

PRICE Salvaging Wet Collections Items: Key Points

Introduction

(This section will introduce common terminology and big picture ideas that are critical to collections emergency response)

- What is **wet salvage**? The salvage of collection items after a water incident. Note: Not every water event is catastrophic such as a biblical flood. Some water incidents might be relatively minor and arise from a burst pipe.
 - **Salvage** is the process of rescuing collections items or associated materials from loss or destruction following an emergency.
 - **Triage** is the process of determining the order of treatment of collections items based on the need in an event of an emergency. The goal of triage is to stabilize collection items so that they may be recovered and or conserved at a later date.
 - **Collections Emergency Kits** are a compiled group of supplies set aside specifically for emergencies response to collection emergencies. Note: you may not always have access to the ideal supplies needed for salvaging. Be prepared to think critically and creatively about using the resources you do have on hand to get the job done.
- What is **collections prioritization**? It is the predetermined order in which collection items are salvaged and triaged. Some factors to consider when determining the order include institutional value/cultural significance, monetary/insurance value, material sensitivity and stability, access, and existing damage/potential for additional damage. There may be additional factors to consider that are unique to your organization. Note: Human safety always comes first.
- How does salvaging fit within the **collections emergency response lifecycle**? Salvage is just one small component of the Security and Stabilization step in a collections emergency response. Many steps come before it, and often the recovery process afterwards can take weeks, months, and even years depending on the extent of damage.



Infographic framework from *First Aid to Cultural Heritage in Times of Crisis* handbook.
ICCROM and Prince Claus Fund (2018)

Wet Salvage Key Takeaways

(This section will summarize important material characteristics, prioritization considerations, and basic salvage protocols)

Textiles

- Textiles can range in size, shape, and material. They are typically made of fabric and flexible when dry. Textiles may have dyes that bleed when wet, which could create additional damage to itself and other collection items in a water incident. Textiles may have multiple layers and/or be made from multiple materials. The seams of these textiles may become fragile when wet, and different materials have differential shrinkage, which could put additional strain on a textile.
- When **handling** textiles, use a rigid support such as a board and the buddy system. If the textile is largely stable, flexible supports such as plastic sheeting can be used as a sling to move it.
- **Rinse** textiles to remove any debris or contamination. If using containers of water to rinse, make sure to change the water frequently to prevent cross-contamination.
- When **drying** textiles, use a flat surface and clean, unbleached, absorbent materials like paper towels, fabric towels, or blotting paper. Place a layer of cheesecloth between the textile and the absorbent material to protect the collection item, and keep an eye out for bleeding of dyes. Use a paint roller to squeeze out any excess water.
 - Then allow it to air dry flat, or if the textile is stable enough and space is limited, you can hang it. Use pipe insulation or padding to allow for air circulation and prevent creasing.
 - If your drying station is outside, find a shaded area to prevent fading of light sensitive fabric dyes. Fans and blow dryers with no heat can be used to accelerate drying.
 - For 3D textiles, line them with breathable fabric to help the item retain its shape and allow for air circulation.
- If drying immediately is not possible, prep textiles for the **freezer**. Freezing them will help stop deterioration and prevent mold from forming, effectively buying you time to respond.
 - To prepare a textile for freezing, fold along stable areas to fit the size of the container, separate dyed areas with wax paper, and put into a clear plastic bag and seal with tape. Only put one textile in each bag and make sure to label the bag with the collection item information so it can be easily identified later.

Paintings

- Paintings are complex structures composed of a support layer (commonly canvas, wood, hardboard, or laminated card), an image layer (ground layer, paint layer, and varnishes), and sometimes frames (commonly wood and some may have ornamentation). All of these components are susceptible to damage by water and will have differential expansion, shrinkage, and deformation. This will cause the image layer to crack or flake off entirely. Paintings are also at risk of absorbing coloration and contaminants from the water, creating tidelines on the image layer.
 - **Mold** is a significant risk for paintings if they are allowed to remain wet or in damp, warm conditions. Mold can grow in under 24 hours. Note: paintings with stretchers and frames will dry slower.

- Before evacuating paintings, **prepare a triage area** that is dry with constant air circulation. Dehumidifiers and fans can help regulate relative humidity and air circulation, and thereby retard mold growth. Ideally, the relative humidity should be between 40-60%.
 - Prepare all surfaces that will come into contact with a painting with a layer of padding and then a layer of plastic sheeting, or a hydrophobic material, so that the padding does not become soaked with water.
 - If you have a number of paintings in the triage area waiting to be addressed, prop them up to allow for air circulation.
- Ideally your unit has a list of **collections priorities** in the disaster plan. These should be the first to salvage and triage regardless of their condition. These items are generally selected because of their significance to their collection or institutional value.
 - After the high priority items are salvaged and triaged, consider the state of the incident. Is the water intrusion over and the situation stable?
 - If the situation is stable and the water intrusion has stopped, focus on those paintings that are obviously wet or actively distorting. Your priority is to mitigate existing damage.
 - If the situation is ongoing, but staff are permitted to work in the area, then the focus becomes preventing further damage by salvaging the items not yet affected.
- When **handling** paintings, use both hands. If it is a large painting, two people should carry it. Avoid touching the painted surface and any decorative elements on the frame.
 - If wet, tilt the painting to allow excess water to drain off.
 - Make sure you have a clear route and a final destination prepped to receive the painting.
- When **drying** paintings, gently remove any loose debris taking care not to remove any paint. If debris is stuck, leave it in place for a conservator to address.
 - Remove the painting from the frame. If it is stuck in the frame don't fight it. Leave it in the frame and allow a conservator to address it.
 - Place the painting face up on blocks 4-5 inches high to allow for air circulation.
 - Place soft weights such as sandbags on the four corners with a layer of white tissue paper or blotter between the paint surface and the weight. This will minimize the deformation of the frame and painting as it dries.
 - If the surface of the painting is flat and relatively stable you can allow it to dry face down. Place a non-textured, clean, white layer of blotter paper or tissue paper on the painted surface and on the back side of the painting to absorb the water.
 - Replace the blotter paper every 20 minutes until it remains dry, and then every hour until the paper is dry to the touch.
 - Cut a rigid board to fit the inside of the structure to distribute weight.

3D Objects

- Organics
 - **Wood and other plant materials** are found in many collections . They can make up a single item or be one element of a multi-component item, often referred to as “composite” items. Wood and other plant materials are susceptible to chemical changes induced by light, temperature, and moisture. Their high cellulose composition often results in volumetric changes (expansions or contractions) and an increase in weight when exposed to water. Common types of damage by water are cracking, splitting, staining, and mold.
 - **When salvaging** these items, you should first move them away from the source of water. If items are large and cannot be removed from a space, use blocks and non-absorbent barrier materials to elevate the items off the ground and increase airflow. Blot away excess moisture. Consider rinsing items that are exposed to contaminated water. For more fragile 3D items like basketry, you may need to block with a non-porous material (Ethafoam, polyester batting, etc.) to help them retain their shape. Allow them to air dry.
 - **Leather and Skin** are animal dermis that have been processed. Leather is chemically processed through tanning (permanent) or tawing (semi-permanent) while skins such as parchment and rawhide are processed via drying.
 - Leather and skin are easily distorted when wet and can be very fragile depending on the chemicals used. Tawed leather is extremely fragile and prone to tearing, and has the added vulnerability of the chemical process reversing when wet.
 - **When salvaging leathers and skins**, it is important to block with a non-porous material (Ethafoam, polyester batting, etc.) to help them retain their shape. Leather and skins may dry harder after exposure to water. Ensure good air circulation and allow items to air dry. Note: these materials are susceptible to mold, fungi, and other biological attacks, especially when damp
 - **Ivory and Bone** are strong, flexible, porous, and hygroscopic (can absorb moisture from the air). The ways in which they were prepared or treated will affect their physical characteristics and how they react to water damage. Some may be articulated, or hinged, as armatures, which may have metal or cordage components, which may corrode or hold moisture. Some bone may also have been treated with toxic chemicals. Always wear nitrile gloves to handle specimens or their containers.
 - Do not attempt to replace dislodged teeth. Place skulls with their teeth pointing up and allow to air dry. Bone can be rinsed with clean water, but dry specimens completely before attempting any additional cleaning. Keep each specimen in a separate, dry container with their labels.
- Inorganics
 - **Metals** could be pure (derived directly from the ore) or alloys (a mixture of metals). The properties of metals range widely, but all metals are reactive to moisture and can begin to corrode when relative humidity is greater than 20%. Corrosion caused by water damage can lead to dimensional and color change in the item. Dimensional change from

corrosion can cause breakage to the artifact and adjacent materials, and colorful corrosion products can stain adjacent materials.

- When **salvaging metal artifacts**, rinse with clean water if affected by contaminated water, and then dry as quickly as possible. Metals are relatively stable. You can air dry or use a hair drier with low or no heat setting to help accelerate drying. Make sure the inside of cracks and crevices fully dry as this is where moisture is likely to be retained and cause local corrosion.
- If you are working with a composite item, isolate metal components from adjacent materials to minimize damage and staining. Use an interleaving or barrier material such as Mylar.
- **Prioritize** iron alloys. When iron corrodes, the rust becomes exponentially larger than the metal's surface. As a result, these objects can rupture apart.
- Be aware of lead alloys, which are a health and safety concerns, and always remember your PPE.
- **Glass** is very strong and brittle. At high temperatures, glass can go from a solid to a liquid. Depending on the additives used in the formulation, glass properties and stability can range widely.
 - Glass that has been repaired in the past is most susceptible to water damage. Many adhesives used in repairs tend to soften and weaken when exposed to long-term moisture. Glass could be broken, and the shards may be sharp. In the right conditions (long water exposure or various pH levels) glass can start to corrode or delaminate.
- **Ceramics** are generally molded and worked clay. Some have assembled parts, which should be noted during handling because the joints are often the weakest points. Ceramics can be fired or unfired, and have glazes or slips (glassy outer layers), both of which determine how soluble it is in water.
 - Common types of water damage include failure of old repairs and mechanical damage. You may see corrosion depending on the pH of the water and how long the ceramic has been exposed to it. Ceramics are very porous and likely to stain if there are contaminants in the water.
 - Particularly with archaeological ceramics, you may also see soluble salt migration which appears as efflorescence (powdery white deposits on the surface) and exfoliation of the surface.
 - When **salvaging glass and ceramics** rinse in clean water if affected by contaminated water, pad your work surfaces, blot dry with soft towels and allow to air dry. Do not apply heat. Reduce handling of glass and ceramic collection items as corrosion layers may fall off when touched.
 - If the item is broken, retain all pieces together in a single unit or tray. If old repairs are failing, use Teflon tape, which is only sticky to itself, to hold components together.

Natural History Items

- Natural History Items encompass a wide range of materials and many of them have undergone human modification. Many natural history items are susceptible to water damage, including ones you might consider relatively safe, like minerals. Exposure to water can also enhance the hazards that are already present in natural history items.
 - Note: Loss of a label or label information can equate to loss of a specimen. Labels and catalog data are essential components of natural history items and their research value. Always keep labels with the item. Type specimen (anything with a red label or other type of identifier) are of particular importance. They are benchmarks for species identification, and are candidates for high priority salvage.
- Mineral Specimen
 - Some minerals can be damaged by water or even high humidity. Minerals that are not stable and susceptible to water should be air dried.
 - Minerals that are stable can be rinsed in clean water and allowed to air dry. Gemstones, rocks, and ores are generally stable.
 - If you are uncertain about a specimen's stability and identification, it is best to check with a subject matter expert. Some specimens such as Marcasite and Pyrites, can become hazardous when exposed to water and undergo rapid deterioration and form acids.
- Paleontology Specimen
 - Before moving, check stability of items and their labels. If unstable, tie each element using Teflon tape.
 - Do not rinse specimen or place on paper or other materials that may stick to softened adhesives.
 - Air dry in a well vented area using fans and dehumidifiers to promote drying. For materials that are extra susceptible to moisture, use any effective means of desiccation.
 - Make sure the triage area is secure as these specimens are attractive to looters and thieves.
- Botanical Specimens
 - Adhesives and paper substrates may soften or dissolve when exposed to water, and inks may run if soluble in water.
 - Use rigid supports for handling.
 - Specimens that were housed together should be kept together during drying.
 - Interleave sheets with silicone release paper/film, waxed paper, or freezer paper.
 - Dry using a plant press.
 - Specimen bundles can be frozen or dried using very low heat and good air circulation.
 - Open boxes containing specimen and allow them to air dry
 - Note: Some herbarium sheets may have mold or have been treated with mercury salts. Both appear as dark spots. If you suspect either are present consult a conservator.
- Entomology Specimens
 - Often pinned into foam in cardboard trays and stored in glass topped wooden drawers. If water enters the drawers, the cardboard trays may become fragile. The labels are usually attached to the metal pins that hold the specimen. These may become loose

when wet and depending on the composition of the metal pins, they may corrode. The specimen itself may be fragile and parts may become disassociated.

- If the specimens are still in the glass-topped-wooden containers and are unaffected by water, simply keep dry.
- If the water has entered the wooden trays, open them and allow to air dry.
- If the cardboard trays are soaked, remove them using a rigid support and allow to air dry.
- If repining is necessary or there are detached specimen parts, seek out a subject matter expert.
- Note: Entomology specimen are particularly vulnerable to live insects. Monitor the drying process and consider using fine screens over trays and drawers.
- Bird and Mammal Specimen
 - Primarily maintained as study skins. These raw hides are largely unprocessed, and extremely sensitive to moisture and may be stuffed with cotton to absorb moisture.
 - Skeletal materials often accompany these collections.
 - Specimen may have metal wire or thin wooden sticks to support legs and tails.
 - Any direct handling will result in permanent distortion of wet study skins. Leave the specimens in the trays, support the trays on rigid supports, and air dry if possible. If air drying is not an option, then leave in the drawers, double bag in polyethylene and freeze until air drying is feasible. Freeze drying may also be used if that is available.
- Taxidermy
 - Most modern specimens are made with tanned skins, but many early specimens are untanned or tawed. These are very vulnerable to water. (See section on Leather and Skin in 3D objects for more information on tanned, tawed, and skin specimen)
 - Filling and modeling materials used in taxidermy are often absorbent and metal armatures may corrode when wet. Wooden armatures and bases may be fragile as well. Never remove a specimen from its base. This results in immediate distortion and often tearing of the skin.
 - Air dry specimen and wrap with gauze, Remay, or other vapor permeable material to maintain the shape of the skin and vulnerable areas like limbs and tails.
 - Do not try to remove soil or other contaminants until fully dry.
- Fluid-Preserved Specimen
 - Glass containers may be extremely fragile and may break when handling. This could damage the specimen and expose the handler to unidentified and sometimes toxic fluids.
 - Don not attempt salvage without appropriate PPE.
 - Metal tanks and fasteners will corrode rapidly in a water emergency.
 - Place glass containers in secondary containment before handling.
 - If glass is broken, place specimen in buckets of undenatured, potable, alcohol and keep labels with specimen. If alcohol is not available, use a small amount of water to keep them damp. The residual fixatives and alcohol will help prevent mold until more alcohol is available.

Archival Material

- **Archival material** encompasses photography, works on paper, audio visual materials, and born digital. They are made up largely of human readable materials, and in more recent times have begun to include materials that are only machine readable.
 - Archival collections are functional collections, that are described at the collection level. In other words, every single object might not have a label, but the group of items in a folder or a box will. Items tend to be arranged in order and often times this order and the housing (boxes, folders, etc.) contribute to the meaning and function of the collection. Losing the order and housing can be similar to losing a label for a natural history specimen.
 - Archival collections also have an immense density, meaning there is a large amount of material stored in a compact space. In an emergency, in order to deal with such a collection, you may end up needing a lot of space to triage and store items.
 - When **salvaging archival collections**, you may consider mass treatment and freezing or freeze drying for stopping or arresting the damage from a wet disaster. Additionally, you may choose not to retain some items. Some archival collections have backups. If the materials are not unique or reproduced elsewhere, there is the possibility to duplicate them.
 - Note: treatment and retention of items that are visibly scarred may also be okay, as archival collections value is based in their function and not on their aesthetic value.
- **Photographs** may be considered art or archives, and can be printed on glass, metal plates, paper, or plastic. Photographs are chemical objects and tend to react very quickly to a change in conditions. Many early photographic prints were born in water and will be okay in water once again, but contemporary, inject photographs and other materials are susceptible to bleeding, fading, delamination, etc.
- **Works on paper** when exposed to a water incident can stick together, compress/distort, bleed/lose pigment/discolor, and become vulnerable to tearing and breakage. Coated materials may also separate and lose layers, and grow mold.
- Strategies for **salvaging photographs and works on paper** depend on how long materials have been exposed to water. With a dense collection that is paper-based, you generally want to buy time and space. Separate materials that should be air dried/suction dried (more vulnerable items) and materials that can be frozen and freeze dried (more stable materials), and do so. If the water was contaminated, collections should be rinsed with clean water, and then prepped for air drying, suction drying, freezing, or freeze drying.
- **Framed and matted works**, should be separated if possible, and allowed to air dry. Frames and mats, which are designed to protect material may retain water and be a hindrance in after a water incident.
- If debris is stuck to a surface or the collection materials have started to dry, do not attempt to separate. Leave items that have become stuck for a conservator to address.
- **Time-based media** is mostly not human readable material. Some can be really sturdy and some are extremely vulnerable to different emergency incidents. Water can cause expansion for a lot of non-human readable materials, which may cause interruptions in reading for the machines required to interpret the media. In those cases, keeping these collection materials wet may be

best, until they can be drained and appropriately air dried. Generally, avoid freezing these materials. Often with digital media, migration of the information is the best solution as the material or media that it sits on may not be a substantial valuable component.

Books

- **Priorities** include books with covers made with vellum, leather, and clay coated paper.
 - Vellum is very hygroscopic and will absorb and adsorb water easily. Even elevated humidity will cause it to distort and crack.
 - Leather will blacken and darken when it is wet.
 - Clay coated paper will fuse to each other and block. Unless treated within 12 hours, it will not be salvageable.
- **Drying** water damaged books requires a lot of space. Use plastic sheeting and a layer of absorbent material to line your work spaces.
 - **Damp books** can be fanned open and allowed to air dry with good air circulation. You can add some interleaving (a layer of absorbent material) in-between sections of the text block to help absorb the moisture.
 - **Wet books** need a layer of Mylar or wax paper between the cover and the text block to prevent bleeding of the cloth or leather cover (Note: red in particular is a color that tends to run). Absorbent materials should be interleaved less than 1/3 of the text block. Anything more and you risk distortion. If the cover boards are not quite strong enough to support a book standing, you can add a board to support it.
 - **Soaking wet Books** need to have the excess water pressed out. This can be done with your hands. Place wax paper or Mylar between the text block and covers, and lay flat with interleaving. No more than 1/3 of the text block should be interleaved to prevent distortion. It is best to freeze dry these materials.
- Preparing books for **freezing**. You will need a container that is both water tight and can let water escape. A couple options are Rescubes (corrugated cardboard), milk crates, or a cardboard box lined with a trash bag. Place barrier material like Mylar or wax paper between the boards and the text block of each book. Place another piece of barrier material between each book and stack the books vertically with the box on its side. Do not over pack the box. These will expand a little when freezing.

What now?

(This section provides additional resources and recommended next steps after finishing this training)

- Visit the [PRICE SharePoint Site](#) for additional resources and future training opportunities.
- Interested in hosting a hands-on salvage exercise at your unit? Contact the [PRICE Training Action Team](#) Co-Leads or Samantha Snell, the PRICE Team Chair! They can help you facilitate a workshop, tabletop, discussion, etc.
- Talk with your colleagues about what resources exist at your unit (collections emergency kits, training, collections emergency management plans, collections prioritization lists, etc.)