

# Objects Recovery, Mitigation

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Why would an archives or library need to develop an emergency response plan that includes an ancient vase, a polychrome wooden sculpture, a plaster cast or a bronze relief? After all, the concerns of libraries and archives are focused on paper based material...like books, documents, and photographs...right?

As many of us know that statement is not exactly true. Holdings of libraries and archives go far beyond paper based materials, often including an astonishing range of objects from Renaissance clay models to Day-of-the-Dead sugar sculptures. The library and archives of Catholic University in Washington D.C, for example, oversees a collection of more than 2000 sculptures, ethnographic objects and archaeological artifacts.

Since the variety of material in any collection can be astonishingly broad, the number of problems that present themselves in an emergency or disaster situation are multiplied far beyond those challenges already presented by paper based material during and after an emergency. Assuming you are in such a situation and have objects in the collection under your care, lets start with some questions you might ask during or immediately after an emergency:

- "Our polychrome sculpture has just been saturated by flood waters..."
- "My collection of iron markers was in a basement flood..."
- "The museums historic furniture has been charred in a fire..."
- "The collection of Indian baskets is black with soot from an electrical fire..."
- "All the ceramics have fallen in the exhibition case after the earthquake and I can not open the case..."

"...What should I do?"

There is only one responsible initial answer to all of these questions... "It depends."

This answer is not an attempt to dodge responsibility or to be purposefully vague. By necessity the answer begs significant follow-up questions in search of specifics since each piece of information can dramatically change the advice given and the solution applied. These questions will include queries about the characteristics of the object; about the source of the problem; about the degree of the objects previous, immediate and eventual vulnerability; and about your overall resources. And that's just for starters. In a situation which is already demanding and emotional, when each minute can count, when each action

or non-action can have serious effects on the preservation of an object or collection, do you really want to be searching, at that moment, for the answers to these questions? It is unlikely that you would. And so as with emergency and disaster planning for paper based materials, planning for all other categories of art, artifacts and collections must begin with defining the threats and then defining the vulnerabilities of the materials to these threats. The steps are fairly straight forward and have been well developed throughout the literature. They include:

- Define the threats
- Define the vulnerabilities
- Define the appropriate actions under a range of circumstances (as many as you can imagine)
- Develop a coordinated response
- Stockpile reasonable resources
- Test, practice and refine the plan

Other papers will go into far more detail as to the types of threats common for most institutions; it suffices to say here that most threats generally involve water, extremes of temperature and humidity, fire, impact or explosive force, wind, chemical degradation, and vandalism/terrorism. Each, or the combination of any number, presents a wide range of threats and each material within a collection has a range of susceptibilities that can fluctuate with time and the severity of the threat present. A burst pipe for example threatens a piece of historical furniture in a different way and to a different degree than raging flood waters.

## **OBJECTS:**

"Objects" is a category that represents an enormous number of materials, each with a variety of inherent vulnerabilities, some whose initial characteristics have changed over time and use; some whose characteristics change under differing environments; and some whose characteristics change when combined with other materials. It is worth while to take a moment and consider the broad range of materials which might be present in your collection since if the material exists, or once existed, you can be sure it was used to manufacture artifacts or create work of art. Among the list of materials you might find:

Stone (marble, limestone, granite, soapstone, alabaster), metals (silver, copper, iron, pewter, zinc, lead), ceramic/clay (high fired, low fired, porcelain, coarse ware), mud brick (objects made of dried mud), sugar/dough (many ethnographic items can be made of such familiar material), plastics of all type (including cellulose nitrate), animal products (such as skins, hides, fur, teeth, hoofs, antler, horn), ivory, bone, wood, fiber, feathers, cement, plaster...the list can go on for some time. Each of these materials can then be categorized further depending upon how much they have been altered, purposefully or by time and circumstance. Painting, gilding, inlays or other added decoration may be present on the surface of the objects. Some objects may also support accretions that represent their age, their use or their contextual history. Cooking pots or storage jars for example may have residues of the materials they stored, or the foods that were cooked in them. Additionally

religious objects may have associated deposits representative of ritual use. And finally each of these objects may have additional materials on or in them that were deposited from prior treatments or maintenance of the object. Such materials, like coatings or consolidants, may have quite significant impact on the susceptibility of the object to specific kinds of threats and will certainly effect how the object should be handled and treated. The variations boggle the mind!

For this reason it is best to avoid sweeping generalizations regarding emergency treatments and to seek the assistance and opinion of conservators specializing in the type of material you may find in your collections and are not familiar with.

Once a good survey has been completed and the objects within the collection have all been identified (including as much information about each as possible) conservators with expertise in such materials should be called for advice. Natural history specimens, archaeological, and ethnographic artifacts as well as historic decorative objects and works of art all have very specific characteristics, and can have very different kinds of responses to the basic threats contained in a disaster.

As a specific illustration for the need to call upon expertise let's consider just the category of ceramics or clay objects in only one situation, a flood. Most publications dealing with emergencies and disasters list ceramic objects well down the line of priorities when outlining response actions to flood damage and during salvage operations. When advice is given about stabilization it usually goes something like "...rinse with clean water, blot and air dry". In many cases such action may in fact be completely appropriate, but not all ceramics are alike nor are they all necessarily robust. Among clay objects one might find very low-fired ware, "sun-baked" objects and even vessels made, essentially, from a mixture of dried mud and dung. Such fragile material may, in some instances, become a high priority. In some cases it may not be advisable to attempt any blotting or place any absorbent materials on the object since water soluble constituents, deposits or coatings that are integral to the object or its history may be removed in the process. All drying of clay objects should be carefully monitored to assure that soluble salt efflorescence is not occurring, since if it is observed, a more thorough treatment regime might be necessary. Ceramics that have been in a fire may represent equally difficult challenges. Soot should always be vacuumed away from the surface before any other efforts are taken. Vacuuming using a unit fitted with a HEPA filter is recommended as is the effort to keep the gauze-covered wand attached to. Contact is avoided so that the wand will not rub or smear the soot deeper into the surface. Washing or poulticing may be in order, however the extent to which the vessel, object or any surface decoration is resistant to water has already been pointed out and consolidation prior to poulticing or solvent poulticing may be more appropriate. Caution must be given to deposits that have anthropological value and may, in some cases, look very much like the soot being removed.

### **Vulnerability survey**

Because of these complications a range of possible susceptibilities and reactions for each general category of objects should be determined, followed by sub-categories that note specific differences. They may include the different responses to flood waters exhibited by "sun-dried" versus kiln-fired ceramic objects or the solubility difference between marble and the much more susceptible alabaster. The complications presented by painted surfaces or decorative finishes should also be included. The "vulnerability survey" should note all threats including extremes of temperature and humidity, fire, flood, a range of chemical threats, particulates, impact, etc. as well as a combination of these agents. Included in this exercise should be a list of visual indicators which can guide the responder's understanding of whether the object's susceptibility is changing and how the object has, or is, responding to the environment. Lifting veneer, blanching varnish, efflorescing salts, etc. all can give indications of whether the object requires immediate attention or can wait, and if it can wait, for approximately how long. The survey will help to identify how sensitive the objects are to any of the threats; how fast will damage occur; what the damage will look like; and what will the warning signs be.

By asking these questions before the event and familiarizing yourself with the range of possible problems, the response and salvage operation will be far more informed, efficient and, most importantly, successful.

Let's look at how some common materials are affected by either flood or fire, as examples of this complication and the importance of investigating vulnerabilities ranges (keeping in mind this list is by no means exhaustive):

### **Wooden furniture:**

*In a flood the following may occur:*

The porous wood will readily soak up water and swell, as it does this its weight will increase significantly and the wood, especially the surface of the wood, will be more fragile. Joints may become weakened either because the glue may become weak from swelling/dissolution or as the object is drying out the joints might loosen particularly due to the compression of the wood parts during swelling. The joints may become so weak that the object collapses, particularly when the object has increased its weight due to water it has absorbed. Responders should look out for any deformation or sagging and separation of the joints. Differential absorption or loss of water may cause decorative veneers to split, warp or lift from the surface. Responders should keep wet furniture or wooden objects under regular observation for such movement, particularly during the drying process. Placing white paper around the perimeter of furniture, particularly if it has small decorative veneer elements, makes it possible to monitor any losses and to retrieve those losses. Water-soluble coatings, stains, or constituents may migrate causing stains or tide lines. Varnish, decorative finishes or wax may blanch or become cloudy. Gilding may lift, iron supports or internal fixtures may rust and stain, other metal fittings may corrode. One must always be on guard for the development of mold. These concerns may be present after both floods and inundation of water from fire suppression.

*In a fire the following may occur:*

Direct burning will of course weaken the structure of the piece of furniture, but so may heat. The responder should evaluate the strength of the joints and observe any separation of the joints. Charred furniture should be evaluated carefully, things may not be as bad as they seem but the surface will be highly fragile. Alkaline deposits, such as ash or soot or dust may harm finishes. Soot will deposit as well.....

### **Ceramics:**

*In a flood the following may occur:*

Some "clay" objects are highly susceptible to water, such as "sun-dried" or low-fired artifacts. ( an example is cuneiform tablets or ethnographic fetishes made of mud/dung mixtures). Such material will completely disassociate in water or, at best, become highly fragile, soft and easily deformed. Most ceramics however are quite resistant to water. Problems can occur during drying if soluble mineral salts or other soluble or reactive minerals are present in the clay or decorative features. Glazes can cloud and surfaces can begin to spall (flake away from the body of the object) or become "sugary" (loss of cohesion between particles) due to the migration and repeated crystallization of these soluble mineral species. Staining might also be a problem if water-soluble materials are in or on the pot and are transported through the porous structure to the surface. Flood waters may also contain staining substances. Surfaces may be coated or decorated with water-soluble materials which become highly fragile and mobile when wet.

*In a fire the following may occur:*

Intense heat may cause some "ceramic" objects to fracture and literally explode, especially if the heating is uneven and sudden. Glazes and other decorative surfaces may micro fracture and become delaminated from the surface. Soot from fires may become engrained and difficult to remove.

### **Metals;**

*In a flood the following may occur:*

Generally speaking, most metal is highly resistant to water for short periods, but water is also one of the primary ingredients necessary for corrosion processes. For iron that process is rusting and it can occur very rapidly. Silver may tarnish due to sewage from the flood waters or other chemical constituents.

*In a fire the following may occur:*

Some metals, like silver, may become extremely brittle if exposed to intensive heat. In general however, metals are reasonably resistant to damage due to fire. However, decorative surfaces may be less than resistant, such as wax or resin patinas. repairs made to metal object may have quite low melting temperatures, sufficiently low that they may succumb during a fire and make the object structurally unsound.

Organic based objects (animal and plant materials such as ivory, bone, skins, fur, baskets, wood, papier-mâché material, bark, etc.):

*In a flood the following may occur:*

These categories of materials are highly susceptible to damage when saturated with water and some respond dramatically to extremes of humidity. Many will revert to a stage in their original processing and many will almost immediately begin to decay, others will lose structural integrity, while others will deform severely upon being "relaxed" from a shape or form they were forced to take during their initial manufacture. Leather and desiccated wood can become very weak when wetted. Ivory, when wetted, is highly susceptible to swelling and then subsequent cracking or warping during the drying process. Skins, which are not fully tanned, will quickly begin to putrefy.

*In a fire the following may occur:*

All objects in this category will burn, some will burn rapidly. Intense heat in all cases will cause chemical alterations and physical deformation (due to drying and stress). Soot (particularly greasy soot) from fire is difficult to remove from these substrates and must be done cautiously and preferably by a conservator experienced with the material.

**Stone:** (marble, limestone, alabaster and including mortars, cements and plaster):

*In a flood the following may occur:*

Most stone materials are fairly resistant to damage due to water when exposure occurs over relatively short periods. However, contaminants in the water will quickly absorb into the porous structure of stone or mortars and can result in staining or in the deposition of soluble salts (see ceramic section). Acidic water will directly effect a highly polished surface through etching. Some stone materials are more susceptible to dissolution than others, alabaster for example is far more soluble than marble. Some sedimentary rock, may have inclusions that react adversely to prolonged exposure to water.

*In a fire the following may occur:*

Damage is predominantly due to extreme heat and the deposition of soot. Extreme heat can change the basic chemical structure of limestone or marble, increasing their solubility while decreasing their inherent strength (also often resulting in micro fissuring and spalling of the surface). Soot can become engrained in the porous structure and difficult to remove without extensive treatments.

## **RESPONSE AND SALVAGE:**

In reality, response operations in most emergencies will not be allowed to get underway as quickly as you will want them to. The delay may be hours, days or even weeks. It is also true however that in most emergency situations that may be best, since dangers to you and to the entire team lurk everywhere in a burned structure, a flooded environment or a building structurally damaged by a hurricane or earthquake.

In the response process and in the salvage process it is important to be cognizant of the dangers present and the fact that the staff and the volunteers which may be assisting may not be sufficiently trained to deal with the dangers of such situations.

Health risks may include the presence of asbestos or PCB's and other chemical residues from a fire or collapse. They may take the form of contaminated water or electrical lines/outlets near a flooded area. The objects themselves may present a hazard (ethnographic material for example that may have been treated with arsenic compounds or other toxic material should be very carefully handled). Fatigue and over exertion must be guarded against. In general it is essential that those involved in the response and salvage review the dangers present, and those that may arise, as the salvage operations proceed. It is unwise to assume that an aftershock, for example, will not occur and further weaken an already damaged structure, just because you are in it trying to survey damage or salvage your collection. Each person must be kept aware (and reminded) of the need to work with caution and with their own safety and the safety of others in mind.

### **Organized response, the first step in salvage: setting priorities.**

It is important to organize and prioritize your salvage operations before you need to implement them. That's not an easy thing to do since no one wants to leave anything behind, unattended. Most of us will have the instinct to save everything, but in the end that may not be possible nor might it be the most effective approach. While you are attending to a minor problem, or to a less important object in your collection (which you have come upon first in the initial response), one of your rarest and most important objects might be in the process of being destroyed around the corner or in the next room. In the latter case simple remedial efforts may be enough to save the object, but you may get there too late. The earlier you prioritize in a calm, thoughtful environment where you can take into consideration all aspects of the collection, the better. The process should begin well before there is any immediate need for salvage and long before any emergency occurs. For most of us prioritization will be difficult. There are however ways of approaching the process that make it somewhat easier.

A priorities list can be drawn up based on generalized susceptibility to the most prevalent threat(s). For fire and flood a general category list may be placed in this order:

1. Organic materials
2. Metals
3. Ceramic
4. Stone

*Priority consideration may include:*

- Immediate susceptibility to damage
- Rarity
- Importance to collection

- Monetary value
- Whether the object(s) are on loan
- Ability to move the object particularly without introducing the risk of additional damage. This takes into consideration: height, shape, weight, and fragility.
- Degree of apparent damage (has not been damaged and so will be OK or has not been damaged and so should be saved)
- Degree of susceptibility over the time period of the salvage operation (might it become unstable later if it is not attended to now)
- Proximity (to you or to an exit or other resource for salvage/evacuation)

It is clearly important in any response or salvage operation (and in any attempt to develop priorities), that one is aware of what materials are most susceptible to what problems and how those susceptibilities might change with differing disaster scenarios and over time. This is where the "vulnerability survey" will come in use.

The process of developing priorities is a complex balancing act that should be thought through before such priorities are needed for immediate action. One should not however assume that the priority list will always hold true. Emergencies and disasters are dynamic events and each presents unique problems. Thinking through priorities means that you have a number of optional structures and that each of those will quickly assist in developing the most effective immediate plan of action you need at that particular moment.

#### **Initial response:**

Having considered the priorities and developed a triage plan, and armed with knowledge regarding the various types of objects and their particular characteristics as well as their responses to various emergency scenarios, you are ready to respond in an effective way.

There are some general overall guidelines that should be taken into consideration when responding to an emergency. First and foremost is that the initial response should be an act of gathering information and not necessarily a process of salvage. An overall picture of the damage should first be developed, evaluated and formed in to a salvage plan. In some cases, immediate action to prevent further deterioration must be undertaken, but if that actions can be assigned it will enable the initial response team to continue gathering initial information regarding the scope of the damage and the range of immediate needs. Much of the salvage work and stabilization treatment will have to wait until a "big picture" over views is established so that resources can be applied within a priority structure.

Establish an initial overview that clarifies priorities and determines what resources will be needed where. What treatments will be needed immediately and what treatments will be needed later, what is essential and what is cosmetic. Some treatment can be put off, some you will have to do quickly or in a relatively short period (soot, for example, can often be harder to remove as time passes).

#### **Salvage:**

The initial response survey has offered the opportunity to evaluate the extent of the damage and to distribute resources where they are most needed based on the vulnerability survey and the collections priority list. Actual treatments beyond those which need to be done immediately to prevent further damage will take a secondary importance and can be guided by conservators with specific specialties as they are brought to the scene.

There are however some actions which you will need to take as quickly as possible in order to check the progression of damage and stabilize the object or the environment. In all cases these actions should be carefully and regularly monitored.

For those objects that the vulnerability survey suggested could be air-dried the process should take place slowly, with cool dry air circulated gently throughout the space being used. Never blow air directly on the material in order to avoid uneven drying and stresses.

Objects which have exhibited mold growth should be separated from all others.

Some objects may be rinsed with clean water. Rinsing should be done gently and over a container. The rinse-water in the container should be regularly checked for dislodged parts should they be loosened accidentally.

In the initial stages of cleaning soot should be vacuumed from the surface using a vacuum fitted with a HEPA filter. The wand attached to the vacuum should be fitted with loose-weave gauze stretched over the opening to prevent any small parts of an object from being sucked into the vacuum (though suction should never be strong in any case). The wand should not be allowed to touch or drag along the surface of the object to avoid abrasion or smearing of the soot.

Some objects should not be allowed to dry out until a specialist arrives. In such instances plastic sheeting can be loosely fitted into a tent shape to maintain an appropriate environment. The micro climate should however be carefully monitored to be sure that mold or staining is not initiated.

If objects have been broken or crushed all fragments should be carefully bagged and the bags marked. Traffic around the area where the broken object has fallen or been damaged should be limited so that small fragments are not scattered or lost.

Never unfold or flex organic material. If organic material is wet and must be moved, use rigid supports.

Establish what resources would be required to move the object should it have to be moved and where the object would be moved to BEFORE undertaking the evacuation.

Once moved the objects should be placed on absorbent material for drying.

Some objects, that can be dried but have fragile surfaces, can be dried by the application of absorbent materials on the back or opposite side of decorative elements to avoid loss of those elements.

There should always be ample transport containers such as collapsible plastic polyethylene boxes (the use of cardboard boxes should be avoided if possible. If not possible then they should be used for transport only, supported evenly and especially at the bottom, and then objects should be removed from them as soon as possible).

Do not try to separate objects that appear stuck together.

Always isolate moldy objects.

Garments or moccasins can be gently stuffed with an appropriate absorbent paper while drying to retain their shape.

Keep in mind that many archaeological and ethnographic collections are held or packed within boxes, bags or other forms of containers that are part of their documentation. These also need careful consideration in any salvage operation.

### **Documentation:**

The need for documenting the response and salvage process has been already covered in the literature and its importance can not be overstated. Documentation BEFORE the emergency strikes however is not emphasized enough. What will each object need in a variety of circumstances? How is the object installed and what resources (from a screwdriver to a fork lift) will be needed to access, stabilize or move an object? These questions should be answered and those answers recorded and made accessible long before they are immediately needed.

### **Conclusions**

Ultimately what we all want to achieve is better control of a situation the every definition of which includes the loss of control. Whether the situation is a simple emergency or a large-scale disaster being better prepared, before the event occurs, will result in a more efficient response and a more successful salvage and recovery. While you are waiting to gain access to the collection after a fire, or flood or earthquake wouldn't you rather know that you are armed with knowledge regarding the potential susceptibilities of the materials; with the confidence that you have sufficient resources to respond to the initial challenges; that you have already negotiated your priorities under a variety of conditions; and that simple measures you had taken prior to the event will have reduced the amount of damage you are about to face.