Appendix 1. Wet records: Stabilising and drying methods

There are a number of stabilising and drying methods that can be used in the recovery phase of disaster management. It is important to remember that different types of materials, and different types of damage, can require different recovery treatment options and techniques.

Below are general tips on stabilising and drying water damaged paper-based materials. ***HOWEVER, advice should be sought from a trained conservator before proceeding.***

Airdrying within the first 48 hours is suitable for drying small quantities of damp and partially wet records. It can be used, on a triage basis, to dry records in a major disaster when services are not available.

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

Vacuum drying will dry large quantities of wet records but will cause more distortion to bindings than if they were freeze dried.

Table. Suitability of drying methods

Format / method	Air-drying	Freezing	Vacuum freeze drying
Volumes	Yes	Yes	Temporary records only not to be used on State Archives
Files	Yes	Yes	Temporary records only not to be used on State Archives
Card indexes	Yes	Yes	Temporary records only not to be used on State Archives
Maps and plans	Yes	Subject to material & physical size (not to be used on linens or thermal printed items)	No
Vellum and parchment	Yes	Yes	No
Photographic prints	Yes	Not recommended	No
Photographic negatives	Yes	No	No
Glass Plate negatives	Yes	No	No
Electronic media	Yes	No	No

Whichever method is chosen, dried materials should be monitored for potential mould growth after recovery.

1.1 Airdrying

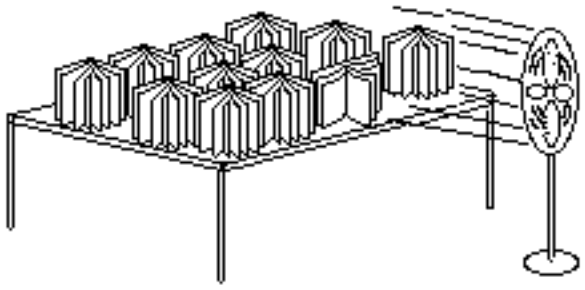
Airdrying can be attempted if it is within 48 hours of the disaster and if material is not soaked. Otherwise, mould will start to grow, and items that are suitable should be frozen where possible. Airdrying may result in some distortion of items and should not be used for items with soluble inks.

Airdrying requires a large space with good air circulation and temperatures below 21ºC. Circulation should be encouraged by positioning fans and opening windows. If available, dehumidifiers can be used in the drying process to reduce relative humidity (ideally to 25-35%). Screening material such as window screens can provide an excellent compact drying surface which allows for air circulation (although metal mesh will rust in contact with moisture).

Airdrying techniques are dependent on the physical format of the record. For example, paper files should be spread out, laid flat, and interleaved with blotting paper, while volumes should be stood upside-down, opened, and fanned out with absorbent paper placed at between pages at regular intervals.

Volumes

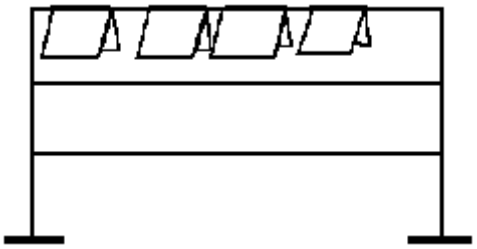
- Closed volumes can be cleaned before drying, by washing off dirt or mud on covers and edges using clean running water and a sponge.
- Books and volumes which can stand upright can be placed on paper toweling with their covers slightly open and their pages lightly fanned. A gentle breeze from a fan can assist the drying process. Do not use heat as it will encourage mould.
- Priority volumes can be dried by placing plastic sheeting on the floor, standing volumes upright with pages fanned (if their spines will support them), and then forming wind tunnels around them from cardboard or plastic sheeting. Cool air from fans can then be directed down the tunnels.
- Interleaving can be used for wet volumes that cannot support their own weight. Loose sheets of paper towel or blotting paper can be placed at 1 centimetre intervals though the volumes. Do not allow interleaving materials to exceed a third of the thickness of the volume or the spine will be damaged (the exception is with coated papers where each page must be interleaved). Replace interleaving materials when wet.
- If adhesives are sticking to the interleaving sheets, a release material such as nylon gauze should be used as a barrier between them.



Drying bound volumes by standing upright (reproduced with permission of National Archives of Australia)

Pamphlets

- Pamphlets and loose pages can be hung on lines or improvised drying racks providing you have enough space and assistance.



Hanging small items (reproduced with permission of National Archives of Australia)

Files

- Files should be removed from boxes carefully and laid flat. Bundles can be interleaved and pressed under a light weight or pages turned regularly, ensuring that the original order is maintained for each bundle. Cool air can be directed to the pages, but ensure that it is directed upward rather than directly on the pages. Replace the interleaved sheets when they become wet. Glossy papers should be fully separated and interleaved or frozen.
- For saturated files, metal binders should be replaced with plastic tubing or plastic coated wire and pages fanned with some interleaving.

Maps and plans

- Maps and plans can be interleaved with blotting paper stacked up to 10 high and pressed dry under glass, Perspex or thick board and weighted evenly.

Card indexes

- Card indexes should be removed from drawers, stack on sides loosely and supported at each end.

Vellum and parchment

- Vellum and parchment items are very fragile and susceptible to damage when wet. They should be fully supported at all times when being moved. Consult a Conservator before proceeding with any treatments. If nobody can be contacted interleave and freeze.

Photographic prints

One of the major threats to photographic prints is the development of mould. If treated rapidly, photographic prints may be air dried.

Freezing or vacuum thermal drying is not recommended. Photographs can become mottled and/or stick together.

To air dry: have good air circulation and avoid touching the photo surface as it is fragile and easily damaged.

- remove photographs from mounts or separate from each other to prevent the emulsion sticking, save accompanying information
- if covered in mud or dirt and are still wet, rinse gently in a bucket of cold clean water
- do not touch or blot surfaces, allow excess water to drain off by tilting
- place emulsion side up on blotters, lint free cloths or racks
- to speed drying, hang on a line with non-abrasive clips on non-image areas, ensuring there is no overlap. Small indentations will occur.
- when part dry, interleave with baking paper in small stacks (approximately 5 photos only)
- to avoid cockling, when nearly dry, re-interleave with baking paper and place under light weights for a few days. Check throughout.
- colour photograph emulsion is more sensitive than black & white. If wet and the colours are stable, they can be rinsed in cold water. However a protective coating may be removed. Copy as soon as possible.
- digital prints are prone to water damage as many of the inks are water soluble. They require careful handling. If you have the original digital file it would be better to copy rather than salvage.

Photographic negatives

Again the major threat is the development of mould.

Glass plates, daguerreotypes, ambrotypes, tintypes should never be frozen or immersed. Air dry emulsion side up.

To air dry:

- remove negatives from envelopes
- gently rinse in a bucket of cold water
- hang to dry or tilt lie with emulsion side up on blotter, to allow excess water to drain off.

The National Film and Sound Archive of Australia website gives first aid advice for water damaged film, which is also applicable for negatives. They also suggest freezing by placing the film in plastic bags after rising, removing as much air as possible. If unable to access a freezer or to air dry, they suggest placing the film in a bucket of cool water, changing the water daily until conservation can be arranged.

Glass plate negatives

Glass plate negatives should **NOT** be immersed in water. They should never be frozen or freeze dried. Air dry them immediately by laying flat onto blotter with the emulsion side up (duller side) or upright in a dish rack. Avoid touching the emulsion side.

Magnetic media

If magnetic media (disks, audio, video) is damaged, teams should ***never*** try to make copies of it immediately because it might damage the hardware. If exposed to heat, an expert can advise of the chances of preserving the information.

Floppy disks and diskettes

If floppy disks are wet, they should be placed upright in cold distilled water until recovery is possible. Do not dry or attempt to freeze them. If full backup copies exist, then damaged media can be destroyed and replaced. If they need to be salvaged:

- Remove from water immediately
- Remove from jacket
- Rinse off dirt with clean distilled water. Do not soak
- Drip dry vertically in a disk drain or rack.
- Clean with a soft lintless cloth, move perpendicular to grooves, not in a circular motion. Do not use hairdryers.
- Place cleaned compact disk in clean jackets.
- Replace if mould or condensation is present or if there are deep scratches. Check playability and readability.

Magnetic tapes

- **DO NOT** freeze because the moisture in the tapes will cause permanent damage when frozen. Do not use magnetised tools/scissors
- **DO NOT** use hot or warm air to dry as it will cause the tape to adhere.

Treatment of magnetic tapes will depend on the extent of water penetration. The casing usually keeps tapes clean and dry. If full backup copies exist, then damaged media can be destroyed and replaced.

Wet tape

- Disassemble the case and remove the tape.
- Rinse dirty tapes, still wound on reels in lukewarm water.
- Support vertically on blotting paper to air dry.
- Reassemble and copy.

Compact disks

If full backup copies exist, then damaged media can be destroyed and replaced.

- Remove from water immediately
- Remove from jacket
- Rinse off dirt with clean distilled water. Do not soak
- Drip dry vertically in a disk drain or rack.
- Clean with a soft lintless cloth, move perpendicular to grooves, not in a circular motion. Do not use hairdryers.
- Place cleaned compact disk in clean jackets.
- Replace if mould or condensation is present or if there are deep scratches. Check playability and readability.

Microforms

If backup copies exist, damaged media can be destroyed and replaced. Silver halide microfilm should be kept underwater and not allowed to dry out. It should be sent to a processing laboratory within 72 hours. Vesicular and diazo film should be separated and air dried:

- Extract water affected records and dry separately.
- Peg aperture cards up for drying.
- Unroll microfilms and air dry with the emulsion side up or send to film laboratory.
- Rewind film and store in dry containers.

If microforms cannot be dried immediately, they should be immersed in clean, cold water for no more than 2 to 3 days and taken to a laboratory. Duplication is recommended where possible.

1.2 Freezing

For stabilising and restoring large quantities of records, or records that are already starting to grow mould, freezing is the most effective method. If there are only small quantities of records and mould has not begun to appear, then airdrying, should be employed.

Freezing is a useful alternative for some records as:

- it stops the growth of mould and mildew (while the object is still frozen)
- it may stop bindings from warping, depending on the method of drying
- it stabilises water soluble materials such as inks and dyes, and
- it gives your organisation time to plan for recovery and restore buildings and equipment ready for the material.

However, conservators *do not* advise the freezing of vellum, photographs, glass plate negatives, electronic media such as diskettes, videos, cassettes or vinyl records.

As soon as the record quantities requiring freezing are decided, companies with appropriate freeze facilities (listed in the counter disaster plan) should be contacted and arrangements made for transport. You can:

- ***Blast freeze*** commercial blast freezers are ideal as they drop the temperature quickly and have a large capacity.
- ***Freeze in refrigerated chamber*** this could be slow but there are benefits to reducing temperature even before freezing point is reached.
- ***Use a home freezer unit to freeze small quantities quickly*** ensure that it reaches a temperature of –10C and do not open until ready to remove the material (otherwise it will cause a freeze-thaw cycle).

Once the material is frozen and you have the time and resources to defrost and treat it, you need to look at drying options.

1.3 Freeze drying / Vacuum drying

Vacuum drying must be undertaken by Conservators. The process involves placing frozen items in a vacuum chamber, which allows the water to evaporate without melting. This is of a huge advantage for water sensitive inks as it minimises the risk of them running further. Likewise it is also good for glossy papers as it prevents them from sticking together. But if these situations have begun freeze drying will not reverse it.

Vacuum freeze drying is not recommended for photographic materials unless there is no alternative, as their surfaces may be damaged. Leather and vellum may not survive. Volumes that are vacuum freeze dried should be acclimatised for at least one month before opening to avoid cracking the bindings, and monitored for mould.

It is important to have an agreement with a freeze-drying facility before a disaster so that costs, packing requirements and items suitable for the procedure are understood.

1.4 Dry air purging or dehumidifying

Dry air purging can be used if records are not soaking. A building or site is sealed in plastic sheeting and dry air, at least 26°C and 15% relative humidity, is pumped in using desiccant or refrigeration equipment. The water vapour is then absorbed in the dry air. This method is rapid and has the advantage of being in situ, but is only useful when the whole site can be sealed off.