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Caring for Artifacts After Excavation – Some Advice for Archaeologists

ABSTRACT

As the concern for long-term curation of artifacts grows in the United States, more responsibility will fall on the archaeologist and the laboratory assistant to provide adequate care for artifacts during and after excavation. In this article various systems are presented for packing and storing the range of artifacts found on historic sites in North America. A list of suppliers of some materials mentioned in the text is included.

Introduction

As soon as an artifact is removed from its burial environment, it is subjected to certain physical and chemical changes. The equilibrium the artifact has achieved with its surroundings is upset. For instance, increased temperature of the air may promote chemical reactions. Abundance of oxygen in the new surroundings may stimulate corrosion on metals. Soluble salts from ground water may move through porous materials and, when exposed to a drier environment, crystallize on surfaces. Increased levels of light may destroy painted surfaces (Sanford 1975:55-56).

A conservator stabilizes an artifact to prevent its further deterioration. This should be done as soon as possible after excavation. Because some of the treatments can be quite exacting and complicated, archaeologists should employ trained conservators. Ideally, a conservator should be involved both in the planning of fieldwork and in the excavation (Grosso 1978). The presence of a conservator during all stages of excavation and subsequent analysis is a critical factor in the survival of artifacts. To a conservator, the excavation by archaeologists of artifacts without adequate measures for their preservation is irresponsible.

However, the conservation treatment itself is not enough: the preservation of any archaeological artifact may be regarded as a maintenance problem of curation. Artifacts undergo more changes during storage as temperature and moisture in the air change seasonally as well as daily. Greater factors in the survival of artifacts indeed may be proper storage and handling. The actual conservation treatment, then, constitutes an important but small part of the long-term preservation scheme.

Even the most laborious of treatments can be undone by placing an artifact back into an improper storage environment.

In reality, the current lack of trained archaeological conservators and curators in the United States means that artifacts in collections may wait years for any kind of treatment. This situation will change in the future as awareness of endangered collections grows, co-operation between archaeologist and conservator increases, and support for conservation and curation is mandated (Bourque et al. 1980). However, because of the present situation, more responsibility must be taken by the excavators to safeguard their finds during and after archaeological projects. Even if a conservator cannot be provided, the curatorial process of labeling, packing, and storing must be regarded as equally important as the excavation. Before the excavation, adequate funds must be included in budgets prepared by the archaeologist for suitable packing materials of good quality. Moreover, time and care must be given by excavators in labeling and packing their finds.

This article provides some advice concerning handling of artifacts in the field and storing them in the transitional period between excavation and conservation. The measures are relatively simple and inexpensive. Some of the ideas are not new and are similar to those presented in two British publications by Dowman (1970) and Leigh (1972). Hopefully this article will reach a wider audience of American archaeologists and provide more useful suppliers for materials. Emphasis has been placed equally on what to do and not to do. Unfortunately, because of space, only basic advice could be given. The advice will help, but not guarantee, the survival of artifacts. It should not be regarded as a substitute for professional conservation and long-term curation. No attempt is made to discuss conservation treatments found elsewhere. For more information on the kinds of treatment available, one is referred instead to two general books (Plenderleith and Werner 1971; UNESCO 1968) as well as a small selection of publications cited below.

Some sources for materials and suppliers marked by an asterisk (*) are provided in the appendix. A more complete discussion of packing materials has been presented by Fall (1965). Archaeologists dealing with artifacts from marine sites should consult Lawson (1978).

Marking, Bagging, and Boxing – General Advice

Although every archaeologist has his own way of recording artifacts, certain methods in marking, bagging, and boxing can be suggested to minimize confusion.

If an artifact is given temporary identification in the field, it is advisable to use a dual marking system – a notation on the bag *as well* as a duplication card or tag inside. Waterproof pencil, marker, or ink should be used. Waterproof plastic paper* may be useful in damp conditions. The plastic paper can also be cut into tags that are more resistant than paper to damage by insects and dampness in storage.

If an artifact is actually marked, the field or catalog number should be applied in India ink on two thin coats of a reversible resin (PVA-AYAF* in acetone*; Acryloid B72 in xylene* or toluene*) which seals the surface of the artifact. Clear nail polish is a readily available alternative. Caution should be exercised in using any of these resin solutions for marking artifacts. Always use in a well-ventilated area. Toluene is especially dangerous if used for long periods without proper precautions. Avoid contact with these solvents on the skin by wearing solvent resistant gloves* and avoid inhalation of vapors by using a cartridge respirator*. Do not use near open flame or store in extreme heat.

Once the number is applied, another coat of resin is applied for protection. It is unadvisable to mark directly on any unstable surface that is flaky or heavily encrusted with dirt or corrosion. In these cases tags (preferably plastic paper, as above) would be better. Pottery sherds should not be marked along the edges but on the inside surfaces as inconspicuously as possible.

While artifacts recovered from wet environments will require special packing, artifacts from dry sites should not be damp when bagged and marked. The artifacts should be dried slowly in the shade. Any moisture trapped in bags will encourage corrosion on metals and the growth of mold and mildew on artifacts. “Zip-lock” bags are especially dangerous for this reason. Paper bags may be used (except for lead and pewter), if they are of good quality. Double bagging is recommended for added strength.

Small, more fragile artifacts, like worked bone, glass, or buckles, are better stored in hinged clear plastic boxes* with labels (Figure 1). Acid-free tissue paper* and/or

flexible foam sheeting* should be used as padding around the find, although only the tissue paper should be in direct contact with the artifact. These packing materials not only will protect the surface but also will serve as buffers to lessen the effects of daily fluctuations in temperature and relative humidity. Cotton wool should be avoided as a packing material because it catches easily on rough edges. Newspaper, so strongly acidic, should not be used in direct contact with artifacts.

Additionally, a cheaper alternative to individual boxing is to staple small plastic polyethylene bags (2” x 2”) containing finer fragments of glass or porcelain to index cards which can be boxed together. Galvanized staples are preferable to others which may rust in time. Pharmaceutical vials* also are useful for storing small fragments, but any empty space should be packed with acid-free tissue paper.*



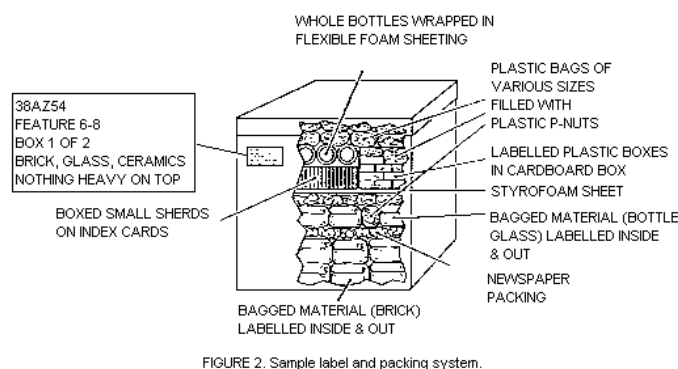
FIGURE 1. Fragile artifacts packed in plastic boxes with padding.

Industrial polyethylene tote boxes* are more durable but more expensive than cardboard for transporting and storing artifacts. Some have internal dividers that are removable. If sturdy cartons like liquor boxes are used to store artifacts, heavier artifacts like brick, tile, and ceramics should be placed on the bottom. It may be necessary to reinforce the bottom with rigid foam sheeting.* The weight should be evenly distributed. Packing material like newspaper or polystyrene p-nuts in stapled plastic bags may be used to fill in holes and minimize shifting and reduce physical damage. Air-trapped polyethylene sheeting, like “Bubble-Pack”, may also be useful. The exterior of the box should be marked clearly to give contents and any special instructions (Figure 2). Finally, boxes do have limits in

load, and should be transportable by one person of normal strength.

Thought and care should be given as well to shelving and storing of the cartons. The curatorial area should be accessible, well-ventilated, and free of dust and vermin. A general stable environment, with ideal levels of relative humidity at 45-55% and temperature at 65-75°F, is preferable to an environment with severe daily and seasonal fluctuation. Constancy of relative humidity is probably more critical than constancy of temperature. Some artifacts, like metal and unstable glass, require special storage (see below).

Shelving units for a collection should be selected with a regard for strength rather than economy. Some cheaper metal utility shelving units may collapse under the weight of boxed artifacts. Enough boxes and shelving units then should be available to avoid over-loading. Any necessary heavy boxes should be marked as such and placed on lower shelves. Stacking of heavier cartons of tile, brick, or iron on top of boxes of glass or bone should be avoided. An arbitrary placement of boxes just to retain sequence may be disastrous for more delicate artifacts. Partially or totally reconstructed pots should either be boxed or covered with plastic bags to prevent dust accumulation. Finally, some containers, i.e., those holding metals or waterlogged organic materials, may require placement where the archaeologist or laboratory assistance can get to them for frequent inspection.



Metals

Most metal artifacts recovered from historical sites may be removed directly from the ground. Metal artifacts should not be washed: if superficial cleaning is attempted, it only should be to brush off loose adhering dirt. No removal of corrosion by chisel, pick, or wire

brush should be tried. Not only may impressions of organic material (wood, textiles) exist in the corrosion layer, but also the extent and condition of remaining metal may not be readily apparent. Ideally, a trained conservator should treat metals as soon as possible after excavation because much information may be lost with secondary corrosion. For various discussions of corrosion processes and conservation treatments, see Stambolov (1969), Hamilton (1976), and Brown et al. (1977).

Metal artifacts recovered from terrestrial sites should be thoroughly dry before bagging, especially if plastic bags are used for packing; otherwise, moisture will be trapped and further corrosion stimulated. For this reason plastic bags should be used for storing metals only in conjunction with indicating silica gel.* Indicating silica gel is an absorptive silica which changes color from blue to pink as moisture is removed from the surroundings. Pink indicates the silica gel's exhaustion, but the desiccant may be renewed by heating it in a domestic oven at not higher than 350°F until the deep blue color returns. The silica gel must not come in contact with the artifact's surface. Most important: artifacts stored with silica gel must be inspected monthly and the desiccant rejuvenated as necessary. A more complete discussion of the nature and applications of silica gel is found in Stolow (1977).

Fine or delicate metal artifacts may be packed individually in plastic boxes* as mentioned above. However, a small perforated plastic bag of silica gel* should be used as a desiccant (Figure 3).

Small metal finds like buttons or coins can be bagged in small plastic bags and stapled to cards filed in a plastic food container (i.e., Tupperware) with a perforated packet of silica gel* (Figure 4a). This system permits easy inspection of the artifacts. Plastic containers for shoes and clothing also may be useful.

A large storage container for metals (Figure 4b) recently has been devised by the York Archaeological Trust in England (Spriggs 1979) using a 5 gallon polyethylene utility bucket, often available cheaply from franchise food concerns, such as Hardees or McDonalds. The cover should be tight fitting. Indicating silica gel* is placed in a muslin sleeve that slides down a drilled PVC pipe (Poly Vinyl Chloride), the kind used in plumbing. The sleeve system permits easy removal of the silica gel

for inspection and regeneration without disturbing the bagged artifacts.

If covered plastic containers are unobtainable, metal artifacts (except lead and pewter) may be stored in cardboard boxes as recommended by Leigh (1972) provided that the box is placed inside a heavy gauge plastic bag (8 mil minimum) with a perforated bag of silica gel* (Figure 5).

It is very important that all metals before *and* after conservation be stored in area that are as dry as possible, ideally not more than 30% Rh. Domestic dehumidifying units will help lower the overall relative humidity in a storage area. However, because the lower level is so difficult to achieve in most storage areas, a system of individual containers with silica gel* may be more advisable, despite the need for maintenance.

Metals recovered from waterlogged sites should be kept wet (Hamilton 1976; Lawson 1978).

Finally, archaeologists should be aware of four special considerations for metals:

1. Outbreaks of active corrosion on *iron* take the form of shiny, wet areas, often pustules of ferrous chloride ("weeping iron"). Weeping iron indicates very unstable iron which needs the immediate attention of a conservator as well as a sealed dry storage environment.
2. Active corrosion on *copper and brass* takes the form of an electric green, soft powder (basic cupric chloride – "bronze disease"). Again, the artifact is unstable and a dry environment and conservation treatment are needed.
3. *Lead and pewter* should not be stored in paper bags and cardboard boxes because the organic acids emitted from paper will attack the lead. Similarly, wooden shelving (oak, fiberboard, plywood) should be avoided. Lead and pewter exhibiting a whitish powder need immediate conservation treatment. Plastic boxes* padded with acid-free tissue* are recommended.
4. *Silver* artifacts in storage should be kept away from any sulfur containing materials because the hydrogen sulfide emitted from them will tarnish the silver. Included in this group are rubber materials like rubber bands, mats, and molding strips as well as some latex paints and treated textiles (Oddy 1975a).

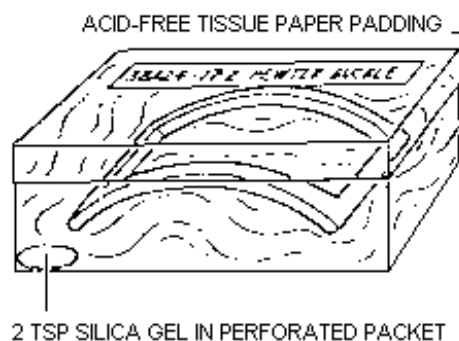


FIGURE 3. Metal artifact packed individually with padding and desiccant.

Ceramics

Occasionally pottery (especially coarse Indian) is so weak and friable that consolidation is necessary before the fragments can be lifted from the ground. In general, consolidation is the exception to the rule and should be avoided unless totally necessary. Consolidation of any material should be regarded as a last resort; often resin heavily applied in the field is very difficult to remove later. If the situation seems complicated, the advice of a trained conservator should be sought first. More complete discussions of consolidations and lifting techniques, including block lifting and encasement with plaster, are provided in Dowman (1970).

When simple consolidation is necessary, soil conditions will determine the type of consolidant used. If conditions are damp, a waterbased emulsion of polyvinyl acetate (PVA)* or acrylic (Rhoplex 234)* should be used. Both of these may be removed later with ethyl alcohol.* If the soil is dry, a 10% solvent-based solution of Acryloid B72* in xylene* or toluene* or PVA-AYAF resin* in acetone* may be applied.

While emulsions come prepared and may be thinned with water to aid penetration, solutions are made in a weight per volume ratio expressed as grams per liter. For example, a 10% solution is 10 grams of resin crystals dissolved in 100 mls of solvent; a 15% solution is 15 grams in 100 mls. Wrapping the resin beads in cheesecloth tied with string and then suspending the bundle in a jar of solvent will aid dissolution of the beads.

Again, care should be exercised in handling solvents like acetone, * xylene, * and especially toluene* in preparing, using, and removing consolidants. Cartridge respirator* and protective solvent-resistant gloves* should be worn. The solvents should be kept from heat, flame, and sunlight and always used in a well-ventilated space. Additionally, for large applications and prolonged use, it may be wiser to use an emulsion.

The selected consolidant may be applied by brush, spray, or pipette. Dripping on the consolidant is advised if the surface is friable or painted; however, the solubility of the paint should be tested first. Applying the solvent alone first will encourage penetration of the consolidant. Successive coats of a thinner consolidant usually are more effective than one heavier coat, but care must be taken that the consolidant does not dry to leave a skin between coats. The consolidant should be applied until the ceramic appears saturated. Most importantly, do not attempt to lift the fragments until the consolidant is totally dry, usually in an hour depending on temperature, sunlight, wind, etc. After removal fragments should be supported on boards or packed in a padded box for transport.

It should be noted that consolidation will eliminate the possibility of any future analysis of the ceramic, so a small fragment should be kept separate for this purpose. The type of consolidant used in the field should be recorded as well.

While consolidated pottery will require special cleaning with the respective solvent, the bulk of historic (and prehistoric) ceramics may be washed easily in plain water provided that some care is taken. Warm water should be changed frequently, because accumulated grit can act as an abrasive. If soap is needed, a few drips of a non-ionic wetting agent like Tergitol-NPX* is preferable to household detergents which may have additives. Surfaces with burnishing or deteriorated glaze should be not scrubbed vigorously but cleaned carefully and gently using a soft paintbrush. On porcelain care should be exercised to notice overpainting and lifting glaze. These pieces, as well as any poorly fired pottery or terra cotta which may disintegrate totally in the water should *not* be washed, but cleaned by dry methods (scalpel, dry brush, pin-vice). Consolidation with a 10% solution* could follow if necessary.

Joining sherds with tape before packing is a temptation which must be avoided; otherwise, damage will result

from long-term contact of the tape to the ceramic surface. Bagging together possibly joining sherds is preferable.

Complete reconstruction is best done by a trained conservator; methods have been examined by Mibach (1975). However, if sherds must be glued for photography and study, then an easily reversible adhesive like Duco cement, which can be dissolved in acetone, should be employed. One should use as little glue as possible and record the brand. Cyanoacrylate (“Crazy Glue”) and other instant adhesives, rubber cement, epoxy, and even Elmer’s Glue should be avoided. A sandbox will be useful for supporting the sherds. Masking tape or Scotch Magic tape may be used to temporarily hold sherds during drying if their surfaces are not friable or painted. Even with sherds in good condition, care should be taken not to lift the surface as the tape is removed. Acetone* will soften the tape.

Most ceramics can be processed and packed easily. In general, ceramics are relatively inert and require no special storage requirements. They may be stored under normal conditions, i.e., 45-55% Rh, 65-75°F.

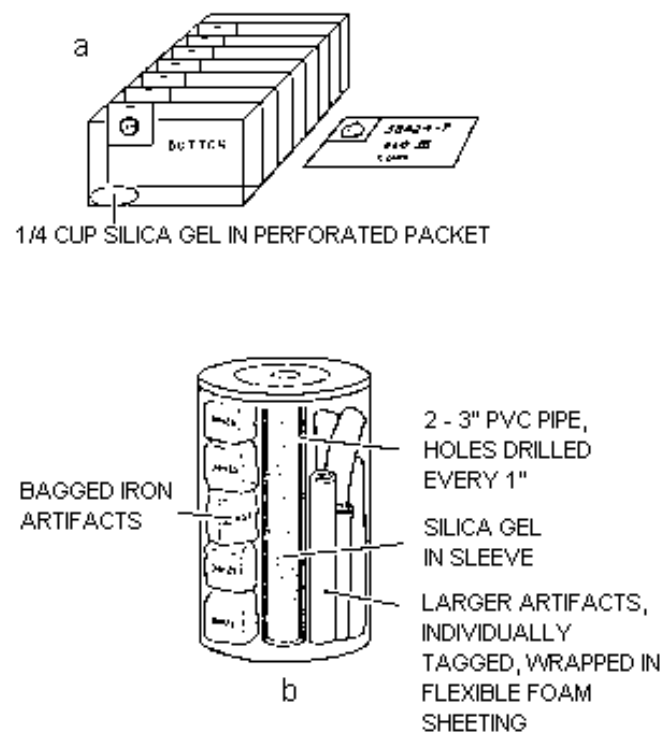


FIGURE 4. Metal artifacts packed as a group in closed containers with desiccant. a) Small finds on cards in a sandwich container. b) Larger artifacts in a bucket.

changed like clouding, cracking, or a rainbow effect, the rest of the glass can be dried slowly. Otherwise, the glass should be stored damp, laid flat on layers of damp acid-free tissue paper* in a covered sandwich container with waterproof labels.* The advice of a conservator should be sought immediately.

Bone

Bone from dry or somewhat damp soils should be dried slowly to prevent distortion. Drying bone in direct sunlight should be avoided. Because of the likelihood of bone's weakened condition in both acidic and basic soils, it may be necessary to consolidate it before lifting. Again, consolidation may be carried out *only* if the bone cannot carry its own weight. After the bone is cleaned by brush and dental picks, consolidation can be carried out as describe in the section on ceramics, although a thinner solution of either resin* or emulsion* (5-10%) is advisable. Following consolidation and drying, the bone may be removed directly or in block sections. If future analysis may be required, some samples that are not consolidated should be kept separate.

Only bone in good condition should be washed using a minimum of scrubbing and exposure to water. More friable or delicate pieces, skull and diagnostic fragments, or artifacts of work bone should be cleaned dry by scalpel or pick, perhaps using a 50-50 mixture of ethyl alcohol and water applied in swabs to loosen the dirt. The bone can be consolidated with a 5-10% solution of resin* or emulsion* as cleaning proceeds. Bone fragments may be glued with a viscous PVA emulsion.*

Sections of bone should be packed carefully in cardboard or plastic boxes using acid-free tissue* or flexible foam sheeting* as padding. No bone should be packed in a plastic bag unless totally dry because mildew and mold will grow.

If bones are found in totally waterlogged conditions, they should not be allowed to dry, but should be stored wet with a fungicide (see sections on leather and wood).

The care and classification of bone are covered more thoroughly in Coy (1978).

Leather

Leather is best preserved when little attack by microorganisms has occurred; acid waterlogged

conditions with their anaerobic environments are most conducive to preservation. Leather has been found in privies, wells, swamps, and rivers. Leather from somewhat damp terrestrial sites should be treated as waterlogged.

Damp or waterlogged leather should be handled carefully because it probably will be weaker than it appears. It should be kept wet continuously. If allow to dry, wet leather will harden and curl irreversibly. Therefore, waterlogged leather should be submerged in water in a closed container (i.e., Tupperware sandwich container). Smaller pieces may be stored with some added water in "zip-lock" bags, but these too should be stored in a secondary covered container with more water (Figure 6). A fungicide will be needed, and for this purpose a quick application of Lysol spray (non-foaming

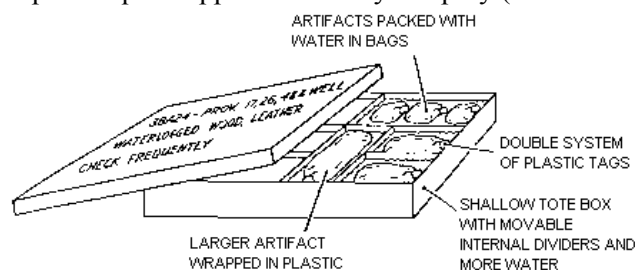


FIGURE 6. Small waterlogged artifacts packed in plastic in a covered plastic tote box

kind) on the leather before storing will help but may need to be repeated. Storage containers and bags should have a dual label system using waterproof plastic paper* or plastic tags inside and out. Dymo tapes also have been used for labeling, but they may deteriorate with time. Teflon tapes may be more durable. Storage systems are discussed further in the following section on wood. It is unadvisable to use neat's foot oil, cedarwood, or linseed oil for storing wet leather or for dressing dry leather. Treatments for wet leather have been presented by Mühlethaler (1973) and Morris and Seifert (1978).

Dry or desiccated leather should be handled carefully and packed on layers of acid-free tissue.*

Wood

As with leather, wood is usually best preserved in anaerobic waterlogged environments. Wet wood also will suffer irreversible damage if allowed to dry, even if for a few minutes. Exposed wood must be covered with a wet blanket or hosed repeatedly during in situ drawing and photographing. Because of the problems and costs associated with handling, storing, and preserving

waterlogged wood (Mühlethaler 1973; Oddy 1975b; Grosso 1976), the advice of a conservator should be sought immediately if waterlogged wood is found on an excavation.

Small fragile pieces of waterlogged wood may be packed in individual “zip-lock” bags* with a little water and then placed in a covered plastic container with more water. Covered industrial tote boxes with internal dividers* also may be useful for organizing and storing small pieces of wet wood and leather from various proveniences (Figure 6). Large pieces should be wrapped in three layers of polyethylene bags or sheeting* that are sealed; however, this system is not advisable for prolonged storage. A dual system of waterproof labels* is advised. Dymo or Teflon labels or plastic tags attached to the wood with stainless steel staples or nylon fishing wire also may be useful.

If the waterlogged wood cannot support its own weight, a board should be used as a secondary support (Leigh 1972). The wood should be wrapped in damp flexible foam sheeting* followed by a layer of heavy plastic sheeting (8 mil minimum) and tied down to the support. Care must be taken not to cut into the cheesy wood with rope or masking tape (Figure 7).

All these temporary storage systems will require a generous application of non-foaming Lysol spray to the wood before wrapping. Lysol (a dilute solution of orthophenyl phenol in alcohol) is recommended for field use because of its availability and ease of application. However, for prolonged storage of wet wood (and leather) a suitable fungicide should be used in solution form. If no fungicide is used, then the water in the storage containers should be changed at least three times a week. Factors to be considered in the selection of a particular fungicide are cost, effectiveness, toxicity, pH value, compatibility with the wood, and compatibility with any future conservation treatment. A conservator should be able to help make the best selection. Archaeologist should also realize that exposure of the wood to a carbon containing fungicide or preservative will change Carbon 14 values. Samples of wet wood for Carbon 14 or dendrochronology will require special handling (Keene 1972).

For prolonged storage of larger pieces of waterlogged wood, submersion in a covered tank containing water and fungicide is preferable to plastic bags and sheeting. The wet wood should be checked frequently.

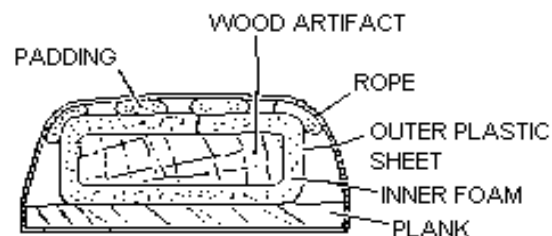


FIGURE 7. Support system for waterlogged wood.

Textiles

In dry conditions, textiles usually are found only as mineralized remains on metals, which is one reason cleaning metals in the field should be avoided.

If a textile is waterlogged, it will be very fragile. No attempt should be made to lift it directly. Rather, the textile should be removed with its surrounding dirt as a block and wrapped in heavy gauge plastic or three layers of thinner plastic bags or sheeting and then placed in a covered plastic container or tote box.* Plastic paper* and tags are advisable for labeling. However, unlike wet wood, bone, and leather, no fungicide should be used in storing wet textiles. The advice of a conservator should be sought immediately.

Conclusion

Numerous ways of packing and storing artifacts have been presented in the article in order to make archaeologists more familiar with some of the problems of long-term Curation. The care of artifacts begins with excavation. Even if a conservator cannot be provided, an archaeologist has a responsibility to insure that artifacts are handled properly and packed adequately. Developing a storage scheme will require time and thought. Artifacts may have to be separated and stored by material, not provenience. Some artifacts may require periodic checking. Cataloging and shelving systems should be devised to accommodate these separations. Finally, a good packing system will require money. A few hundred dollars worth of appropriate supplies should be regarded as equally important as tools and equipment for excavation. With these efforts, the material remains from an excavation will have a better chance for survival.

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