areas that have undergone severe water damage should be sterilized before any archival collections are returned to them. It may be worthwhile to request assistance in this matter from the companies which provide cleaners to hospitals since their staff will be well aware of the techniques used in attaining this high level of cleanliness. When the stacks have been completely cleaned and the collections returned, an inspection system should be established. All of the stack areas involved in heavy water damage should be carefully monitored for at least a year to ensure that there has been no recurrence of mould growth. If mould and mildew are found, then the infected areas should be "fogged" with a fungicide and the collections should be fumigated.

The final stage of the contingency plan deals with post-disaster assessment. This is a very important part of any disaster plan and should not be overlooked. During this post-mortem several questions should be asked. Did the plan work and, if not, why not? How should the plan be modified? Were the sources of supplies and

---

5 Peter Waters, *Procedures for Salvage of Water-damaged Library Materials* (Washington: Library of Congress, 1979).

emergency facilities adequate and, if not, should new sources be found? A designated member of the disaster action team should prepare a detailed, written report describing the emergency and the recovery operation. This report should not only be sent to the senior management of the institution and circulated throughout the archives but should also be offered for publication to journals relating to archives, libraries, conservation, fire prevention technology, if applicable, and security and emergency planning. The staff members involved in disaster prevention should carefully review the whole contingency plan and the list of emergency facilities and suppliers, and make the necessary revisions.

These then are the basic steps involved in the development of a contingency plan for an archival institution. To indicate how this model might be applied to a real life situation, we shall discuss development of a contingency plan for the cartographic and architectural holdings of the National Map Collection (NMC) of the Public Archives of Canada.

One of the first steps taken was the preparation of a detailed description of the material and storage equipment that exist in the archival collection of cartographic documents in the NMC. To speak of maps, charts and plans is entirely too vague when one is undertaking a contingency plan. A collection of cartographic documents includes a great variety of media, each of which has characteristic physical properties and many which require a different type of storage equipment. The recovery operation in such a collection is therefore complicated by special considerations relating to format. The exercise is considerably more complex than would be the recovery of materials of uniform media, such as books. A description of the holdings of the NMC illustrates the complexity of the problem.

We have long marvelled at man's ingenuity in recording information on whatever base material was suitable or available; however, this same ingenuity can be a headache where disaster planning is concerned. In the NMC as in most archival collections not all cartographic documents are printed. Rather, printed maps represent a mere fraction of the holdings. The majority are manuscript, the information set down in water colours, inks of many vintages and chemical compositions, and graphite, to name only a few recording agents. Drawings have barely survived to this day on fragile tissue paper, a base which would surely disintegrate under wet conditions. Plans in ink on starch-coated linen are equally likely candidates for severe damage by water: the starched sheets may stick together and the inks may wash out. To give them support and protection, many maps in the NMC have been backed using a variety of pastes and glues, many of which are soluble in water. A number of unusual formats exist, such as insurance plans with revised sheets pasted on the original edition. Aerial photographs and other photographic reproductions and microforms require special attention. Some documents are of standard dimensions, but a large percentage are extremely large and awkward. And the list need not end here. Clearly the losses in a flood disaster would be tremendous even with the best recovery techniques available. In the National Map Collection the mixture of various types of documents obviously would make the salvaging task extremely difficult.

The description of cartographic formats led naturally to an inventory of the various types of storage equipment employed by the NMC. The way in which cartographic materials are stored may greatly affect the extent and type of damage

they suffer in a disaster and the procedures used in the recovery operation, since the procedures may differ according to what storage method is used. In the NMC some maps are stored flat, some with and some without acid-free folders in map cabinets outfitted with shallow horizontal drawers. Others are hung vertically by adhesive-backed bands, some are stored folded in standard filing cabinets and a large portion of the cartographic holdings are rolled and maintained on open shelving. Each of these storage methods was noted, and, later in the contingency planning, evacuation techniques were then outlined for each case.

The next step in the NMC's portion of the disaster plan was the establishment of priorities for evacuation. This aspect of contingency planning is stressed by almost all individuals who have been involved in disasters. The decision about what materials are most important and valuable must be made prior to the crisis. In a large institution such as the Public Archives of Canada, this exercise is extremely difficult. In the National Map Collection it was determined that priorities for evacuation would be established based on four criteria: uniqueness, value, replaceability and surplus. In the contingency plan for the Archives Branch as a whole, the priorities were outlined in the following manner:

Priority 1: Manuscript maps, Government records, architectural collections; divisional records.
Priority 2: Early printed maps and most individual printed maps; early atlases.
Priority 3: Series maps both Canadian and foreign; modern atlases; divisional library.
Priority 4: Duplicate maps or redistribution materials.

Various difficulties arose in establishing the NMC priorities for evacuation. One, as indicated earlier, is the sheer volume of the holdings. Another is the storage system used, whereby maps are filed by geographic region. This results in the bringing together of manuscript and printed maps in the same drawer; what is extremely useful for reference and retrieval purposes is not always advantageous for disaster planning. The integration of dissimilar materials makes it very difficult and time consuming to categorize specifically the groups of documents now identified generally as falling under any one of the priorities. At this stage in the disaster planning exercise it was acknowledged that further decisions would best be made at the time of the disaster. In the event of a flood in a particular stack area, for example, an assessment of all damaged material would have to be carried out in cooperation with the archivist most knowledgeable about the holdings in that physical area. If the documents in that area fell under the first priority, then a decision about what specific government records and architectural collections to evacuate first would have to be made immediately at that time.

One thing is clear: the salvaging of the office files, the card catalogues, accession books and any other finding aids would occur at the outset. These documents are not only essential to the continuity of the organization's administration, but necessary for an evaluation of losses and reconstitution of collections of printed materials which may still be available. As a preventive measure, copies of these vital records should be maintained off-site and up-dated periodically.

However, the next stage in the contingency plan, the establishment of physical handling procedures for cartographic documents damaged or threatened by a

disaster, was devised in advance. Because of the varying physical properties of maps and plans and the multitude of storage methods described earlier, numerous special precautions must be taken when removing cartographic documents from the affected areas if additional damage is to be prevented. The proposals which appear in the following paragraphs are largely approaches advised by experts in the field of recovery operations. Much of this advice is based on their experiences, successful or not, on reports about previous disasters, and on common sense. These proposed procedures have been outlined for the NMC disaster plan.

A cynic might think it unfortunate that cartographic documents have not been part of the major disasters involving cultural institutions during the last decade, since we therefore cannot learn much from those experiences. But those disasters which have occurred have often involved groups of maps, and so the reports of those experiences have been valuable sources of information. The most recent known example is the Italian earthquake of December 1980: according to a brief report in a recent issue of the *Map Collector,* irreplaceable maps and atlases may have been damaged or lost mainly because access to the devastated buildings was not authorized for a long period of time.[6] In 1974, the Queensland State Archives in Australia was called on to provide assistance and advice to some of the State Government departments in salvaging their records after a major flood in Brisbane. Some groups of maps were water-damaged and recovered.[7] We have heard also from Peter Waters[8] that extensive damage was recently done to a collection of 1500 cartographic and architectural materials because of a flood in a Chicago architectural firm. Closer to us, the Canadian Conservation Institute staff was involved in the recovery operations after the fire at the Glace Bay Miners' Museum in August 1980. The collections of that museum include some cartographic documents. Each of the experiences can help us to be better prepared to face an emergency situation. Certainly each has been considered in establishing the handling procedures of the NMC.

The first decision to be made after the assessment of the extent of the disaster and of the damages is whether the material should be immediately frozen or dried. After a minor disaster, it may be possible to take the appropriate measures to dry the water-damaged documents very quickly, but it would be impossible in most other situations. Because the time factor is so critical for wet archival materials, it is considered unwise to try to dry everything unless no freezing facility is available, as was the case in Glace Bay.[9] Immediate drying might also be chosen for active or open files needed for daily operations.[10]

Generally speaking, however, the experts recommend immediate freezing. Conservators as well as archivists involved in recovery operations recommend freezing and storing water-damaged library and archival materials at low

---

6 *The Map Collector,* No. 14 (March 1981), p. 42.

7 Lee McGregor and Jim Bruce, "Recovery of Flood Damaged Documents by the Queensland State Archives," *Archives and Manuscripts* 5 (1974): 193-99.

8 Peter Waters to Sandra Wright, (telephone communications) 16 and 25 March 1981.

9 Martha Segal, "Emergency operations during the fire at the Glace Bay Miner's [sic] Museum," Typescript (unpublished) 1981.

10 The Provincial Archives of Manitoba was involved in this type of recovery during the winter 1981. See Peter Bower and Charles Brandt, "Operation Paper Lift", *Archivaria* 12 (1981): 135-44.

temperature (−20°F) in order to stabilize their condition.[11] Freezing provides time, as Waters says, "to plan and organize a controlled, carefully coordinated drying operation."[12] In previous disasters, problems occurred because people sometimes waited up to a week before deciding to freeze water-damaged collections. By that time, mould growth is evident and some materials may have dried under undesirable conditions. For example, documents on coated paper will stick together forever if they are permitted to dry without being separated first. So, preparation for freezing would be the next step after the assessment of the damage. In the meantime, consideration is to be given to lowering as much as possible the humidity and temperature of the affected areas. Also, a control list maintained by the individual in charge must be created to ensure the proper identification of any materials removed.

Damaged cartographic collections present peculiar handling problems during a recovery operation. How does one carry a pile of soaking wet maps from their shelf to a freezer truck? How does one remove wet atlases which have expanded so much that they are jammed on their shelves? What is the preferred method for the removal of maps from a horizontal drawer partially filled with water—if the drawer can be opened? These are some of the anticipated questions to which answers should be sought before a disaster happens. This is the type of question which the staff of the National Map Collection have considered while preparing the Archives Branch Contingency Plan. Faced with a real disaster, some of the solutions proposed may not work as expected but an awareness of the advantages and disadvantages of each approach may reduce the chances of irrevocable mistakes. Additional information received at a later date may bring to light better solutions. There will always remain decisions to be made on the site and on the spur of the moment. Improper handling in those trying circumstances could just aggravate the already vulnerable material or even worse could make the material irrecoverable.

One of the basic recommendations in salvaging operations is to take the containers with their documents directly into the freezer. Obviously, the size of storage equipment for cartographic documents precludes their transport to a freezer truck. But in the case of horizontal map cabinets, the drawers with their contents can certainly be removed after the excess water has been carefully sponged off. To prevent sliding of drawers and contact between maps and drawers, and to ease air circulation in the freezer, slats of wood (one inch by two inches is recommended) may be placed between the drawers. One point brought to our attention by Peter Waters is the fact that the cloth covers often used in horizontal drawers usually contain water-soluable dyes that will ooze out and stain the cartographic material. These covers should be cut off and removed before freezing.[13]

In cases where the drawers cannot be removed from the cabinets and where maps are stored flat on open shelves, the documents could be carefully transferred into large flat storage boxes, empty drawers or plywood sheets covered with polyethylene sheets and brought to the freezer with the appropriate measures to ensure air circulation within the freezer. Maps in vertical cabinets have the advantage that water may run to the bottom of the cabinets, but the likelihood of

---

11 Waters, *Procedures for Salvage*, p. 5.
12 *Ibid.*
13 Peter Waters to Sandra Wright, 16 and 25 March 1981.

their becoming distorted is greater. Here one preventive measure would simplify the evacuation: the maps might be divided by inserting polyester interleaving sheets every four centimetres or so. Later, wet documents could then be separated at the polyester interleaving and transferred to horizontal containers for freezing. Maps stored in rolled form on open shelves should be frozen after being removed, using the same precautions as for other groups of maps. Bound volumes and atlases should be wrapped in freezer paper, waxed paper, or silicone paper to prevent their sticking together during the freezing process. Depending on their size, they should be placed horizontally in plastic milk crates, bakers' bread trays or cardboard boxes for movement out of the affected stacks and into the freezers. No attempt should be made to separate the wet maps individually. It is preferable to transfer the entire contents of a shelf to a new container before freezing or bringing them to the manual drying facilities.

The chances of recovering aerial photographs is rather limited. Freezing is not recommended, although it might be the temporary measure if immediate restoration cannot be undertaken. Research is now underway to ensure better protection of photographic materials during a disaster.[14] For microforms the solution is as simple as keeping them immersed in containers full of clear, cold water and then transporting them quickly to a microfilming lab where they can be reprocessed. Other items such as globes, maps on vellum and relief models would require special treatment by professional conservators.

Vacuum-drying, freeze-drying, dielectric and microwave-energy drying or even drying under the sun are some of the techniques that have been used or experimented with in order to return water-damaged materials to their original condition. Considerable research and experimentation has been conducted following major disasters in order to find ways of reducing the cost of drying and restoring large quantities of documents. Some of these mass-drying techniques are described as "an improvement over the long-practiced air drying methods"[15] and are becoming well-known, while others remain known only by scientists, since their application requires highly controlled conditions to give satisfactory results.[16] The two processes that can most effectively be learned from these technical reports are the vacuum-drying and the freeze-drying methods, both of which have been used successfully on several occasions. The freeze-drying treatment was used successfully at the McDonnell Douglas Space Laboratories in St. Louis to dry a collection of 1500 architectural plans damaged by a flood in Chicago.[17] The Provincial Archives of Manitoba successfully employed a vacuum chamber of the Department of National Defence.[18] The Stanford University Library was able to rent freeze-drying facilities from the Lockheed Corporation.[19] In St. Louis, in the

---

14 "Archives Branch Contingency Plan," p. 13-5.

15 George M. Cunha, "An Evaluation of Recent Developments for the Mass Drying of Books," in *Preservation of Paper and Textiles of Historic and Artistic Value* (Washington: American Chemical Society, 1977), p. 103.

16 David J. Fisher, "Simulation of Flood for Preparing Reproducible Water-Damaged Books and Evaluation of Traditional and New Drying Processes," in *Preservation of Paper and Textiles of Historic and Artistic Value*, p. 105.

17 Peter Waters to Sandra Wright, 16 and 25 March 1981.

18 Bower and Brandt, "Operation Paper Lift," p. 140.

19 Sally Buchanan, Philip Leighton and Leon Davies, *The Stanford-Lockheed Meger Library Flood Report* (Stanford: The Stanford University Libraries, 1980).

recovery of records damaged in the Military Personnel Records Centre fire in 1973, the vacuum-drying chambers were also available from the McDonnell Douglas Aircraft Corporation.[20]

The vacuum-drying process is the cheapest of these two methods and allows drying of a large quantity of documents. However, because there is a danger of some staining, this method is not recommended for cartographic documents. Rather, the more expensive freeze-drying process, which prevents feathering of inks and soluble dyes is suggested for the treatment of cartographic collections. The main distinction for our purposes is the fact that in freeze-drying water is evacuated as a vapour and has no physical effect on spreading of inks or colours while in the vacuum-drying a strong vacuum is pulled for two hours, after which large quantities of very dry air are pumped into the chamber to complete the drying.[21] For a more complete description of the various processes, we refer readers to Cunha's article.[22] In any event, the choice of the mass-drying process would have to be made in consultation with experts in the field of mass-drying and their recommendations would have to be followed. In fact more research is still to be done to evaluate the use of mass-drying processes for documents other than books and files. If mass-drying facilities are not available or even freezing facilities non-existent or if the damage is so limited that it would be too costly to look for such "great solutions", manual-drying would probably give equally good results if this task were carried on under the supervision of skilled persons and following basic rules and procedures. It has been done for many years and will continue to be used precisely because of the lack of special drying facilities. In his long list of drying processes, Fisher rates third the air-drying process (with interleaving) of frozen materials (particularly books) not far behind the more sophisticated methods of "freeze-thaw, vacuum" drying.[23]

A distinction should be made between the air-drying process with inter-leaving and the drained-air drying process. In the latter, the water is drained from the books and evaporated by providing good air circulation. A drawback of this method is that sticking of coated papers will likely occur. The air-drying process with interleaving means that as soon as a book, an atlas or a pack of wet files has dried enough to be opened naturally or its pages separated, it is interleaved with blotting paper, which is changed frequently, until all the pages are dried completely. The Archives nationales du Québec used this method to dry voluminous registry books which were water-damaged in a flooded basement of the old Palais de Justice Building in Québec. Each of the 105 registry books was dried in about five to eight days using the interleaving technique.[24] However, most cartographic documents are in the form of single sheets and a different technique of manual-drying is required. The technique recommended by Waters takes advantage of the special properties of polyester non-woven fabric and film.[25]

---

20 Walter W. Stender and Evans Walter, "The National Personnel Records Center Fire: A Study in Disaster," *The American Archivist* 37 (1974): 545-46.

21 Peter Waters to Sandra Wright, 16 and 25 March 1981.

22 George M. Cunha "Recent Developments for the Mass-Drying of Books," p. 95-104.

23 David J. Fisher, "Simulation of Flood," p. 119.

24 Liliana Stanojlovic "Mesure d'intervention en cas de désastre", *Archives*, 10,3 (1978): 51

25 Waters, *Procedures for Salvage*, p. 21-22, gives a full account of this technique.

The question of specific preventive measures, particularly as they affect cartographic collections, has been deliberately down-played in this article. There has been a great deal of discussion on this aspect of map custodianship and it is a subject which lends itself to further examination. There is inevitably the cruel realization that preventive measures are not enough in the face of disaster and that archivists' ability to implement all but the most basic preventive measures may be severely limited. What can an archivist do, for example, about the institution which is built on a flood-plain, or about the storage facilities which are located in an industrial park alongside oil or gas tanks, or on a major airport flightpath? Inevitably, the expression of these concerns is met with appeasing statements to the effect that the building has been flood-free for almost a century, or that it is the only space available. Similarly, installation of sprinkler systems or halon gas systems has been urged, and yet funds for that type of equipment seldom become available until after a disaster. For example, further investigation is still needed to find out what type of protection, if any, acid-free folders provide in a flood. Archivists and technical experts might direct their efforts to this sort of research and experimentation. Would a different construction material for acid-free folders offer better protection than does the material used at the present time? Does encapsulating maps water-proof them?[26]

Familiarization tours of the institution given to local firemen would also help to make them aware of the peculiarities of the building and of the holdings. The Public Archives and National Library Building has been visited by four crews of firemen. They were alerted to the difficulties they would encounter in the event of a disaster in this building and in turn contributed their observations on how their job would be affected by the arrangement of security measures, design of storage areas and so on. Such tours will take place on a regular basis. Good housekeeping and cleaning would definitely help eliminate hazardous conditions. These are but a few preventive measures. There are many more. Their implementation will not eliminate the disaster itself, but they could reduce its consequences.

Résumé

Comment les archives doivent-elles s'occuper des circonstances telles que l'inondation et le feu? D'après l'expérience des Archives publiques du Canada, les auteurs examinent les moyens de tenir compte de l'imprévu. Ils font surtout attention aux problèmes des archives de cartes en cas d'accidents.