

How to Salvage Wet Books

This leaflet was produced as a public service by the Preservation Division of the University Library, the University of Michigan. While the information presented represents tried and accepted practices in the library preservation field, neither the University nor its employees accept responsibility for results from their application. Always consult a professional conservator when working with valuable or precious materials.

Water is a major hazard to the survival of books. It can dissolve glues, deform paper, warp bindings, make inks run, and cause glossy papers to fuse together. Damage to books from water can be limited if proper steps are taken promptly after the books become wet.

Wet paper is highly susceptible to mold. Mold damage on paper is difficult—often impossible—to remove. Mold may start growing on wet books within 24 to 48 hours, especially if temperatures are warm. If you cannot begin steps for drying your books within that time, you should freeze them until you have adequate time to work on them. Freezing does not damage books but inhibits mold growth and prevents further absorption of water. Instructions for freezing a book are given at the end of this leaflet.

This leaflet provides steps you can take yourself to minimize water damage to books. Bear in mind, however, that a book that has once gotten wet is likely always to show some signs of damage. Seek assistance from a professional book conservator for drying especially valuable books.

Contaminated water

Before handling wet books, consider carefully the source of the water that has wet them. DO NOT HANDLE books wet with sewage water or water that has dripped through contaminated areas (attics with animal droppings, sources of chemical contamination); contact local health authorities for advice before proceeding.

Mud, soil

The safest time to clean a book is after it has dried. Heavy mud or silt on the cover of the book, however, can be reduced effectively before starting the drying process. Hold the book shut and place it under clean running water, using a sponge or rag to gently wipe away mud with a daubing motion; rubbing and brushing should be avoided. Do not open the book under water or attempt to wash the pages. Cleaning a stain that is difficult to remove should be not be attempted until after the book has been dried.

DO NOT PUT A BOOK IN AN OVEN OR MICROWAVE TO DRY. Heat will over-dry and warp the book and can melt the adhesives used in the binding. Microwaves cook the book rather than dry it and can also melt adhesives or singe paper.

Air-Drying Wet Books

When salvaging a number of books, you should first sort them into different types:

- A. thoroughly wet (dripping) books,
- B. moderately wet books,
- C. damp books,
- D. pamphlets and small paperbacks,
- E. books printed on clay-coated (glossy) paper.

There are slightly variant methods for treating each type of book, as described in the instructions.

Materials

- electric fan(s) to keep the air circulating
- electric dehumidifier(s)—useful, if available, to reduce ambient humidity
- plastic sheeting to protect tables
- paper towels—plain white, avoid paper towels that contain color dyes, or
- UNPRINTED newsprint—available at packaging supply shops or art stores
- waxed paper—kitchen rolls available at super-markets or freezer wrap
- sponges (small pieces)

Set up for drying

Before you begin the procedures outlined below, create an environment that is conducive to drying wet books. Ideally, the temperature should not be above 70° F, and the relative humidity should not be above 65%. Use fans to circulate air and, if necessary, portable dehumidifiers to take excess moisture out of the air. Cool, dry, circulating air will accelerate the drying process and discourage mold growth. Clean and dry the shelves and rooms to which the books will be returned, to inhibit additional damage and mold growth.

If weather conditions permit, books may be air-dried outdoors. Relative humidity should not be above 65%. Long-term exposure to the ultraviolet rays of the sun may cause books to fade and may accelerate aging, but setting a book in the sun for one or two days should not cause visible damage to most books. DO NOT leave books outside overnight because morning dew will dampen them.

Create a work surface

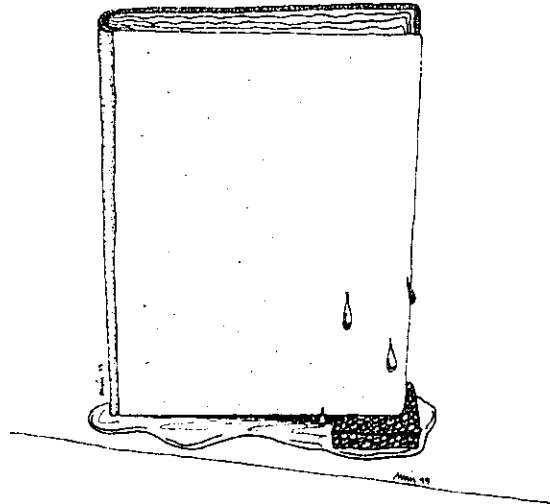
Use a table top or pieces of wood set up on cinderblocks, etc. Cover the work area first with a piece of plastic (to protect the work surface), then with several layers of absorbent paper such as strong, white paper towels or unprinted newsprint. The paper will absorb excess water from the books. Remove wet absorbent papers from the drying area promptly to help keep the ambient humidity down.

A. Wet (dripping) books – start at Step 1

Step 1. Do not open thoroughly wet books. Wet paper is extremely delicate and will tear easily. Do not remove covers or bindings unless absolutely necessary.

Step 2. Place the wet book, closed, on its head (top edge) on the absorbent paper. Place small pieces of sponge under the fore-edge of the book to allow water to drain from the book more efficiently. Do not fan the pages open. You may place paper towels or unprinted newsprint between the cover and the text block to further help with water absorption. Replace the absorbent paper when it becomes damp. DO NOT use this process with books that contain clay-coated (glossy) paper; see **Clay-coated (glossy) paper**, below.

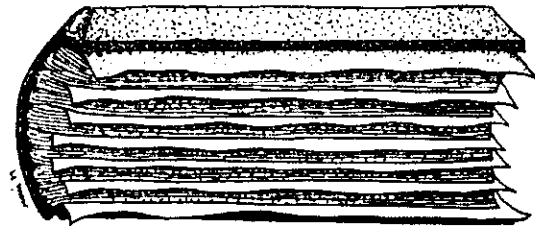
Step 3. Continue draining the book until water is no longer dripping and you do not see free water on the pages if they are gently opened. At this stage the book may be advanced to Step 4.



B. Moderately wet books – start at Step 4

Step 4. Cut paper towels or unprinted newsprint to the approximate size of the pages in the book. (Older guidelines on the salvage of wet books recommended paper impregnated with thymol to control mold; *do not use thymol*, which is now known to be a carcinogen.) Very carefully, open the book and insert a sheet of paper between the text block and the cover and additional sheets every quarter inch (20–30 pages) to absorb excess water. Be careful not to insert too many pieces of paper, which may cause the spine to become concave and will distort the book. Right-handed people may find it easiest to start inserting sheets from the back of the book working to the front. Lay the book on its side on the table. As the sheets of paper become wet, they should be removed and replaced with dry sheets. Turn the book over on the other side each time sheets are replaced.

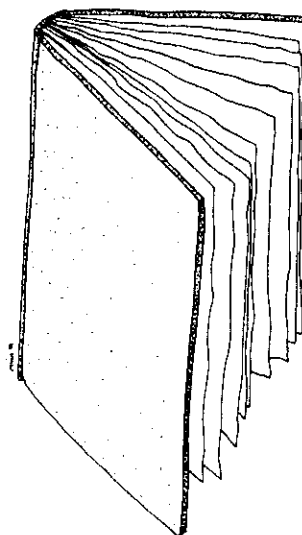
Take care at this stage to keep the book square and in shape, which will help minimize permanent damage to the binding.



Step 5. Continue exchanging the interleaving of the book (vary the location of the absorbent sheets at each exchange) until the paper is just damp rather than wet. At this stage the book may be advanced to Step 6.

C. Damp books – start at Step 6

Step 6. Stand a damp book on its head (top edge) on the work surface and open the book, slightly fanning the pages. Don't force the book open more than about 60°. Electric fans circulating the air should not be allowed to flap the pages. Let the book stand until it is thoroughly dry—check the book for dryness in several locations by feeling the gutter as deeply as possible between pages. It may take days or even a week or more for wet books to dry thoroughly.



Step 7. Pressing can reduce cockling (rippling) of the dried pages. Manipulate the dry book square and in shape and place it in a press or under weight (other books, a clean brick covered with cloth or paper) for a few days to a few weeks.

D. Pamphlets and small paperbacks

Damp pamphlets and small paperbacks that cannot support themselves when fanned open may be hung over fishing line to dry. Fishing line is not recommended for thoroughly wet items—it can cut the paper.

1. Thoroughly wet pamphlets may be dried by laying them flat on absorbent paper; change the paper as it gets wet. Small paperback books that are thoroughly wet should be dried by following steps for **Wet (dripping) books**, above; book ends or wood blocks may be used for support during the draining process.
2. If the pamphlet is only moderately wet or is no longer dripping, insert paper towels or unprinted newsprint cut to the approximate size of the pamphlet between every few pages, as described in **Steps 4-5**, above.
3. When the pamphlet or small paperback is dry enough to hang over fishing line without ripping, it may be hung up to dry completely. Use fans to keep the air circulating in the drying area but do not let the breeze flap or dislodge the pamphlets. Place dry pamphlets under a light weight to flatten the paper.

E. Clay-coated (glossy) paper

Sort out books that contain clay-coated paper; many books and magazines are printed entirely on clay-coated paper, some use glossy paper for sections of illustrations. Water softens the clay coating, which then fuses together as it dries. If two sheets of clay-coated paper dry together, it is impossible, even for professionals, to separate them. If you do not have time to begin the drying process immediately, *keep these books wet* by placing them in plastic bags and freeze them to prevent them from drying. Follow the steps for **Freezing a Book**, below.

1. Cut waxed paper, paper towels, or unprinted newsprint to the approximate size of the pages in the book. Carefully separate *each* clay-coated page in the book and place a sheet of separation paper between *each* page. It is important to place a sheet of paper between each clay-coated page so the pages will not be able to dry together. As soon as the interleaving sheets become wet, they should be removed and replaced with dry sheets.
2. Once the pages are merely damp, the interleaving paper may be removed and the book fanned open to finish drying (**Steps 6 - 7**, above). Check frequently to be sure the pages are not sticking.

Freezing a Book

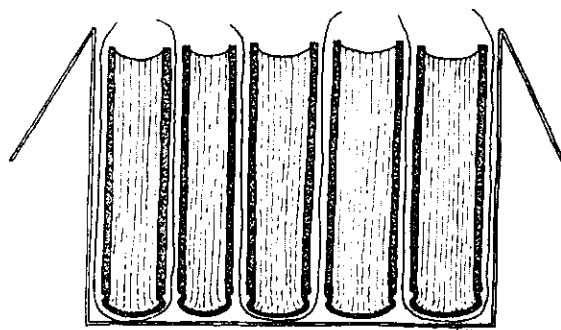
If you do not have the time or resources to air-dry wet books immediately, or you need extra time to find professional help, you may freeze it. Freezing does not dry the book—or only very, very slowly—but it prevents further damage. A book may safely remain frozen for weeks, even months.

Materials

- paper towels—plain white, avoid paper towels that contain color dyes, or
- UNPRINTED newsprint—available at packing supply shops or art stores
- plastic freezer bag

To freeze the book

1. Wrap the book in paper towels or unprinted newsprint.
2. Seal the wrapped book in a plastic freezer bag. Use a bag with a zip closure or fold the open end over several turns and tape it closed. Remember to label the bag so others will know what it is!
3. Place the book in a freezer. If you have a choice, use the coldest freezer available: optimal temperature is about -20° to -40° F. Domestic chest freezers are usually about 0° F; refrigerator ice boxes are usually just below freezing (32° F). Any of these will do, if necessary. Use plastic bags and placement to separate the wet book from other contents in the freezer so neither will contaminate the other if there is a power failure.
4. Large quantities of wet books may be packed (flat on their sides or *spine down*) in cardboard boxes before freezing; place a sheet of waxed paper or freezer wrap between books but do not wrap the books individually.
5. If you arrange for a professional to dry your books, keep them frozen until that person can assess them and provide further instructions. If you wish to air-dry them yourself, thaw only as many books as you can handle at a time.



To thaw the book

1. Remove the book from the freezer. DO NOT remove it from the plastic bag or box.
2. Let the book come back up to room temperature inside the bag. This step will take anywhere from 2 to 48 hours depending on how wet the book is. When the book reaches room temperature, remove it from the bag and discard the paper towels. Do not let the thawed book sit at room temperature; a wet book left to sit at room temperature in a plastic bag will encourage mold growth.
3. Thoroughly dry the book, according to the instructions for **Air-Drying Wet Books** above. The amount of time it takes to dry the book will vary depending on how wet or damp it was when it was placed in the freezer.

Freezer-drying

Frost-free freezers—freezers that have regular automatic defrost cycles—can dry out wet books by the same process that produces “freezer burn” on frozen foods. The book should *not* be wrapped in plastic, to let the water evaporate. The drying process can take weeks to well over a year, depending on the thickness and wetness of the book. Allowing very wet books to drain (see **Air-Drying Wet Books, Steps 1-3**, above) before freezing can help speed up the process.