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Salvage Operations for Water Damaged ARChiVal Collections:

A Second Glance

Written by
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Preservation Committee
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Introduction

I have been salvaging wet records and writing disaster plans for the B.C. Archives since 1982. In 1988, sections of the then current salvage plan were printed as articles in the *WAAC Newsletter* and the *ACA Bulletin*.[1]

Recently, I examined wet records from another disaster. Some problems were familiar—wet volumes and files, while other problems were relatively new, such as carbonless papers and diazo microfiche. The experience reinforced the advantages of ongoing disaster planning, and the benefits of sharing experience with the conservation and archival communities. The following, updated version of the plan was published in the May 1997 *WAAC Newsletter*,[2] it has been reprinted by the Canadian Council of Archives.

I would like to thank the following experts for their advice. For the recovery of sound and video recordings, I am indebted to Brian MacDonald (National Archives of Canada), Gilles St-Laurent (National Library of Canada), and Gerald Gibson, (Library of Congress). The sections on the recovery of photographs were revised on the basis of a workshop supervised by Debbie Hess Norris at the Getty Conservation Institute. Additional tips on archival materials were provided by Nancy Marrelli (Concordia University).

Finally, many thanks go to my employer, and Barry Byers, my supervisor, for their ongoing support in maintaining the plan—and giving me the practical experience in the salvage of wet records.

Betty Walsh

[1] The full salvage section of the plan, the "Salvage at a Glance" chart, and notes were published as: Betty Walsh, "Salvage Operations for Water Damaged Collections," *WAAC Newsletter* 10, no. 2 (May 1988): 2–5. The chart and notes were published in the Association of Canadian Archivists' *ACA Bulletin* 12 no. 4 (March 1988), and reprinted in the *IIC-CG Newsletter* 14 no. 2 (March 1989): 5–6 and chart.

[2] Betty Walsh, "Salvage Operations for Water Damaged Archival Collections: A Second Glance," *WAAC Newsletter* 19 no. 2 (May 1997):12–23, plus foldout chart. Reprinted with permission of the author.

General

Salvage is only a small part of the overall disaster planning process: prevention, preparedness, response, and recovery. Most importantly, management should support planning; duties should be delegated ahead of time and staff should be trained. For more information, consult the classic references in the field.[3]

The first table shows the levels of flood emergencies to prepare against, and the responses that may be necessary. In the chaos of a real disaster, events will unfold in an unpredictable way.

A. Minor disaster

Do not enter the area until the Chief Conservator has declared it as safe to do so. If there is an electrical hazard, ensure the circuit breakers have been disconnected.

The Chief Conservator notifies the Conservator, and Imaging Services Supervisor (if needed for documentation or roll film recovery).

The Chief Conservator, accompanied by the Conservator and designated Records Curator will assess the damage:[4]

Where is it?

How many records are damaged?

If it is water damage:

- Have the records been wet for more than 48 hours? Is mold present?
- Is the water clean or dirty?
- Are the records wet, partially wet or damp?

What materials are damaged?

The Chief Conservator, in consultation with the Conservator, will formulate recovery plans. If further assessment shows that recovery is beyond the scope of Conservation and Technical Services, the Disaster Recovery Team is activated.

The Chief Conservator will coordinate with the building superintendent to:[5]

Clean up water. If assistance is not prompt, a mop-up team will be designated.

Control the environment.

Circulate air with fans.

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[3] John E. Hunter, "Mauseum Disaster Planning," in *Museum, Archive, and Library Security*, ed. Lawrence J. Fennelly. (Boston: Butterworths, l983); John P. Barton, and Johanna G. Wellheiser, ed., *An Ounce of Prevention: A Handbook on Disaster Contingency Planning for Archives, Libraries, and Record Centres,* (Toronto: Toronto Area Archivists Group, l985); Hilda Bohem, *Disaster Prevention and Disaster Preparedness.* (Berkeley: University of California, 1978); Sally Buchanan, *Disaster Planning, Preparedness and Recovery for Libraries and Archives: A RAMP Study with Guidelines,* (Paris: Unesco, 1988); Judith Fortson, *Disaster Planning and Recovery: A How-To-Do-It Manual for Librarians and Archivists,* (New York: Neal-Schuman Publishers, 1992)

[4] Toby Murray, "Basic Guidelines for Disaster Planning in Oklahoma," (Tulsa: Oklahoma Conservation Congress, February 1991), 12; Fortson, 47.

[5] Bohem, 11–12; Barton and Wellheiser, 59-59.

The Chief Conservator will monitor the environment.

While the water is being cleaned up, a Records Curator will arrange for extra services (such as cold storage) and extra supplies (such as extra boxes, newsprint for interleaves).

The Chief Conservator will supervise the packing of damaged materials, and the move to the Conservation Lab, roll film processing facilities, or cold storage.

The Records Curators will keep basic records regarding the location of the materials moved.

The Conservation Unit will air dry the damaged materials.

B. Moderate and major disasters

Do not enter the scene of disaster until the Recovery Director has designated it as safe to enter. Confer with the building superintendent, fire and police departments.

The Communicator alerts the Disaster Team by phone or in person at each worksite. Key team members will meet during the assessment stage; others are assembled after the site has been stabilized and salvage is ready to proceed.

The Recovery Director, Recovery Specialist, and Conservation Specialist, accompanied by the Recorder and a photographer, will assess the scene of disaster.[6] The latter three will estimate and record the damage in a preliminary way. They should consider:[7]

Where is the damage? Is it in one small area, or in all sites? This will affect the mobilization of staff, supplies, and facilities.

How many records are damaged? Large quantities of records should be frozen to await further treatment.

What kind of water damage is it?:

- Have the records been wet for more than 48 hours? Is mold present?
- Is the water dirty? The records may need to be cleaned.
- Are the records wet, partially, wet, or damp? This affects the drying method.

What materials are damaged? Different media need specialized packing and drying methods. See the Salvage at a Glance table.

The Recovery Specialist will review the salvage priority list and revise it if necessary. It is better to freeze wet records rather than to discard them under the pressure of an emergency.

Given the extent of the damage, the Recovery Director decides whether the site will remain open, or closed so staff can participate in salvage operations.

6 Barton and Wellheiser, 17.

7 Murray, 12; Fortson, 47.

The Recovery Director coordinates with the building manager to:

> Remove standing water. If the building manager cannot assist, the Recovery Director will make alternate arrangements.
>
> Reduce the temperature to less than 18°C (65°F) by turning down the heat.
>
> Lower relative humidity by adjusting the humidification system or installing rented dehumidifiers.
>
> Circulate air with fans. Separate compact storage units so air can move between them. Open doors if security is available.

The Recovery Specialist will monitor the temperature and relative humidity.[8]

Electricity to power cleanup equipment may not be available. The Logistics Manager will obtain generators if the electricity is off. Use safely grounded, waterproof cords.[9]

The Recovery Director will set up a headquarters near the site and ensure that it is accessible by phone or walkie-talkie.[10]

The Recovery Director will designate facilities for the treatment of records that can only be air dried. If the conservation lab is not operational, the Logistics Manager will locate alternate facilities.

The majority of paper and photographic records should be packed and shipped to cold storage. Freezing will stabilize wet materials and buy time until the records can be dried.

The Logistics Manager arranges for emergency facilities and supplies, particularly: cold storage, transportation to cold storage, and packing supplies. Arrangements should be made for team members—coffee, portable toilets, etc.[11]

The Communicator gathers teams at a designated assembly point. The Recovery Director will brief team members and assign them to:[12]

> Prepare packing materials (cutting freezer paper, assembling cardboard boxes) and move records to packers.
>
> Pack the damaged collections. See packing instructions below for the materials being handled. Begin with items on the floor and the wettest objects, and then items on the ends of shelves.
>
> Number the crates and record their contents. Label crates with Tyvek tags; mark cardboard boxes directly with a waterproof pen. Record separately the catalogue range of the records; media priority; condition of the contents as wet, partially wet, or damp; and the destination (e.g. cold storage, conservation lab).

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8 Bohem, 11–12; Barton and Wellheiser, 59–59.

9 Peter Waters, "Procedures for Salvage of Water-Damaged Library Materials," in *A Primer on Disaster Preparedness, Management, and Response: Paper-Based Materials*. (Washington: Smithsonian, NARA, Library of Congress, and National Park Service, 1993), 6.

10 Bohem, 11.

11 Ibid.; Barton and Wellheiser, 58.

12 Waters, *Primer*, 4, 7; Fortson, 49; Buchanan, 73, 75.

Move crates and boxes by hand trucks and pallet movers to a truck in an accessible location.

Meetings are held at the beginning of each day to review strategy and to keep up morale. Salvage team duties should be rotated.[13]

If the damage is substantial and salvage will take more than 10 hours, loosen tightly packed document boxes, books and pamphlets so they do not jam into the shelves.

Do not separate remaining dry books and documents when the relative humidity is high.[14] If the RH remains high during cleaning and repairing of the storage areas, remove to an air conditioned room.

[13] Bohem, p. 15; Buchanan *RAMP*, 66.

[14] Waters, *Primer*, 7.

Guidelines For Packing

A. General

Be extremely careful when handling wet materials—all of them are very fragile, and they can be easily damaged during packing and transport. If cardboard boxes are saturated or weak, replace them with new containers. Borderline boxes may be reinforced by packing inside plastic crates.

Pack files in order and retain documentary information. If the label is loose or lost, pencil identifying information and location on a piece of paper, and insert it in the volume or box. Don't mark wet paper. Film and tape reels and the backs of picture frames can be marked with a grease pencil.[15]

During removal, do not stack materials in piles or on the floor. If boxes are put on pallets, do not mix different sizes of boxes or stack more than 3 boxes high.[16]

If there is time, different materials should be packed separately, in the following categories: by media, moldy from uncontaminated, and wet from partially wet and damp.[17]

B. Packing guidelines for specific media

1. Paper

Do not try to separate single sheets of paper or uncrumple them. Pick up files by their folders, and interleave the folders every two inches with freezer paper. If it is known from the outset that the records will be freeze dried, interleaving is not necessary. Fill cartons and crates three quarters full.[18]

Soluble Media (watercolours, soluble inks, hand coloured maps and historic map and plan production processes): Do not blot the surface. Quickly freeze or dry.

Coated papers will stick together unless frozen or dried immediately. Keep them wet in cold water until they can be air dried or packed for freezing.

Framed prints and drawings: if time and space permit, unframe and pack as for single sheets.

Maps, plans, oversize prints and manuscripts: Sponge standing water out of map drawers. Remove the drawers from the cabinet, ship and freeze them stacked up with 1" x 2" strips of wood between each drawer. Pack loose, flat maps in bread trays, flat boxes, or plywood sheets covered in polyethylene.[19] Bundle rolled maps very loosely to go in small numbers to the freezer, unless facilities are available for conservators to unroll them.

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[15] Fortson, 49; Waters, Primer, 13; Public Archives of Canada, *Archives Branch Contingency Plan,* (Ottawa: Public Archives, September 21, 1982), 11.7.

[16] Waters, *Primer*, 7, 10: Buchanan, *RAMP*, 77.

[17] Waters, *Primer*, 6.

[18] Fortson, 51.

[19] Gilles Langelier, and Sandra Wright, "Contingency Planning for Cartographic Archives." *Archivaria* 13 (Winter 1981–82): 55.

Drafting cloths are coated with starch and may stick together like coated papers.[20] Be careful not to blot the surface or apply pressure. Immediately freeze or dry.

Maps and plans by photoreproductive processes (diazos and blueprints in particular): Do not blot the surface. Quickly freeze or dry.

Maps and plans on Mylar:[21] Do not blot if the inks are soluble. Freeze or air dry.

2. Books

Don't open or close wet books or remove book covers. Gently shape closed books to reduce the distortion set into the book on drying.[22]

If the water is very dirty, wash the books before freezing. Do not wash open books and those with water soluble media (e.g. letter press books). Wash closed books in tubs of cold running water and dab away (do not rub!) mud with a sponge. Time and facilities may limit treatment at this stage; it may be safer to clean the books after they are dried.[23]

Lay a sheet of freezer paper around the cover, and pack spine down in a milk crate or cardboard carton. Pack only 1 layer deep, to prevent crushing of bindings. Oversized volumes can be packed flat in cartons or bread trays, 2 or 3 books deep.[24]

If books have fallen open, pack them "as is" in cartons or trays. They can be stacked in between sheets of freezer paper and 1/2" foam.[25]

Leather, parchment, and vellum bindings are an immediate priority because they distort and disintegrate in water and they are highly susceptible to mold growth. They should be air dried; if there are large quantities, freeze them.

Books with coated papers will stick together unless frozen or dried promptly. Keep them wet in cold water until they can be air dried or frozen.

3. Parchment and vellum

Interleave between groups of folders, pack in crates or flat boxes, and freeze.

4. Paintings

Tilt the painting to drain off excess water, and take it to a work area for immediate drying. Transport horizontally if you can; if not, carry the painting facing toward you, holding the side of the frame with the palms of your hands. Larger paintings should be carried by two people. The order of removal and treatment is: first, the most highly valued; second, the least damaged; third, slightly damaged; and fourth, severely damaged.[26]

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[20] Fortson, 56–57; Carol Turchan, "The Chicago Historical Society Flood: Recovery Analysis Two Years Later" *The Book and Paper Group Annual* 7 (1988): 61–62; Harold Henderson, "After the Flood: A Restoration Drama" *Reader: Chicago's Free Weekly* 16 No. 1 (September 16, 1986): 22.

[21] Ibid.

[22] Waters, *Primer*, 13; Buchanan, *RAMP*, 74.

[23] Waters, *Primer*, 8–9.

[24] Buchanan, *RAMP*, 76–77.

[25] Waters, *Primer*, 7.

[26] Canadian Conservation Institute, *Emergency Treatment for Water-Damaged Paintings on Canvas,* CCI Note 10/5 (Ottawa: CCI, April 1986), 1.

5. Computer magnetic media

Check with the Systems Administrator, to ensure that undamaged backup tapes are available. It is far more practical to recover data from backup tapes than it is to salvage damaged media.

Separate into the following: dry, wet enclosures only, and wet media. If water has condensed inside cassettes, treat the tapes as wet.[27] Do not touch magnetic media with bare hands.

Media damaged by mud, sewage, or sea water: as soon as possible, rinse in tap water.

Keep magnetic media wet so that contaminants will not dry on to the tape or diskettes. Media can remain wet in cold clean water for several days. Pack inside plastic bags. If media will remain wet for weeks, immerse them to prevent mold. Do not freeze magnetic media because the tape can stretch, and lubricants can migrate out.[28]

a) Cartridge backup tapes

Keep wet by packing inside plastic bags. Pack all tapes vertically in plastic crates or cardboard cartons.

b) Floppy disks

Pack upright in plastic bags inside boxes or in containers of cold water.

c) Open reel computer tapes

Handle the tapes by their hubs and pack them vertically inside plastic bags inside boxes.

6. Compact discs and CD-ROMs

If the discs have been exposed to sea water, wash them in tap water immediately. Do not scratch the disc during rinsing or packing.[29] Pack discs vertically in crates or boxes.

7. Sound and video recordings

a) Sound and video tapes

Separate the tapes into the following: dry tapes, wet boxes only, and wet tapes. If water has condensed inside a cassette, treat the tape as wet.

Salvage tapes according to the following priorities:[30]

unmastered originals over masters,
masters over reference copies,
older tapes over newer,
paper over acetate,
acetate over polyester based tapes.

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[27] Miriam Kahn, *Disaster Response and Prevention for Computers and Data* (Columbus: MBK Consulting, 1994), 26.

[28] John Van Bogart, "Recovery of Damaged Magnetic Tape and Optical Disc Media" (paper presented at Emergency Preparedness and Disaster Recovery of Audio, Film and Video Materials: A Library of Congress Symposium, Washington D.C. September 21, 1995, accessed December 19, 1995); available from http://www.nml.org/publications/presentations/disaster_recovery/lc_disaster-recovery; Internet.

[29] Ibid.

[30] Ibid.

Tapes that have been damaged by mud, sewage, or sea water: as soon as possible, rinse in tap water.

Keep tapes wet, at their initial level of wetness. (For example, some tapes may have only become wet on the outside of the tape pack, and it is not necessary to immerse them). If the tapes dry at this stage, contaminants will dry on to the tape and be harder to remove later. Pack tapes individually inside plastic bags, keeping loose labels with the tape. Pack tapes vertically into pastic crates and cartons.

In general, magnetic tapes can remain wet for several days, as long as the water is cool and clean. This is longer compared to paper records.[31] However, immersion may be limited in two cases. Many tapes have water soluble label adhesives and inks,[32] and paper boxes and labels. In addition, older tapes may not survive long immersion. This may reduce the salvage time to 48 hours or less for some media.

If magnetic tapes cannot be salvaged for more than a week, immerse them to prevent mold. Do not freeze magnetic media.[33]

b) Discs

Salvage shellac and acetate discs first, because they are sensitive to water. If storage boxes are badly damaged, transfer the discs (up to 5 at a time) to plastic crates or cardboard cartons. Pad the bottom of the crate with ethafoam and interleave with ethafoam every 25 records to absorb shocks. Always support the discs vertically and hold the discs by their edges. Avoid shocks and jolts during transport.[34] Groups of discs, particularly 78's, can be very heavy. Pack them in small boxes (or larger ones with extra padding) that can be easily moved.

8. Photographic materials

a) Salvage the following historic photographs without delay. They are best preserved by water protective measures, because the damage may be severe.

Wet collodion glass negatives. Salvage first and air dry immediately. Both immersion and freeze drying will destroy the binder.[35]

Cased photographs:

Ambrotypes:	Salvage and air dry immediately. Both immersion and freezing will destroy the binder.[36]
Pannotypes:	Salvage and air dry immediately.
Tintypes:	Salvage and air dry immediately.
Daguerreotypes:	Salvage and air dry immediately.

[31] Ibid.

[32] Gerald Gibson, personal communication, January 24, 1996.

[33] Van Bogart.

[34] Public Archives of Canada, *Archives Branch Contingency Plan,* (Ottawa: Public Archives, September 21, 1982), p. 11.5.

[35] Klaus B Hendriks and Brian Lesser, "Disaster Preparedness and Recovery: Photographic Materials," *American Archivist* 46 (Winter 1983): 66.

[36] Ibid., 66-67.

Color transparencies by the additive process. (Autochromes, Dufaycolor): The recovery rate is poor because the dyes dissolve. Do not freeze.[37] Air dry immediately.

Dye transfer prints. The recovery rate is poor because the dyes migrate. Prevent damage by enclosing in waterproof containers.[38]

Deteriorated nitrates. Emulsions are water soluble and could be lost. Air dry or freeze immediately.

Deteriorated acetate negatives. Air dry or freeze immediately. Handle with care because of the swelling of the emulsion and backing layers.

Carbon prints and Woodburytypes. Air dry or freeze quickly. Handle with care because the binder will swell up considerably.[39]

b) Other photographs should be kept wet until they are either air dried or frozen. If allowed to partially dry, they will stick together. If there is time, rinse the photographs with cold water before they are dried or frozen.[40] Pack inside plastic bags in boxes or pails. Keep to a minimum the immersion time before treatment or freezing.[41]

Prints, negatives, and transparencies. Salvage prints first, followed by negatives and transparencies on stable bases. Unframe and unmat framed photographs if there is time. If facilities and personnel are available, air dry; pack and freeze if not.[42]

Motion Pictures. If only the outside of the can is wet, dry the container and relabel it if necessary.[43] If the film is wet, fill the can with cold water, and replace the lid. Pack into plastic pails filled with cold water or cardboard cartons lined with garbage bags. Ship to a film processor for rewashing and drying.

Microforms. Microfilms in rolls. Do not remove the films from their boxes. Hold cardboard boxes (and their labels) together with rubber bands. Wrap 5 cartons of film into a block with plastic wrap. Pack the blocks into a heavy duty cardboard box lined with 3 garbage bags; tie each bag separately. Label as "wet film for rewashing and drying", and ship to a microfilm processor.[44]

Aperture cards. Pack and freeze.

Microfilm strips in jackets. Pack and freeze.

Diazo microfiche. Pack and freeze.

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[37] Klaus B. Hendriks, "Recovery of Photographic Collections Following a Flood," in *Sauvegarde et Conservation des Photographies, Dessins, Imprimés et Manuscrits : Actes des journées internationales d'études de L'ARSAG: Paris 30 Septembre au 4 Octobre 1991.* (Paris: Association pour la Recherche sur les Arts Graphiques, 1991), 19.

[38] Norris, 605.

[39] Ana B. Hofmann, "Dealing with Photographic Materials, Before and During a Disaster," in *Library Disaster Handbook: Planning, Resources, Recovery*, ed. Nelly Ballofet, (Highland N.Y., Southeastern New York Library Resources Council, 1992), 17; Debbie Hess Norris, "Air-drying of Water-soaked Photographic Materials: Observations and Recommendations," in *ICOM Committee for Conservation 11th Triennial Meeting Edinburgh Scotland 1–6 September 1996, Preprints Volume II,* ed. Janet Bridgeland (London: James & James, 1996), 604.

[40] Hofmann, 12.

[41] Hendriks and Lesser, "Disaster Preparedness," 67.

[42] Ibid.

[43] Dan Den Bleyker, "Disaster Planning for Film and Video Collections," in *Preservation Papers of the 1990 SAA Annual Conference* by the Preservation Section of the Society of American Archivists, (Chicago: Society of American Archivists, 1991), 68.

[44] Eastman Kodak, "Water Damaged Film" QC0004, dated 6–89, .2.

Recovery Methods

A. Overview of drying methods

The drying method should be selected after careful assessment of the collections. It is important to monitor the capabilities of suppliers who provide freeze drying and vacuum drying services. Check references beforehand and inspect a selection of materials before and after they are dried.

Air drying—Records are dried in a work space at room temperature conditions. To discourage mold growth, the temperature should be below 18°C and the RH as low as possible (at all costs, below 60%) and fans should keep the air circulating. Materials are spread out on or interleaved with absorbent papers.

Freeze drying (vacuum freeze drying)—Frozen records are dried in a vacuum chamber at temperatures below 0°C. The water passes from ice to vapor without becoming liquid, even though heat may be applied to the shelves to speed up the process.[45] It is important to monitor the temperature of the records inside the chamber; once the materials have dried, they will heat up. Freeze drying prevents additional bleeding or feathering of soluble media, distortion of bindings, and the sticking together of coated materials.

Vacuum drying (vacuum thermal drying)—Frozen or thawed records are dried in a vacuum chamber at temperatures above 0°C. A vacuum is drawn, heated air is put into the chamber, and a vacuum is applied again to pull out moisture. (For magnetic tapes, the air should not be heated.) The process may be repeated again.[46]

Freezer drying—Records are packed in permeable containers and kept in a cold storage vault for months. Over time, moisture sublimates out of the records, in the same way that food gets freezer burn. This is a slow process that will dry damp and partially wet records.

Desiccant dehumidification—Records are dried, while still on their shelves, by large dehumidifiers that are brought on site. The temperature and relative humidity should be controlled. This method may not be suitable for drying most collections, because soluble media will further bleed, and coated materials will block together.[47]

B. Recovery methods for specific media

1. Paper

a) Drying methods[48]

Air drying is suitable for drying small quantities of damp and partially wet papers from minor disasters. It can be used, on a triage basis, to dry wet materials in a major disaster when services are not available.

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[45] Sally Buchanan, "Drying Wet Books and Records," in *Preservation of Library & Archival Materials: A Manual,* ed. Sherelyn Ogden (Andover: Northeast Document Conservation Center, 1994), 2.

[46] Ibid.; Fortson, 66.

[47] Buchanan, "Drying," 1; Fortson, 66.

[48] Buchanan, *RAMP*, 80–85.

Freeze drying is preferred for large quantities and wet materials. It is the best way to dry water soluble media, coated paper, and drafting linens.

Vacuum drying will dry large quantities of wet records without intrinsic value. However, it is not suitable for many archival materials because they have water soluble inks that could bleed. Never vacuum dry coated papers and drafting linens because they will stick together.

b) Air drying of paper
During the following operations, maintain the original order of the files, Pencil box and folder information on a slips of paper and keep them with the records.[49]

Documents and manuscripts. Damp and partially wet records can be dried in the following ways:

Spread documents out over blotters, paper towels, or unprinted newsprint. Change the absorbent materials when they become wet.

Interleave stacks of 25 sheets of damp papers and turn over frequently.[50]

Dry damp records vertically, supported by bookends or supports through plastic crates.

Coated papers. Note that freeze drying has far better success rate than air drying. If the papers are wet, separate each coated paper from the other by applying a sheet of polyester and lifting the plastic away with paper. At this point, the paper can be dried on the polyester, which can be hung on lines.[51] Alternatively, dry partially wet paper by interleaving between every sheet with waxed paper, or laying individual sheets on polyester web covered blotters.

Drafting cloths. Dry by interleaving with either waxed paper, freezer paper,[52] or polyester web covered blotters.

Maps and plans on Mylar.[53] Do not blot if the inks are soluble. Air dry.

2. Books

a) Drying methods[54]
Air drying is suitable for drying small quantities of damp and partially wet books. It can be used, on a triage basis, to dry books in a major disaster when services are not available. Leather bindings should be air dried.

Freeze drying is preferred for large quantities and wet materials. It is the best way to dry coated papers and bound volumes with soluble inks.

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[49] Fortson, 56.

[50] Ibid.

[51] Buchanan, "Drying," 3.

[52] Fortson, 57.

[53] Fortson, 57; Turchan, 62; Henderson, 22.

[54] Buchanan, "Drying", 1–2; Fortson, 58.

Vacuum drying will dry large quantities of wet books. The books will distort more than if they were freeze dried and they will require more rebinding or restoration afterwards. Coated paper books should never be vacuum dried because they will stick together.

b) Air drying wet and partially wet books
Air drying involves the following procedures:[55]

Wet books will need to be drained before drying:

- Stand the book upright, on its head, on absorbent paper.
- Support the book by opening the covers somewhat, but not the pages.
- When the pages begin to dry and separate on their own, interleave them.

Prepare interleaves:

- Suitable materials are thin blotters, unprinted newsprint, and paper towels.
- Cut interleaves that are bigger than the pages.

Insert the interleaves into the gutter margin of the book.

- The sheets should project above the head and foredges of the book, but not on the lower edge where the book will stand.
- Beginning at the back, put the interleaves at intervals through the book.
- The sheets should not equal more than one third of the thickness of the volume, so that the binding won't be strained.
- Separate the covers from the text block with absorbent paper or sheets of plastic.
- Open the covers of the book and stand it upright.

Change the interleaves as they become wet, every 2 to 3 hours.

- Put new interleaves in different places in the book.
- Change the paper underneath the book, and turn the book over (if it was standing on its tail, stand it on its head—this will reduce strain on the binding).
- Remove the used interleaves from the vicinity of the books. The sheets can be dried and used again if they are not dirty or cockled.

After the books feel dry to the touch, remove the interleaves and reshape the bindings.

- Flatten each book under a sheet of plastic or covered board with a light weight on top.
- Do not pile books on top of each other, because they could distort.

Ensure that the books are thoroughly dry before they are reshelved. Monitor for mold during and after drying.

c) Air drying of damp books or books with slightly wet edges
Stand books upside down, and fan open the pages. Support paperbacks and books with damaged covers with bookends or weights. Every couple of hours, refan the pages. In the final stages, turn the book over to dry the tops of the pages. When the book feels dry, flatten under weights as above.[56]

Damp or partially wet pamphlets—open and dry flat. Turn pages often.

[55] Peter Waters, *Procedures for Salvage of Water-Damaged Library Materials,* 2nd ed. (Washington: Library of Congress, 1979), 17–21; Buchanan, *RAMP*, 80–83; Fortson, 53–55, 59; Buchanan, "Drying," 3.

[56] Fortson, 54, 57

d) Books with coated papers
Freeze drying will give the best results for wet coated papers. If the book is partially wet, fan open the pages and interleave between every page with waxed paper.[57] Damp books should be stood on their heads and fanned open. Fan through the pages frequently.[58]

e) Books with leather and vellum bindings
A book conservator should dry rare and vellum bindings.

If the books have been frozen, thaw them in the following way. Place blotters on the outside of the book, and then lay the book flat under weights. This will prevent the binding from drying out and distorting while the rest of the book thaws.[59]

In the drying phase, isolate the binding from the text block with a sheet of plastic or blotter. Interleave the book. Lay the book flat on blotters, place another blotter on top, followed by a flat board and weights. Be careful to minimize the strain put on the binding. Change the interleaves as they become wet.

If leather bindings are freeze dried, they will in the very least severely distort. However, freeze drying may be chosen for bound volumes which contain soluble media, and have bindings of low intrinsic value.[60]

3. Parchment and vellum manuscripts
A conservator may air dry individual sheets and charters by drying them with weights around the edges, or flattening them between weighted blotters.

Tests have shown that parchment and vellum manuscripts may be freeze dried. However, the sheets may increase in thickness and brightness, and decrease in mechanical properties. The changes may be reduced by subsequently dampening the records and flattening them under weighted blotters.[61]

In any case, do not freeze dry gilded or illuminated manuscripts.[62]

4. Paintings
Ideally, this treatment should be done by a conservator.

Initially, set up tabletops padded with blotters and covered with plastic.

Separate the merely wet paintings from those showing structural damage. Signs of structural damage are tears in the canvas, flaking, lifting, and dissolving of paint and ground layers. Let structurally damaged paintings dry, face up in a horizontal position, on the tables.

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[57] Fortson, 54–55.

[58] Barton and Wellheiser, 67.

[59] Procedure from the National Library of Canada.

[60] This procedure was followed for water damaged judges' bench books at B.C. Information Management Services.

[61] A.E. Parker, "Freeze-Drying Vellum Archival Materials", *Journal of the Society of Archivists*, 14 No. 2 (1993):181; Francoise Fleider, Françoise Leclerc, and Claire Chahine, "*Effet de la Lyophilisation Sur le Comportement Mécanique et Chimique du Papier, du Cuir et du Parchemin*" (Paper presented at the ICOM Committee for Conservation 5th Triennial Meeting, Zagreb, 1978), 78/14/8, 5–6.

[62] Parker, 180.

Contact a conservator about drying paintings with high or fragile impasto layers.

Other structurally sound paintings on canvas can be dried in the following way: Set up several more layers of blotter on the table, followed by a layer of Japanese tissue paper. Unframe the painting, but don't remove it from its stretcher. Lay it face down on this surface, making sure the tissue is not wrinkled. Cut blotters to the inside dimensions of the stretcher frame. Cut a sheet of plywood or thick masonite to the same dimensions, or smaller to fit inside the stretcher keys. Cover the back of the canvas with a blotter (if the canvas is large and more than one blotter is necessary, butt the blotters end-to-end), then the board, and finally weights. Change the blotter until the canvas is dry. If the tissue on the front has any tendency to stick to the paint layer, leave it in place.[63]

5. Computer media

Magnetic tapes. Rinse off sewage, mud and sea water with tap water, if this has not been done already. If oil and greasy deposits remain, wash the tape in an unscented and undyed dish detergent.[64]

Tapes can be air dried or vacuum dried without heat.[65] Vacuum drying has not been comprehensively tested on a variety of magnetic media. However, it may be the only practical way to dry large quantities of tapes. Do not freeze dry, freezer dry, or vacuum dry with heat (vacuum thermal drying).[66] The following instructions are for air drying of media.

Cartridge backup tapes. If only the outside of the cassette is wet, air dry it on absorbent materials. If the tape has become wet on the inside, or the cartridge is damaged, dismantle and air dry like reel to reel audio tapes.

Open reel computer tapes. Remove the tape from its canister and wrap-around. Rinse off the exterior of the tape with distilled water. If the tape is in good condition, dry the exterior wet surfaces with a lint-free cloth.[67] If the edge of the tape is fragile, do not blot or do the following. Separate the reel flanges from the tape with a rubber grommet or similar material. This lets air flow around the tape and prevents the tape from sticking to the flange. Let the tapes air with fans blowing on them. (Do not use heat). When the tape looks dry on the outside, run it reel-to-reel on a tape cleaner or winder. Run the tape 6 times over the cleaning tissues and not the blades (remove them if you can.), then put the tapes twice through both the tissues and blades. Never put wet tape on a tape drive because the tape could stick to the equipment and tear. Finally, recopy the tape.[68] Monitor the tape carefully; stop cleaning if the oxide layer begins to shed, or mechanical distortion becomes apparent.

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[63] CCI, 2.

[64] Van Bogart.

[65] Ibid.; Edward F. Cuddihy, "Storage, Preservation, and Recovery of Magnetic Recording Tape" in *Environment et conservation de l'écrit, de l'image et du son, actes des deuxièmes journées Internationales d'études de L'ARSAG, Paris, 16-20 Mai, 1994* (Paris: Association pour la Recherche Scientifique sur les Arts Graphiques, 1994), 185.

[66] Van Bogart.

[67] Ibid.

[68] Sidney B. Geller, *Care and Handling of Computer Magnetic Storage Media*, NBS Special Publication 500-l0l (Washington: National Bureau of Standards, l983), 34–35.

Floppy disks. Wet disks should be removed from their jackets, washed, and dried. Before starting, dry a corner of the jacket and the disk hub with a lint free cloth. Mark both the jacket and the hub with a waterproof pen, so both can be matched later on.[69]

5.25" disks. Move the diskette to one side of the jacket. Cut the opposite edge of the jacket with non-magnetic scissors. (Beware—the diskette begins 1/16" from the edge).[70]

3.5" disks. If the jacket has screws, remove them. Hold the diskette with the metal door side down, and remove the door letting its spring fall outward. With a microspatula, open the shell at the side.[71]

Carefully remove the disk without touching the surface. Wash disks in a tray of distilled water. Dry with a soft lint free cloth, or spread flat to dry on the same. Insert the diskette into a new jacket (taken from a new diskette—this can be reused), ensuring that the jacket or shell is firmly taped together so it won't get caught in the disk drive. Copy the disk on to a new disk and check the data. Label the new disk. Copy the information on the old jacket on to the new jacket. The computer drive heads should be cleaned frequently.[72]

6. Compact discs and CD-ROMs

If disks were exposed to sea water, wash the tapes with tap water, if this has not been done already. Clean off mud and sewage by washing the tape in a detergent solution. Do not rub the disk because dirt could scratch the tracks. After either procedure, rinse with distilled water.[73]

Before drying, rinse all discs with room temperature distilled water. Dry the disk vertically in a rack. If blotting is necessary, take care to avoid scratching the surface. Blot, do not rub, with a soft lint-free cloth.[74]

CD cases and the enclosed paper should also be dried. Once the disc is removed, open the case and freeze dry the entire case and glossy paper booklet. Do not freeze dry the CD. While the cases are being dried, either store the discs in spare cases or stack the CDs interleaved with polyester web (such as Tech Clean Absorb Wipes).[75]

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[69] ARMA international Guideline for Records and Information Management, *Magnetic Diskettes—Recovery Procedures* (Prairie Village: Association of Records Managers and Administrators, 1987), 3.

[70] ARMA, 3; Lundquist, Eric G., *Salvage of Water Damaged Books, Documents, Micrographic and Magnetic Media* (San Francisco: Document Reprocessors, l986), 85; Kahn, 20.

[71] Kahn, 20; Jeanne Drewes, submission to Conservation Distlist, Instance 9:57, January 31, 1996.

[72] ARMA, 4–5.

[73] Van Bogart.

[74] Ibid.; Kahn, 28; Gilles St-Laurent, *The Care and Handling of Recorded Sound Materials* (Washington: Commission on Preservation and Access, 1991), 11.

[75] Gilles St-Laurent, personal communication, October 10, 1996.

7. Sound and video recordings

a) Magnetic tapes

Rinse off sewage, mud and sea water with tap water, if this has not been done already. If oil and greasy deposits remain, wash the tape in an unscented and undyed dish detergent.[76] Tapes can be air dried or vacuum dried without heat.[77] Vacuum drying has not been comprehensively tested on a variety of magnetic media. However, it may be the only practical way to dry large quantities of tapes. Do not freeze dry, freezer dry, or vacuum dry with heat (vacuum thermal drying).[78] The following instructions are for air drying of media.

Reel to reel tapes. Wash the tape while it is still wound on its reel. Rinse with distilled water. If the edge of the tape is fragile, do not blot it. Let the tape air dry in a vertical position, without taking the following steps. If the tape is in good condition, blot the sides of the tape and the reel with a lint free cloth.[79] Loosen the flanges of the reel if possible. Support the tape vertically and air dry it; or air dry by laying it on sheets of newsprint spread over plastic covered tables. If contaminants have spread inside the tape pack, run the tape twice over a tape cleaner.[80] Monitor the tape carefully during cleaning; stop if the oxide layer begins to shed, or mechanical distortion becomes apparent.

If the reels are still dirty, remove the tape and wash the reel with detergent and water. An alternative is to replace the reel or the flanges. The box can be air dried as well. Replace the box if it is badly damaged.

Videocassettes. If only the outside of the cassette is wet, air dry it on absorbent materials. If the tape has become wet on the inside, dismantle the cassette and dry as for reel to reel tapes.[81] Inspect the cassette spindles and springs for rust.[82]

Audio cassettes. If the tapes have only been splashed on the outside, dry off the exterior of the tape. If the tape has become badly contaminated, or the cassette is damaged, dismantle the cassette and air dry the tape as above. Cassettes without mounting screws may have to be broken open, and the case replaced. Re-record the tape after drying.[83]

b) Shellac, acetate, and vinyl discs

Salvage first shellac and acetate discs, which are sensitive to water. If these discs need to be washed, keep contact with water to a minimum.[84]

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[76] Van Bogart.

[77] Ibid.; Cuddihy, p. 185.

[78] Van Bogart.

[79] Ibid.

[80] Public Archives, p. 11.7; Brian MacDonald, personal communication, December 21, 1995.

[81] MacDonald.

[82] Van Bogart.

[83] Public Archives, p. 11.8; MacDonald.

[84] St-Laurent, communication; Gibson.

Remove the discs from their sleeves and jackets. If labels have separated from the disc, mark the center of the disc with a grease pencil. Keep track of the label. Dry loose labels on sheets of unprinted newsprint or blotters. Write the number of the corresponding disk under the label. Jackets, sleeves, and labels may be dried like other paper materials.[85]

If dirt has been deposited on the discs, wash them. The best way to clean them is with a record cleaning machine.[86] If this is not possible, wash in trays of distilled water. Air dry the discs on supports that permit free circulation of air. If the disc needs to be wiped off, use a soft lint free cloth and blot along the grooves.

8. Photographic materials

a) The first priority is to air dry photographs that are very sensitive to water. The recovery rate may not be high.

Spread tabletops with small pieces of blotters or unprinted newsprint that can be changed as they become wet.[87] Remove photographs from their enclosures. Be sure to keep identifying information with the photo and maintain the original order.

Wet collodion glass negatives, unmounted ambrotypes, tintypes and pannotypes. Dry binder side up on blotters.

Cased photographs. (These are daguerreotypes, ambrotypes, and tintypes in cases.) If water has penetrated inside the case and assembly, the package should be dismantled and the components air dried. Remove the assembly from the case. Carefully fold back the preserver frame, cut the sealing tape (if present) and take the assembly apart. Place daguerreotypes face up on blotters with the case components beside them. Wet collodion photographs should be dried in a similar way binder side up.[88]

Additive color transparencies (Autochromes, Dufaycolor). If water has penetrated inside, dismantle the slide. Remove the binding tape and cover glass, and dry face up.

Dye transfer prints. Dry emulsion side up on blotters.

Deteriorated nitrate negatives. If they are still salvageable, dry emulsion side up on sheets of polyester web (Hollytex or Reemay) over blotters. (The emulsion side can be identified by the notch code on sheet films—if the notch is in the upper right hand corner, the emulsion side is facing you.) Nitrates in the earliest stages of deterioration may be hung with plastic clips on a line. Don't let the negatives touch each other.

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[85] Public Archives, p. 11.8.

[86] St-Laurent, *Sound*, p.10.

[87] Norris, 604.

[88] Christopher Harvey, "The Treatment of Flood-Damaged Photographic Material at the Perth Museum and Art Gallery, Scotland," *Paper Conservation News 76* (December 1995): 10-11.

Deteriorated acetate negatives. If the emulsion is very swollen or channeled, dry emulsion side up on blotters covered with polyester web. Acetates in the early stages of deterioration may be carefully hung with plastic clips on a line.

Carbon prints and Woodburytypes. Dry emulsion side up on blotters.

b) Other prints, negatives, and transparencies

In order of preference, the drying methods are: air dry; freeze, thaw and air dry; and freeze dry.[89] Do not vacuum dry, because it will make the photographs stick together in a lump.

If the photographs have been previously frozen, thaw them. Treat small batches that can be easily dried in one day without growing mold.[90]

Keep the photographs wet in plastic bags until they are separated from each other and their enclosures. If it appears that the photographs could dry and stick together during thawing, immerse them again in cold water.

Remove photographs from their enclosures. Maintain their original order, and keep identifying information with them. If the enclosures and slide mounts have valuable information, dry them alongside the photographs.[91] If the enclosure information is minimal, it can be copied on to slips of paper that are kept with the photo.[92]

If the photographs have been exposed to dirty or salt water, clean them

by immersing them in a tray of cool water. If the surface is in good condition, it can be very gently brushed (with a soft artist's brush or dental cotton) to release dirt. Do not brush photographs with damaged binder layers, or processes with delicate surfaces—such as collodion chloride printing out papers and glossy Ilfochrome prints.[93]

General air drying instructions. Spread tabletops with small pieces of blotters or unprinted newsprint that can be changed as they become wet.[94]

Prints. Dry prints before negatives. Dry the print face up on blotters above. If the print is in good condition, it may be blotted: lay a sheet of polyester web on the surface, and blot very gently over the web. Otherwise, the gelatin binder will stick directly to the blotting paper.[95] Unmounted albumen prints may curl up as they dry. To prevent this, dry them with weights around the edges,[96] or under lightly weighted polyester web and blotters.[97]

Roll film negatives. Dry emulsion side up on blotters as above.

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[89] Hendriks and Lesser, "Disaster Preparedness," 67.

[90] Harvey, 9.

[91] Norris, 603.

[92] Harvey, 10.

[93] Norris, 607.

[94] Ibid., 603.

[95] Ibid.

[96] Hofmann, 14.

[97] Norris, 604.

Sheet film negatives and transparencies. These have a gelatin layer on the back that could stick to absorbent papers. Carefully hang negatives to dry with plastic clips on to a line.[98] If clips are not available, dry the films emulsion side up on polyester web covered blotters.

Glass negatives. Dry negatives vertically, either by carefully propping them up on their long sides[99] or putting in racks. Dry flat those negatives that are broken, cracked, or have flaking emulsions.[100]

Lantern slides. If water has penetrated inside, dismantle the slide to prevent the emulsion from sticking to other components. Dry the transparency as for glass negatives. Keep paper title and the mask if they have documentary information.[101, 102]

Color slides in paper or plastic mounts. Be sure to remove slides from their plastic sleeves and pages. In a small emergency, when the environment is controlled, it may be possible to dry the slides in their mounts. If conditions are not ideal, it is necessary to unmount the slides and dry the components separately; careful record keeping is necessary. Hang the film chips on a line with extended paper clips.[103] Alternatively, dry emulsion side up on absorbent materials.

9. Microforms

The best way to dry roll microfilms is to arrange for a microfilm processor to rewash and dry them.

Microforms: Follow the instructions under historic photographs for setting up a workspace, washing, and drying.

a) Aperture cards

Remove the film chips from their mounts. Wash the chips and dry them binder side up on blotters or newsprint. When they are dry, remount them.[104]

b) Microfilm strips in jackets

Cut the strips from the jackets. Wash and dry the film, and insert into new jackets.[105] Alternatively, dry the outside of the jacket, and duplicate the film immediately.

c) Diazo and Vesicular microfiche

Remove from enclosures. Inspect diazo films for blistering and delamination. If damaged, discard and replace with a print from a security copy. Wash all damaged microfiche in cool clear water. Lay out to dry, on absorbent materials or hang to dry on a line.[106]

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98 Ibid., 605.

99 Ibid.

100 Harvey, 9.

101 Norris, 605.

102 Harvey, 10.

103 Norris, 605–606.

104 Public Archives, p. 12.10.

105 Julia Niebuhr Eulenberg, *Handbook for the Recovery of Water Damaged Business Records* (Prairie Village, Kansas: ARMA, 1986), 34.

106 Ibid.

Rehabilitation

A. Rehabilitation of storage areas
After the collections have been removed, check the shelves and repair them if necessary. If mold has occurred, sterilize the shelves.

Monitor the environment and inspect the area for mold. Do not return the collections until conditions have stabilized.[107]

B. Rehabilitation of collections
Records that have been dried in low RH conditions need to acclimatize to the usual stack conditions. When the collections return, uncover them and let them equilibrate to the moisture content of the area; this could take up to two weeks. Inspect the records to ensure that they are indeed dry (less than 7% moisture content), and monitor daily for mold. In an ideal situation, collections should be kept in a separate rehabilitation area for six months. If this is not possible, monitor the collections closely for mold and humidity damage.[108]

At this stage, it may be necessary to rehouse records in new enclosures.

Assess and sort dried records for future conservation, such as cleaning and structural repairs.

The Preservation Services Unit coordinates with Records Centre Services and library staff on the following: sorting of collections for reshelving, labeling of records and books, and tracking of location of records.

C. Post-disaster review
As soon as possible after the disaster salvage and recovery operation is completed the Disaster Response Team will review the disaster plan.[109]

> How can similar events be prevented in the future?
> What worked?
> What didn't work?
> What supplies were missing?
> What supplies were not available on short notice?

Management will send thank you letters to all staff, volunteers, and consultants who helped out. A report of the disaster will be sent to the Ministry Executive and any interested organizations.

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[107] Bohem, 16.

[108] Waters, 12; Buchanan, RAMP, 88.

[109] Bohem, 17.

Table 1: Potential Emergencies

Scale of disaster (1)	Examples	Materials affected	Utilities affected	Operations affected	Staff Mobilization	Resources necessary	Facilities
Minor	Minor roof and plumbing leaks	Small quantity Can be easily air dried or frozen	Power operational	Regular operations aren't physically disrupted	Preservation and Imaging Services staff—other staff not needed	In-house supplies plus a few extra services (cold storage)	Can be treated in-house in conservation and imaging labs
Moderate	Burst water pipes, sewer backup	Large quantities that need freezing Complex materials that need air drying	Power may be out of order or disconnected for safety reasons	Flood damage physically disrupts regular operations in one site	Extra staff needed—Activate Disaster Response Team	In-house supplies plus ordering in of outside supplies; cold storage needed	May require extra facilities for freezing, air drying of records and treatment of roll films
Major	Fire (water damage) Broken water mains	Large quantities that need freezing plus complex materials that need air drying	Power may be out of order	Regular operations physically disrupted in one or all sites	Activate Disaster Response Team after human safety needs met	In-house supplies, order outside supplies Cooperation necessary with other institutions for sharing of resources	External facilities needed for freezing, air drying, treatment of roll film, and freeze drying of records
Major—Catastrophic	Great Earthquake (broken pipes)	Large quantities	All utilities out of order	All operations disrupted	Activate Disaster Response Team after home safety needs met	In-house supplies Cooperation necessary with neighbouring institutions	Air drying may be only method because of failure of utilities and transportation

(1) Stanford University Libraries, "Collections Emergency Response Manual," (Palo Alto: Stanford, 1992).

Salvage at a Glance

Material	Priority	Handling precautions	Packing method	Drying method
Paper documents and manuscripts Stable media	Freeze or dry within 48 hours.	Don't separate single sheets.	Interleave between folders and pack in milk crates or cartons.	Air, vacuum, or freeze dry.
Soluble inks (felt pen, colored pens, ball point)	Immediately freeze or dry.	Do not blot.	Interleave between folders and pack in milk crates or cartons.	Air or freeze dry.
Maps and plans Stable media	Freeze or dry within 48 hours.	Use extra caution if folded or rolled.	Pack in map drawers, bread trays, flat boxes, on heavy cardboard or poly covered plywood.	Air or freeze dry.
Soluble media Maps and plans by photoreproductive processes Hand coloured maps	Immediately freeze or dry.	Do not blot.	Interleave between folders and pack as above.	Air or freeze dry.
Drafting linens	Immediately freeze or dry.	Avoid pressure—inks can smear away.	Pack like maps in containers lined with plastic.	Air or freeze dry. Air dry by separating sheets and interleaving.
Maps on coated papers	Immediately freeze or dry.		Pack like maps in containers lined with plastic.	Freeze drying preferred.
Books Books and pamphlets	Freeze or dry within 48 hours.	Do not open or close, do not separate covers.	Separate with freezer paper, pack spine down in milk crate or cardboard box 1 layer deep.	Air, vacuum, or freeze dry.
Leather and vellum bindings	Immediately dry; or freeze if many books.	Do not open or close, do not separate covers.	Separate with freezer paper, pack spine down in milk crate or cardboard box 1 layer deep.	Air dry.
Books and periodicals with coated papers	Immediately freeze or dry.	Do not open or close, do not separate covers.	Keep wet; pack spine down in containers lined with garbage bags.	Freeze drying preferred. Air dry by fanning pages and interleaving.
Parchment and vellum Manuscripts	Immediately freeze or dry.		Interleave between folders. Pack oversize materials flat	Air or freeze dry. Do not freeze dry gilded or illuminated manuscripts.
Works of art on paper Prints and drawings with stable media	Freeze or dry within 48 hours.	Don't separate single sheets.	Interleave between folders and pack in milk crates or cartons.	Air, vacuum, or freeze dry.
Oversize prints and drawings	Freeze or dry within 48 hours.	Use extra caution if folded or rolled.	Pack in map drawers, bread trays, flat boxes, on heavy cardboard or poly covered plywood.	Damp—air or freeze dry. Wet—freeze drying preferred.
Framed prints and drawings	Freeze or dry within 48 hours.	Handle with care—glass.	Unframe if possible, then pack as above.	Once unframed and unmatted, air or freeze dry.
Soluble media Watercolours, soluble inks, and hand coloured prints	Immediately freeze or dry.	Do not blot.	Interleave between folders and pack in milk crates or cartons.	Air or freeze dry.
Coated papers (e.g. posters)	Immediately freeze or dry.		Keep wet in containers lined with garbage bags.	Freeze drying preferred. Air dry by separating pages and interleaving.

Material	Priority	Handling precautions	Packing method	Drying method
Paintings	Immediately dry.	Drain and carry horizontally.	Face up without touching paint layer.	Air dry. See instructions.
Computer media Tapes	Immediately rinse off tapes soaked by dirty water. Dry within 48 hours if paper boxes and labels; otherwise, tapes can stay wet for several days. Do not freeze.	Do not touch magnetic media with bare hands. Handle open reel tapes by hubs or reel.	Keep tapes wet in plastic bags. Pack vertically in plastic crate or tub.	Air dry, or test vacuum drying without heat.
Floppy disks	Immediately pack. Do not freeze.	Do not touch disk surface with bare hands.	Keep wet. Pack vertically in plastic bags or tubs of cold water.	Air dry.
Compact discs and CD ROMs	Immediately dry discs. Dry paper enclosures within 48 hours.	Do not scratch the surface.	Pack vertically in crates or cardboard cartons.	Air dry.
Sound and video recordings sound and videotapes	Immediately rinse off tapes soaked by dirty water. Dry within 48 hours if paper boxes and labels; otherwise, tapes can stay wet for several days. Do not freeze.	Do not touch magnetic media with bare hands.	Keep tapes wet in plastic bags. Pack vertically in plastic crate or tub.	Air dry, or test vacuum drying without heat.
Shellac and acetate discs	Immediately dry. Dry enclosures within 48 hours.	Discs are very fragile. Hold discs by their edges. Avoid shocks.	Pack vertically in ethafoam-padded crates.	Air dry, preferably with a record cleaning machine.
Vinyl discs	Dry within 48 hours. Freezing is untested; if it is necessary, freeze at above -18°C (0°F). Freeze or dry enclosures within 48 hours.	Hold discs by their edges. Avoid shocks.	Pack vertically in ethafoam-padded crates.	Air dry, preferably with a record cleaning machine.
Photographs Black and white prints Albumen prints	Freeze or dry within 48 hours.	Do not touch binder with bare hands.	Interleave between groups of photographs.	Air dry; thaw and air dry.
Matte and glossy collodion prints	Freeze or dry within 48 hours.	Avoid abrasion. Do not touch binder with bare hands.		Air dry; thaw, and air dry; or freeze dry.
Silver gelatin printing out and developing out papers	Freeze or dry within 48 hours.	Do not touch emulsion with bare hands.	Keep wet. Pack in plastic bags inside boxes.	Order of preference: (1) Air dry, (2) thaw and air dry, (3) freeze dry. Do not vacuum dry.
Carbon prints and Woodburytypes	Immediately freeze or dry.	Handle carefully—swelling of binder.	Horizontally.	Air dry or thaw and air dry.
Photomechanical prints (e.g. collotypes, photogravures) Cyanotypes	Freeze or dry within 48 hours.	Do not separate single sheets.	Interleave every 2" and pack in boxes or crates.	Air dry, or freeze dry
Colour photographs Dye transfer prints	Package to prevent damage—recovery rate is poor. Immediately dry.	Do not touch emulsion.	Transport horizontally.	Air dry face up.

Material	Priority	Handling precautions	Packing method	Drying method
Chromogenic prints and negatives	Freeze or dry within 48 hours.	Do not touch binder with bare hands.	Keep wet. Pack in plastic bags inside boxes.	Order of preference: (1) Air dry, (2) thaw and air dry, (3) freeze dry. Do not vacuum dry.
Cased photographs Ambrotypes Pannotypes	Recovery rate is low. Immediately dry.	Handle with care—glass supports and extremely fragile binder.	Horizontally in a padded container.	Air dry face up. Never freeze.
Daguerreotypes	Immediately dry.	Handle with care—fragile surface, cover glass.	Horizontally in a padded container.	Air dry face up. Never freeze.
Tintypes	Immediately dry.	Handle with care—fragile binder.	Horizontally.	Air dry. Never freeze.
Negatives Wet collodion glass plates	Recovery rate is low. Immediately dry.	Handle with care—glass support and fragile binder.	Horizontally in a padded container.	Air dry face up. Never freeze.
Gelatin dry plate glass negatives	Freeze or dry within 48 hours.	Handle with care—glass.	Keep wet. Pack in plastic bags, vertically in a padded container.	Air drying preferred; or thaw and air dry; freeze dry.
Deteriorated nitrates with soluble binders	Immediately freeze or dry. Recovery rate may be low.	Do not blot.	Horizontally.	Air dry; thaw and air dry; test freeze drying.
Deteriorated acetates	Immediately freeze or dry. Recovery rate is low.	Handle carefully—swelling of emulsion.	Horizontally.	Air dry; thaw and air dry; test freeze drying.
Polyester based film, nitrates and acetates in good condition	Freeze or dry within 48 hours.	Do not touch emulsion with bare hands.	Keep wet. Pack in small plastic bags inside boxes.	Order of preference: (1) Air dry, (2) thaw and air dry, (3) freeze dry. Do not vacuum dry.
Transparencies Lantern slides, silver gelatin	Dry or freeze within 48 hours.	Handle with care—loose binding tapes and glass.	Vertically in a padded container.	Air drying preferred; thaw, and air dry.
Colour transparencies Additive color transparencies (most are glass) Autochromes, Agfacolor, Dufaycolor	Package to prevent damage—recovery rate is very poor. Immediately dry.	Handle with care—loose binding tapes and glass.	Horizontally in a padded container.	Air dry. Never freeze.
Chromogenic colour transparencies Mounted colour slides and sheet films	Freeze or dry within 48 hours.	Handle by mounts or edges.	Keep wet. Pack in plastic bags inside box.	Order of preference: (1) Air dry in mounts if possible (2) thaw and air dry, (3) freeze dry. Do not vacuum dry.
Motion pictures	Rewash and dry within 48 hours.		Keep wet. Pack in plastic pails or cardboard cartons lined with garbage bags.	Arrange with a film processor to rewash and dry.
Microforms Microfilm rolls	Rewash and dry within 48 hours.	Do not remove from boxes; hold carton together with rubber bands.	Keep wet. Pack (in blocks of 5) in a cardboard box lined with garbage bags.	Arrange for a microfilm processor to rewash and dry.
Aperture cards	Freeze or dry within 48 hours.		Keep wet. Pack in plastic bags inside boxes.	Air dry, or thaw and air dry.
Jacketed microfilm	Freeze or dry within 48 hours.		Keep wet. Pack in plastic bags inside pail or box.	Air dry, or freeze, thaw and air dry.
Diazo and vesicular microfiche	Freeze or dry within 48 hours.		Interleave between envelopes and pack in milk crates or cartons.	Air dry, or freeze, thaw and air dry.

This article and foldout insert are reprinted from: Betty Walsh, "Salvage Operations for Water Damaged Archival Collections: A Second Glance," *WAAC Newsletter*, Vol. 19, No. 2, (May 1997), pp 12-23, plus insert. Carolyn Tallent, Editor. Reprinted by permission of the author.

The chart which accompanies the article is 17" x 22" and is printed on Kimdura®, a synthetic paper designated to be waterproof and stain, oil, grease, UV and tear resistant.

This chart was written as a ready reference to the B.C. Archives disaster plan. Originally, the chart was modeled on a table of recovery priorities written by Julia Niebuhr Eulenberg, in *Handbook for the Recovery of Water Damaged Business Records* (Prairie Village, Kansas: ARMA, 1986), 47–48.

In the interest of a quickly readable chart, other footnotes have not been included. The reader may consult with the text for more details on sources.