CONSERVATION MANUAL FOR NORTHERN ARCHAEOLOGISTS
Prince of Wales Northern Heritage Centre
Revised 3rd Edition 2007

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Preface

This revised 3rd edition was modified to focus on the field packing of archaeological materials by archaeologists/conservators. Additional glossaries were removed. The document has been augmented to include a cost calculation format, updated packing materials and supplier information.

The major changes in the revised 2nd edition edited by Margaret Bertulli in 1991 was the addition of Appendix G, *Handout for Excavators: Artifact Conservation in the Field* and Appendix H, a *Glossary* of terms used in conservation.

Susan Cross, Charles Hett and Margaret Bertulli wrote the original version of this manual in 1989.

Acknowledgements

We acknowledge with gratitude the assistance of staff members of the PWNHC and CCI past and present who contributed to the previous editions of the Conservation Manual for Northern Archaeologists Manual.

We welcome your comments and suggestions at Rosalie_scott@gov.nt.ca

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Conservator field packs bowl at Kuupak, Inuit site Mackenzie Delta, NWT

PURPOSE

Archaeological data collection and conservation are complimentary activities; both are concerned with the salvage of otherwise lost or inaccessible information. The appropriate place for collaboration to begin between the disciplines of archaeology and conservation is in the planning stage of any archaeological field project (Logan 1988:).

As a condition for receiving an Archaeologist Class 2 Permit from the Government of the Northwest Territories archaeologists must show that they will provide adequately for the conservation of the excavated artifacts and samples. Archaeologists are not expected to apply specialized conservation treatments; however, they should be cognizant of damage that can be done to newly-excavated artifacts, and be able to excavate, handle, and transport those artifacts in a sage manner until such time as a conservator can take them under his or her care. This manual provides basic information on conservation to northern archaeologists, stressing aspects of preventive conservation that will ensure the safety and preservation of excavated objects.

The potential conservation requirements of a collection should be addressed at the initial planning and permit application stage of any archaeological fieldwork. Every reasonable attempt should be made to anticipate the scale and nature of artifact recovery and to assess the requirements for artifact conservation in the field and subsequent laboratory treatment. Applicants for archaeological permits should consider the following:

21. Prior to Fieldwork:
    a) Retain the services of a qualified conservator who will assume responsibility for the conservation of archaeological objects.
    b) Demonstrate that adequate funds have been allocated for artifact conservation.
    c) Submit the conservator's current resume and a letter confirming their participation in the project.

22. During Excavation:
    a) The field project should include conservation packing materials and supplies.
    b) All personnel should be briefed on appropriate techniques for handling, packing and storage of artifacts while in the field.
    c) Artifacts must be packed to prevent drying or breakage during the post-excavation period and shipping.
    d) Wet or damp artifacts must be kept wet or damp prior to conservation.
    e) All artifact packages must be labeled with a Borden catalogue number.
    f) A packing list of the artifacts with their Borden catalogue number, name of object and material should be sent with the artifacts.

23. After Excavation:
    a) Any interim research facility for the artifacts must provide an adequate environment and safekeeping for artifacts under analysis. (see Research Facility- Artifact Care Guidelines).
    b) Ensure that the conservator examines all archaeological artifacts collected under a Class 2 Permit excluding lithic material.
    c) Artifacts should be sent to the conservator immediately or as soon as possible after the completion of the field excavation.
    d) Provide the PWNHC Collections program with an examination report summarizing the condition of the collection and treatment proposal for review and approval by their Conservator before undertaking any conservation treatments.
    e) Ensure that all treatment records are provided to the PWNHC Collections program. Treatment records should include the permit number, site name, year and Borden catalogue number.

NEED FOR CONSERVATION

Untreated wooden object 18th century irreversibly damaged Treated bowl 18th century using PEG and freeze-drying

In recent years, there has been an increased effort to make archaeologists more aware of conservation. Too often the preservation needs of study material have not been addressed until well after excavation and analysis, or after the archaeologist has finished a report and has no further, immediate use for the material. This is usually far too late as irreparable damage to artifacts may already have occurred.

Archaeologists must take an increased responsibility for the care of artifacts. First, there is a responsibility to the public. Excavated artifacts are the property of the people of Canada and are held in the public trust by designated institutions. Excavation is a destructive process. The excavated materials and accompanying documentation are the only remaining records of a site.

There is also a responsibility to science and history. Artifacts kept in good condition will ultimately provide better information to future researchers. Collections must be carefully preserved so that they will be available for study by more advanced research techniques, and for new research questions, of both an archaeological and non-archaeological nature.

Finally, some historic sites, especially historic cairns, may contain documents establishing Canada's territorial jurisdiction. The preservation of these documents has unique legal implications and must be treated with special consideration. (see Cairns)

Conditions in northern Canada generally favor the preservation of archaeological artifacts, with the exception of the boreal forest zone where acidic soils often hasten the disintegration of organic remains. In the arctic, artifacts exposed on the ground surface disintegrate slowly because of prolonged periods of freezing, while objects buried in permafrost may be preserved for hundreds, if not thousands, of years.

After burial, objects reach equilibrium with their burial environment. The rate of deterioration of buried objects is reduced significantly as a result of this equilibrium. Excavation of the artifact disturbs the equilibrium, exposing the object to a new environment with fluctuating levels of moisture, oxygen, light, and temperature. Artifacts will begin adjusting to the new environment trying to re-establish equilibrium. During the adjustment period certain physical and chemical changes (e.g. moisture content) will occur in the material from which the artifact is made. This generally results in accelerated rates of deterioration.

Archaeological artifacts may have a deceptively strong appearance when first excavated. All archaeological materials have undergone some form of alteration while buried and during the recovery process. Generally these processes physically weaken the artifact. While in the ground the objects are supported by the surrounding soil but when excavated they may be unable to support their own weight. For this reason, archaeologists and conservators may use specialized lifting techniques to excavate fragile objects. The objects will need to be supported during and after excavation.

One of the most damaging changes an artifact can undergo is a change in the moisture content. Organic artifacts excavated from wet or damp sites will contain excess water. This water may be supporting a weakened cellular structure giving the artifact a robust appearance. Allowing the artifacts to dry out during excavation or while in the field may cause the artifact to irreversibly shrink or crack.

In the arctic, the relative humidity in summer is consistently high. Wood surface finds will have surprisingly high moisture content, often above the fibre saturation point. Damage is common when the artifact is allowed to dry out during the excavation period.

Sites where large amounts of wet, organic materials or complex, composite artifacts will be recovered may benefit from having a conservator on site. These sites may include large Thule occupations, areas with extensive permafrost, marine excavations or complex historic sites. Due to the short excavation period, cool temperature and lack of running water and electricity, field treatment is normally limited to the safe recovery, field holding, packing, and transport of artifacts. Minor treatments such as cleaning, consolidation, drying and repair of bone, antler, ivory, ceramics or textiles may be possible if time and work load permit. An on-site conservator will require extra equipment, supplies and working space. (See On-Site Conservator)

The preventive conservation methods discussed in this manual are intended to reduce the rate of damage to artifacts caused by changes in the environment during and after excavation. These will include appropriate excavation, handling and packing procedures.

PLANNING FOR CONSERVATION

Many potentially damaging situations can be avoided by adequate planning for conservation prior to the excavation. Early planning will allow archaeologists sufficient time to include conservation in their research design and budget, and to acquire the necessary conservation services and field supplies.

Discussions between archaeologists and conservators early in the planning process should be given a high priority. A first step is for the archaeologist to enlist the services of a conservator or conservation agency (see Finding a Conservator). The individual who will provide advice and treat the materials from the site should be included in the initial planning stages of the excavation. The following outline illustrates how planning should proceed.

Basic information on the archaeological site and the research design

1) Type of site

   i) surface, buried, or underwater
   ii) frozen, wet**.** In the case of wet sites, it is particularly important to identify funding and conservation needs at the outset of the project.
   iii) historic or prehistoric

2) Significant factors specific to the site

i) environmental factors, including ecological zone, environment, soil pH, drainage, marine site or ground permeated with salts
ii) cultural associations, time period, range
iii) material, size, and number of artifacts anticipated

3) Significant factors specific to the excavation research design

i) size of the field crew
ii) duration of excavation
iii) transportation methods to and from the archaeological site

Field procedures

1) Excavation

i) traditional methods (trowels, brushes, blocklifts)
ii) specialized methods for excavation in permafrost (use of running water, use of warm/hot water, use of the sun's heat)

2) Packing and transport of excavated materials

i) work and storage space requirements
ii) containers for holding and shipping artifacts
iii) packing supplies
iv) person/procedure for packing of artifacts
v) transportation methods to and from the field (packing/conservation supplies, artifacts)
vi) oversized or artifacts with special requirements

3) On-Site Conservation

i) does the site require a conservator? (wet/marine, large number of organic artifacts, complex artifacts)
ii) work and storage space requirements
iii) conservation equipment
iv) workload
v) extent of conservation treatments which will be done

4) Conservation laboratory treatment

i) arrival date of artifacts to conservator
ii) time requirements for treatments
iii) analytical requirements (archaeological research, conservation requirements)
iv) documentation requirements (examination, treatment reports)
v) packing requirements

EXCAVATION OF FRAGILE ARTIFACTS

Archaeology on northern sites often involves excavation into permafrost. Permafrost consists of a permanently frozen subsurface soil layer and an overlying active layer, which thaws in summer and freezes in winter. It is common in poorly drained areas.

Heavy organic deposits such as those found in a midden or within a collapsed house structure hold moisture more readily and provide an insulating layer so that permafrost is slow to melt. Artifacts may be found cemented in ice and can be safely removed by warming the matrix.

To hasten the removal of artifacts frozen in permafrost, pour warm water gently around the object until the artifact is loosened from its soil matrix. Patience is required as this is a slow process.

Do not attempt to force the object in any way as this may result in breakage or loss of a surface, which is still frozen in place. Use of a syringe to inject warm water around the perimeter of an object allows greater accuracy in applying the water and so gives finer control in the excavation.

Conservator injects warm water into permafrost to free wooden bowl Kuupak Inuit site Mackenzie Delta, NWT.

Controlled removal of excess water and melted ice is commonly done with sponges and buckets. Gloves are also needed for personal comfort.

The materials required to carry out this procedure are commonly found in field camps: a portable propane or kerosene stove. (e.g. Coleman), fuel, a supply of water, and containers to apply the water. Thermoses are also useful in carrying warmed water to the excavation unit.

This treatment is usually applied to relatively small areas and is mainly used for removing individual artifacts. Where larger areas must be thawed, black garbage bags or black plastic tarps laid over the excavation unit will absorb and retain the sun's heat, thus accelerating the thawing while retaining moisture.

When artifacts are partially excavated from permafrost the exposed surface may begin to dry rapidly and damage may occur. The strong winds and long hours of sunlight of a northern summer combine to increase the rate of drying significantly. In these circumstances, it is important to keep the artifact wet. Use water in plastic spray bottles or cover the object with wet sphagnum moss and plastic until the soil is thawed and the artifact can be safely removed. These measures can also be used to keep the artifact wet/damp if it must remain *in situ* for photographic or excavation records.

Protection of partially thawed unit containing fragile wood artifact
Kuupak Inuit site Mackenzie Delta, NWT.

In well-drained (often sandy) areas, such as riverbanks or bluffs, excavation can accelerate thawing, and an artifact that has reached equilibrium in a cold/frozen/damp environment can dry out before being removed by the excavator. The archaeologist will then recover a dry or semi-dry, distorted, fragile artifact. When excavating in well-drained areas it is important to retard the natural drying process by covering the site after working hours with plastic sheeting or garbage bags and sod, or by watering if covering is not sufficient.

Excavation of fragile artifact using warm water and spray bottle

In a damp, sandy matrix, fragile artifacts can be excavated using brushes and a fine spray of water, which will free dirt and maintain the moisture content.

Some objects, which are badly degraded, are particularly fragile and may no longer be able to support their own weight once they are excavated. In these cases, a blocklift may be necessary. This is a well-established method of recovering fragile artifacts. The object is excavated along with its surrounding soil matrix. The soil acts as a support for the object until the condition of the artifact can be assessed, and controlled excavation in the laboratory is possible.

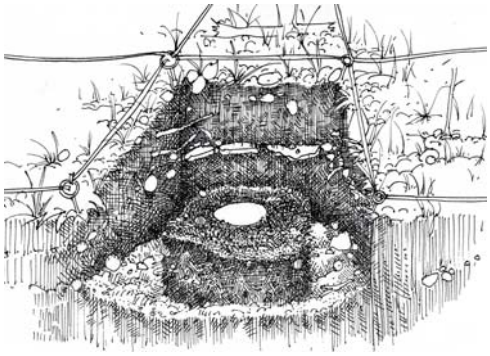
Pedestalled artifact

Often objects which require block lifting are large such as wooden bowls or pottery vessels. These objects may originally appear to be sound but deteriorate rapidly upon excavation. The extent of degradation can be tested simply by probing the surface of the artifact with a straight pin. The pin will penetrate up to several millimeters into the surface of a degraded artifact. It is best to photo document the artifact in situ to record its original shape for reference during excavation in the lab.

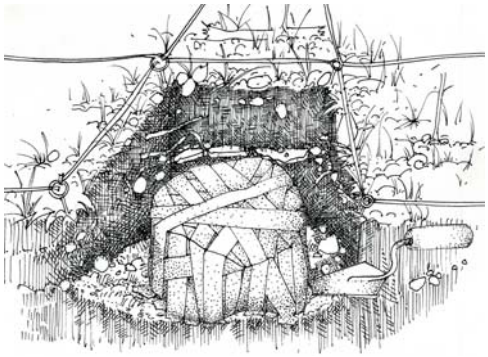
Block lifts on northern sites tend to be small and can be carried out with normal field conservation supplies (i.e. bandages and toweling).

Artifact wrapped in gauze

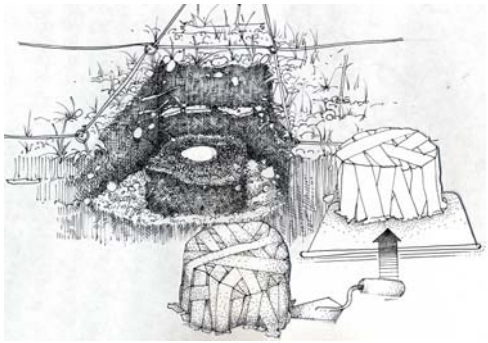
Block lift of a fragile object



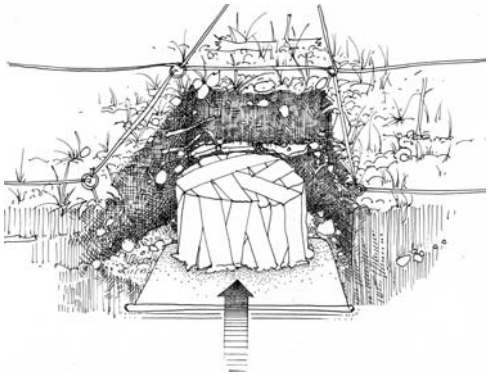
1) The outer and lower limits of the block to be lifted are delineated. The object is pedestalled, leaving enough soil on all sides to support the object.



2) The dampness of the block is maintained by misting with water, and the object is protected with layers of wet gauze bandage.



3)The block is undercut with a trowel and a rigid support is slid underneath it.



4)The block is then wrapped on all sides with gauze/ bandage, then aluminum foil, and stored in a stiff container (e.g. freezer/polyethylene containers with tight fitting lids or coroplast box).

Wax block liftoff an iron object

Melted paraffin wax can provide a form-fitting rigid support for fragile artifacts. Similar to a blocklift the artifact is excavated to expose the artifact. The damp artifact is sprayed with water to wet the surface and covered with a layer of wet bandages or cheesecloth. Wax is hydrophobic and will not penetrate wet objects. The wax is melted and allowed to form a skin that is then applied with a spatula to the wet bandages and pressed slightly to conform to the shape. Apply the wax slowly to prevent excessive heat from damaging the artifact.

Wax block lift of fragile baleen and iron objects

A layer of aluminum foil can be applied on top of the wax. After undercutting the artifact can be flipped and the soil matrix removed. Another layer of wet bandages and wax can be applied to seal the artifact for transport.

Because damage can occur within minutes of excavation, particularly with damp or wet organic materials, it is important that care of the artifact begin at the excavation unit. A briefing on field packing should be a part of the excavation routine for all crewmembers.

Organic artifact being packed at site using sphagnum moss and Ziploc bag.

The goal is to duplicate the excavation conditions as closely as possible until the object can be properly assessed and processed in the laboratory. The principles which apply to field packing are the same as those for final packing from transport from the field.

CARE OF ARTIFACTS IN THE FIELD

During holding and transport, it is best to keep an artifact in an environment which closely resembles the one in which it was buried. Sometimes the soil matrix can be used to achieve this. **In general, if artifacts are found dry, keep them dry; if wet, keep them wet, if damp, keep them damp.** By maintaining the moisture content and temperature of an artifact at a constant level from burial, through holding in the field, to transport to the lab, problems such as waterlogging, mould growth, or desiccation can be avoided. Make sure that artifacts do not undergo cyclical changes of environmental conditions since this can be very damaging.

While excavating, artifacts should be placed immediately into reclosable polyethylene bags (Ziploc) to prevent drying. The artifact bag should be labeled with a black waterproof marker and should include: Borden catalogue number, excavator's initials, date, site area, excavation area, horizontal co-ordinates, vertical co-ordinates, object name and material (if known). At the end of the day, artifacts should be collected from the excavators and stored in a cool place away from direct sunlight.

If there is no conservator on the site, the archaeologist or a designated individual(s) will need to be responsible for the prompt and proper handling, packing and storage of the artifacts. A safe workspace of a reasonable size is needed. A separate tent is ideal but if unavailable the workspace may be incorporated into the back of the equipment/supply tent. This will limit unnecessary traffic into the space reducing the risk of loss or damage to the artifacts. The workspace should never be part of the cook tent as this may contaminate food as well as being hazardous to the artifacts.

Dry artifacts

This is the easiest class of material to handle. Keep these artifacts dry. Make sure that they are stored separately, away from damp or wet material, and provide them with adequate shelter from the elements. Dry artifacts also require a protective layer around them to prevent damage from abrasion from other artifacts or from shipping containers. A polyfoam bag or single layer of thin polyethylene foam sealed with masking tape and marked with the Borden catalogue number is sufficient.

Damp artifacts

Synthetic and natural materials are available for packing damp artifacts in the field.

Only inert materials should be used for packing artifacts. Materials such as acid-free tissue, paper towels, or toilet tissue should not be used as field wrappings. Tissue will adhere and harden on the surface if it is used to wrap a wet or damp object and allowed to dry. Damp paper products will also grow mould.

Damp artifacts can be sealed in reclosable polyethylene bags. These may be the original excavation bags. A good quality polyethylene bag, at least 2 mil thick, should be used to prevent drying. The bagged artifact can then be slipped into a protective polyfoam bag or wrapped in a layer of thin polyethylene foam and sealed with masking tape. The package should be marked with the Borden catalogue number and material type (e.g. wood, skin, baleen) using a black waterproof marker.

Synthetic Packing materials

The packaged artifacts can then be placed in a cooler or strong plastic bin and covered with damp toweling to prevent drying during storage and transportation. The toweling should be rinsed and re-wet daily to prevent it from growing mould or drying.

Sphagnum moss grows on many northern sites. At low temperatures, this moss is effective in inhibiting biological growth (e.g. mould) over the short-term. It is a natural cushioning material and protects the artifact from physical damage during transport. The artifact is wrapped with a thick covering of dampened moss and sealed with plastic wrap. Polyvinylidene chloride film (Saran Wrap) is the least permeable plastic wrapping available.

Sphagnum Moss

There is evidence that sphagnum moss creates an acidic environment and contains bacteria and fungi that would be harmful to wood over the long term. Its advantages of natural availability on northern sites and cushioning properties outweigh the disadvantages in the short term. Artifacts made from iron should never be packed in sphagnum moss.

Aluminum foil is a good outer wrapping for the plastic-wrapped artifacts. It further reduces moisture loss from the artifact and may lessen biological activity by excluding light and oxygen.

Packing with sphagnum moss provides more protection from mould growth and drying during storage and transportation than synthetic materials however it is more time consuming to use and is not available at all sites.

a) This delaminating and fragile bark net float is supported by a small piece of coroplast, kept wet and cushioned by a layer of sphagnum moss, and wrapped in gauze to prevent further splitting.

b) The bark net float is completely covered in wet moss and wrapped in plastic wrap to prevent drying.

c) The plastic wrap is taped lightly yet firmly with a final wrap of aluminum foil, securely taped with the identification number (s), object type and material type clearly visible.

Wet and waterlogged artifacts

Conservator examining waterlogged artifacts in a treatment tank .

If found in large numbers, as on historic or underwater sites, wet and waterlogged artifacts are best held on site in tanks of fresh water. Constantly running water or frequent changes of water at regular intervals will work well. On large sites where quantities of different materials are recovered (eg. iron, wood, etc.) it is recommended that separate tanks be used for each material. Temporary holding tanks can be improvised by lining plywood boxes with thick (6mil) polyethylene sheeting. The use of biocides in holding solutions is generally not necessary and is not recommended. For large marine sites, an on-site conservator may be necessary to deal with the waterlogged artifacts.

In many cases, field holding of artifacts in water tanks is impractical. It is necessary for marine and underwater sites where artifacts are truly waterlogged and have been contaminated with chlorides. On wet/frozen sites, organic materials may not be fully waterlogged so that placing them in tanks may increase the moisture content and cause more complete waterlogging. Most of these artifacts from wet frozen sites can be wrapped, as for damp artifacts and kept in low temperature storage.

Low temperature holding

Low temperatures will significantly reduce both biological and chemical deterioration. In many northern field situations, cold storage is possible and recommended. This can be achieved using an insulated camping cooler or crate lined with 5 cm of expanded polystyrene sheet insulation as a field refrigerator.

Cooler in cold storage pit dug into permafrost .

Coolers are used to keep artifacts cool during storage and for shipment of artifacts.

A low temperature can be maintained in the cooler or crate by using freezer packs that can be refrozen in snow banks or cooled in melt-water and changed regularly. Reclosable polyethylene bags filled with ice or snow can be used as an alternative. If the cooler or crate is waterproof, embedding the container directly in the snow bank or a hole dug into the permafrost can create low temperature storage.

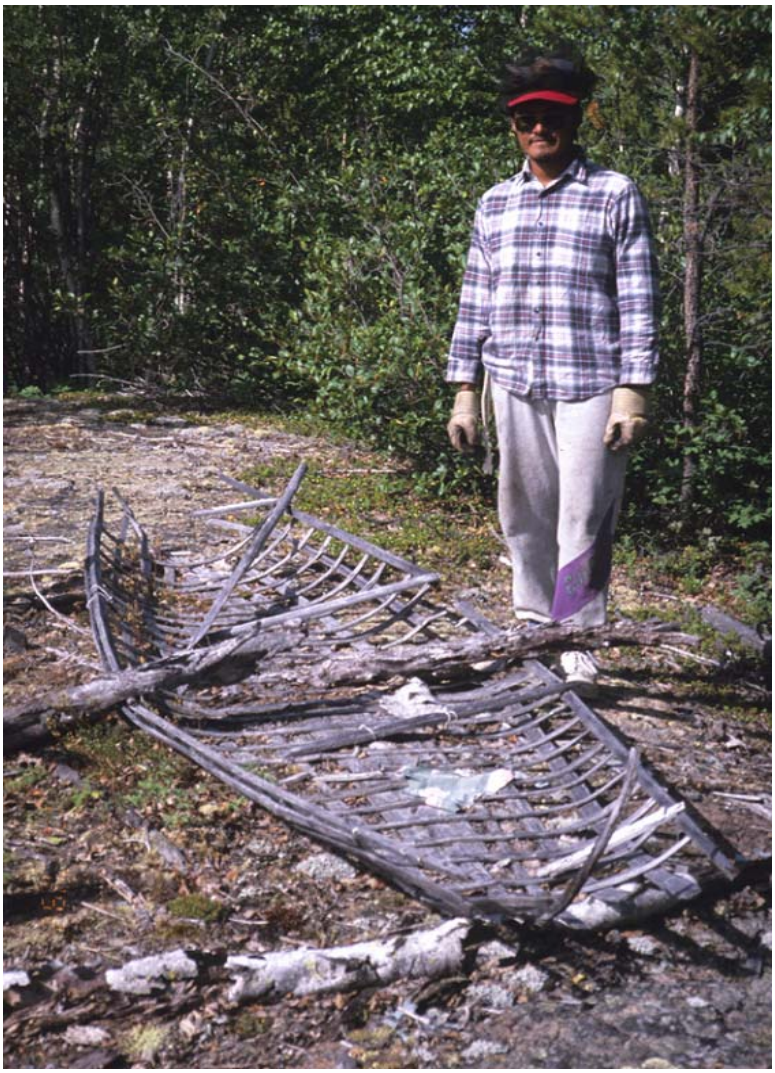
Fragile artifacts

To provide adequate physical support for fragile artifacts, it may be necessary to improvise custom supports. Corrugated plastic (e.g. Coroplast) is very useful for this purpose. It is easily cut, formed, and taped to make light, custom supports and containers for fragile artifacts.

Corrugated plastic, 4 ml thick, is generally strong enough for most supports and is easily cut. If large, heavy artifacts are expected a thicker corrugated plastic can be used. Corrugated plastic supports can be padded with polyethylene foam or sphagnum moss to prevent flattening of soft objects. Artifacts can be secured to the support with stretch medical bandages or plastic wrap (Saran). Typically large, flat fragments of skin or fur; long, thin wood or bone artifacts; feathers; thin metal objects particularly if heavily corroded; textiles; baleen, sinew, and underfired, crumbling pottery may need corrugated plastic supports.

Oversize artifacts

If oversized artifacts are expected, special provisions will need to be taken to bring in larger supports and packing cases as well as extra amounts of packing materials in order to adequately cope with these items. Containers and packing materials usually brought into the field are geared for small to mid-sized artifacts. If strong enough, large textile fragments can be folded or rolled onto a cylindrical piece of foam with a separating layer of polyethylene sheeting or polyethylene foam.



Field technician stands beside a cedar/canvas canoe frame near the Camsell River.

Lithics

Lithics should be packed in a separate container in their original excavation bags. Sufficient extra cushioning material should be added to prevent abrasion or breakage from movement. Extremely heavy stone artifacts should be padded with polyethylene foam or bubble pack and packed separately from smaller lithics. Lithics do not generally require treatment by a conservator with the exception of degraded soapstone or broken lithics requiring repair. These artifacts can be separated out and packed with the organic materials which will be sent to the conservator.

If desired, lithics can be cleaned in water with a soft brush and air-dried.

Lithic scatter near Daring Lake on the barrenlands.

Transportation

Logistics and cost will determine transport methods. When planning logistics, a little thought given to containers can facilitate the safe return of artifacts. Containers used for shipping food and other consumable items to the field can be re-used for shipping artifacts from the field.

Containers should be light, watertight, and insulated. Coolers are practical. Other smaller containers to take to the field are sealable polyethylene refrigerator containers in assorted sizes. For large-scale, wet excavations, heavy-duty polyethylene tubs can be used for transport.

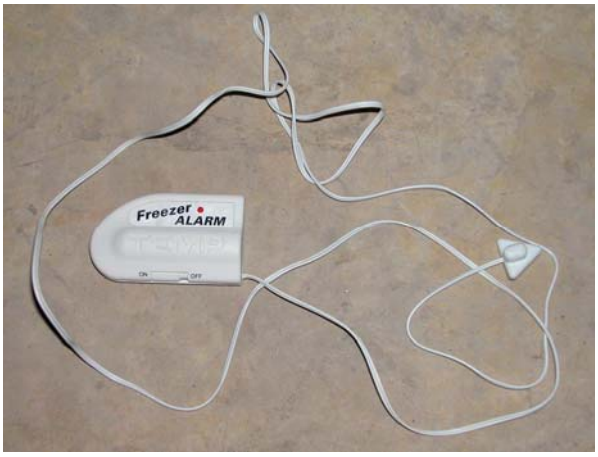
Fragile artifacts should be packed in individual containers within coolers for transport. The coolers or plastic bins should be padded with polyethylene foam or bubble pack. Heavier artifacts should be place near the bottom with lighter artifacts on top. There should be enough cushioning material in every crate to prevent direct contact between the artifacts themselves, and between the artifacts and the sides of the crate. Sufficient packing material should be included in the crate to prevent any movement of artifacts within the crate. For sites producing large quantities of artifacts, the artifacts can be separated by material (eg. wood, skin, bone/antler/ivory) and packed in individual coolers for transport. It is important not to over pack containers.

Shipping containers should be secured with mailing straps or heavy tape and labeled clearly. The label should include the address, box number/total box number (e.g. 1 of 7), contents and a fragile label. A list of contents with pertinent site information should also be included with the shipment.

HEALTH HAZARDS

Some organic materials recovered from northern sites may present health hazards and consequently require care in handling. Two items identified are food tins and skin items. Botulism has been identified in sealskins. This subject has not been well studied but the information available now indicates that the principal risk is from accidental ingestion of even minute amounts of pathogenic material, as can be transferred from fingers (or cigarettes) to mouth. Infection may also result from contact of pathogenic material with open cuts or abrasions. More common are mild skin rashes and eczema from handling artifacts.

Good hygiene is required in handling these artifacts. Either kitchen or disposable gloves can be used. Hands should be thoroughly washed before preparing or eating food. Food tins and frozen skin artifacts should be sealed in reclosable polyethylene bags, plastic wrap or polyethylene sheeting and taped shortly after excavation. The best field holding is at as low a temperature as possible; upon return to a laboratory, frozen storage is essential. A damp environment at ambient temperatures provides a medium in these objects in which microorganisms thrive and multiply rapidly. This will increase the health risk to people at the same time as rapidly degrading the objects.



a) Chest freezer with freezer alarm

b) Chest freezer with food tins containing hazardous contents from Dealy Island (risk of botulism)

ON-SITE CONSERVATOR

Large sites where huge quantities of organic, metals or complex materials will be excavated would benefit from the presence of an on-site conservator. Wet or damp materials must be dealt with quickly to prevent damage caused by drying, physical damage or mould. Underwater marine sites with their combination of waterlogged materials and salt problems generally benefit from a conservator on the site.

Onsite conservator documenting artifacts prior to treatment.

A conservator can excavate fragile materials using block lifts. Artifacts can be assessed and condition reports prepared expediting treatment when back in the conservation laboratory. Bone, antler, ivory and baleen can be cleaned and slow air-dried. If the field excavation is too short, treatment can be completed in the laboratory. If temperature permits, degraded bone, antler and ivory can be consolidated in the field. The conservator can clean and dry uncontaminated ceramics, pottery and metals. Salts can be removed from contaminated metals and ceramics. Lithics can be separated, cleaned and packed. The remaining artifacts can be properly packed, sorted, prepared for shipping and a packing list compiled. Conservators can provide support and guidance for dealing with faunal material.

A field conservation unit requires a safe work area where artifacts can be examined, packed, treated and stored. Equipment would include a work surface or table, chair, drying racks, water container and plastic wash bins. A conservator would bring condition/treatment forms and additional supplies such as specialized small tools, consolidants, adhesives and materials for block lifts. A conservator may supply the necessary inert packing materials.

Consolidated and unconsolidated artifacts in various stages of drying in field lab.

Depending on the excavation a conservator may be brought in after the camp is established and excavation has begun. This is dependant on the size and length of the field season and the cost and logistics of transportation.

The extent of conservation treatments, which can be accomplished in a northern field camp, is generally limited by the duration of field season, facilities (space, running water, heat, lighting), equipment (tables, microscopes, solvents) and time. For field seasons of a short duration even air-drying of bone-like material may not be completed. Some adhesives and consolidants will not set in cool temperatures. Solvents are deemed hazardous materials and cannot be flown into sites. The lack of running water and good lighting can make cleaning time consuming.

TEMPORARY LABORATORY HOLDING

Conservation lab with specialized equipment: fridge, fume hood and freeze dryer.

Ideally artifacts should be shipped immediately to the conservator for assessment and treatment after the field season. If the archaeologist needs to study the material prior to conservation this period should be kept to a minimum. The length of this study period should be discussed with the conservator. Holding excavated materials prior to conservation treatment requires considerable monitoring, as this is a time when rapid deterioration is a constant possibility. If damp or wet artifacts are unwrapped for study they should be kept damp or wet by misting with water.

Refrigerated storage (4 C) is generally recommended for damp artifacts but requires regular monitoring to control mould growth. This is difficult to maintain over extended periods of time. Frozen storage is recommended for skins and textiles and also requires regular monitoring. Freezers are subject to breakdown and power fluctuations with disastrous results. Alarms can be purchased which will sound if a freezer's power supply is interrupted or if the temperature rises above a set point. These are essential for freezers holding artifacts and especially for those holding potentially dangerous material such as frozen skins or food tins.

CONSERVATION TREATMENT

Before treatment 2,290 year old kamik from Lagoon site, Banks Island, NWT

After treatment

The archaeologist should arrange with the conservator when the excavated material will be delivered. As mentioned earlier treatment of wet or damp material should begin as soon as possible after excavation – before the artifacts begin to dry or grow mould. This can conflict with the archaeologist's need to study and document the artifacts. Uncontrolled drying prior to treatment however may cause the artifacts to suffer irreversible damage such as shrinkage, compression, cracking or delaminating. Mould growth makes treatment more difficult and once infected may cause repeated outbreaks of mould when the artifact is in the depository

Many treatments for artifacts recovered from northern sites are fairly simple and can be accomplished in a short time. The treatment for wet or damp wood artifacts however is very time-consuming. Wood is immersed in a bulking solution, polyethylene glycol, for a period of 3 months to several years depending on the species of wood and the size of the artifact. Other artifacts require extensive handling during cleaning or restoration which is time-consuming such as: layered, fatty or three-dimensional skin or leather, salt-contaminated corroded metal, bowls, baskets, cordage, layered or folded textiles or paper; and composite artifacts.

The archaeologist should discuss with the conservator any analysis, which the artifacts will undergo. Conservation treatments may interfere with the analysis. Ideally all sampling should be done before the artifacts are sent for conservation. The conservator may also need to perform analysis in order to determine the correct treatment. This analysis is predominantly material identification (type of metal, wood species, skin species, fiber identification). If destructive sampling is to be done then permission must be granted by the PWNHC Collections program.

An examination report summarizing the condition of the artifacts and the treatment proposal must be sent to the Collections Section of the PWNHC for approval by the conservator before undertaking any conservation treatments. When treatment is completed a copy of the treatment record must be provided to PWNHC Collections program. The treatment record should include the permit number, site name, year and Borden catalogue number. It should be determined if the conservator will submit the reports directly to the PWNHC or through the archaeologist.

For packing guidelines for the PWNHC see *Instructions For Returning Archaeological Collections in the NWT permit guidlines.*

Mobile compact storage at the Prince of Wales Northern Heritage Centre repository.

Artifact storage packing.

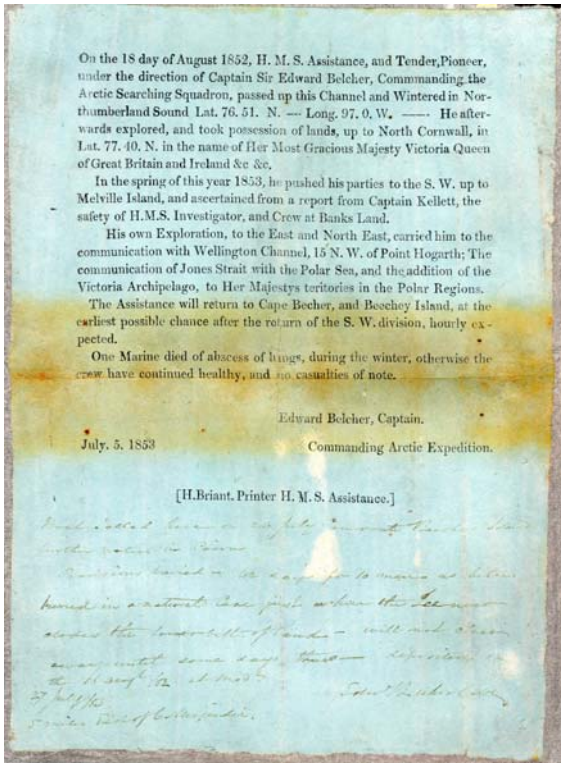
CAIRN DOCUMENTS

Documents were deposited in cairns by explorers to leave information for other explorers and, on many occasions, to establish the territorial rights of the British (to 1880) or Canadian governments over the Arctic Islands. These documents have a legal as well as an historical importance. A Class 2 Archaeological Permit is required to explore any cairn older than fifty years.

Cairn on Cape Majendie (Devon Island), Nunavut 1975.

Detail: Canister in cairn containing rolled document

For cairns less than 50 years old a careful record of all such finds must be kept and forwarded with the original documents to the appropriate Archives (not to a museum or university). All finds in the Northwest Territories should be reported to:



On the 18 day of August 1852, H. M. S. Assistance, and Tender, Pioneer, under the direction of Captain Sir Edward Belcher, Commmanding the Arctic Searching Squadron, passed up this Channel and Wintered in Northumberland Sound Lat. 76. 51. N. — Long. 97. 0. W. —— He afterwards explored, and took possession of lands, up to North Cornwall, in Lat. 77. 40. N. in the name of Her Most Gracious Majesty Victoria Queen of Great Britain and Ireland &c &c.

In the spring of this year 1853, he pushed his parties to the S. W. up to Melville Island, and ascertained from a report from Captain Kellett, the safety of H.M.S. Investigator, and Crew at Banks Land.

His own Exploration, to the East and North East, carried him to the communication with Wellington Channel, 15 N. W. of Point Hogarth; The communication of Jones Strait with the Polar Sea, and the addition of the Victoria Archipelago, to Her Majestys teritories in the Polar Regions.

The Assistance will return to Cape Becher, and Beechey Island, at the earliest possible chance after the return of the S. W. division, hourly expected.

One Marine died of abscess of lungs, during the winter, otherwise the crew have continued healthy, and no casualties of note.

Edward Belcher, Captain.

July. 5. 1853 Commanding Arctic Expedition.

[H.Briant. Printer H. M. S. Assistance.]

Treated Document: left by Captain Edward Belcher 1853 from canister in cairn at Cape Majendie, Nunavut.

Territorial Archivist
Prince of Wales Northern Heritage Centre
Government of the Northwest Territories
Yellowknife, NT
X1A 2L9
(867) 873-7657
Richard_Valpy@gov.nt.ca

PACKING LIST FOR ARCHAEOLOGISTS

An archaeologist will find the following supplies useful. A kit can be packed in a cooler(s). The material listed below will satisfy basic and immediate packing, storage and transportation needs for artifacts from a northern site with a mixed assemblage. It can be adapted to each specific site as necessary.

Containers
insulated coolers
plastic bins and boxes with lids, in assorted sizes
plastic vials

Packing Materials
reclosable polyethylene bags (Ziploc)
thin polyethylene foam (Microfoam)
polyfoam bags
corrugated plastic board (Coroplast)
polyethylene sheeting
polyethylene tubing
bubble pack
plastic wrap (Saran)
garbage bags
glass filament tape
masking tape
2" clear shipping tape
stretchy gauze bandages
terry toweling
aluminum foil (for spaghnum packing)
mailing straps with fasteners

Tools and Equipment
scissors
utility knife (for cutting polyethylene boards)
ruler
magnet
spray bottle (with a wide bottom to prevent tipping).
black, waterproof markers (Sharpies)
freezer packs
gloves, latex or rubber

To save space when transporting the corrugated plastic into the field the boards can be cut to the size of the cooler lid, interleaved with polyethylene foam cut to the same size and strapped to the lid of the cooler with mailing straps.

If sphagnum-packing methods are to be used then the polyfoam bags and the terry toweling can be eliminated and extra rolls of plastic wrap, aluminum foil and masking tape should be added.

MATERIALS FOR EXCAVATING FRAGILE MATERIALS

The following is a list of items that would be useful in a conservation field kit.

Excavation from Permafrost
black garbage bags and/or black plastic tarp
spray bottle
gloves
sponges
thermos
pin chuck
large syringe
bucket
*will also need a camp stove, fuel and cooking pot for heating water

Blocklifts
bandages
cheesecloth
aluminum foil
spray bottle

Wax Blocklifts
All of the material listed for blocklifts plus,
artists' spatula or knife
aluminum foil container or tin can (for melting wax)
paraffin wax
*will also need camp stove, fuel and cooking pot for heating water

PACKING MATERIALS FOR ARTIFACTS

Packing materials are chosen to protect artifacts from environmental fluctuations, abrasion and other physical damage. Packing materials must be made from inert, stable plastics (free of polyvinyl chlorides PVC).

Reclosable Polyethylene bags (Ziploc)
-come in a variety of sizes
-small ones tend to be more useful
-stable, good moisture retention
-buy thicker bags (2 mil, 4 mil)
-avoid very thin sandwich bags as they are too moisture permeable
-thick (double track) closures are easier to seal when wet or dirty
-available from packaging suppliers
-cost $0.03-0.10/bag

Polyethylene foam (Microfoam or Ethafoam)
-white, stable
-comes in rolls of varying thicknesses and textures
-only thinner foams useful for wrapping
-good for cushioning
-available from packaging suppliers
-cost/roll is $90.00 (24" x 175', 1/8" thick)

Polyfoam bags
-white, stable, lightweight
-various sizes, match to size of ziplock bags
-good for cushioning
-available from packaging suppliers
-cost $0.10-0.40 each, depending on size

Corrugated plastic board (Coroplast)
-like corrugated cardboard, but made from polypropylene co-polymer
-light, floats in wet storage
-good support for flat or fragile pieces
-board can be re-used
-thicker boards available for heavy artifacts
-available from hardware and building supply
-chemically stable
-cost is $10-15/ 4' x 8' sheet, 4 ml

Polyethylene sheeting
-water resistant
-transparent
-available in various thicknesses
 from hardware stores
-cost inexpensive

Polyethylene tubing
-useful for long, thin artifacts
-various widths
-only sold in large quantities so may be considered optional for purchase
-available from shipping supply companies
-cost/roll $166 (10” x 1100’, 4 mil)

Bubble pack
-polyethylene sheets with air pockets
-bubbles break easily
-available in a range of bubble sizes, but small bubbles are more versatile
-available from shipping (large quantities), office supply or post office (small quantities).
-Make sure it is free of PVC and never comes into direct contact with an artifact.
-cost/roll is $70 (24” x 155’, 3/16” bubbles), $55 (24” x 100’, 5/16”)

Cotton/nylon gauze bandages
-stretchy bandages in a variety of widths
-short-term stability, cotton will degrade in wet solutions
-available from pharmacies, medical suppliers
-cost is $1-4/roll, depending on width.

Terry toweling (white)
-for covering large artifacts and keeping surfaces wet
-available in rolls from fabric stores
-cost $5-7/yd

Freezer containers
-polyethylene containers with tight fitting lids
-available in a variety of sizes
-available in grocery, department and hardware stores
-cost is $1.00 and up

Polyethylene vials
-available in a variety of shapes, sizes and different snap closures
-useful for storing or shipping small artifacts, either wet or dry
-available at scientific suppliers and pharmacies

Polyethylene tubs
-available in a variety of shapes and sizes
-heavy duty for wet artifact storage
-with or without wheels
-available from plastic suppliers
-cost from $70- $500

*all prices 2005

SUPPLIERS

Shipping Suppliers

Reclosable polyethylene bags (Ziploc), bubble pack, polyfoam bags, polyethylene foam, polyethylene tubing)

Chiswick
P.O. Box 603
Midland, ON
L4R 4L3

Tel: 1-888-225-8708
Fax: 1-800-526-0066
www.chiswick.com

Uline
2105 S. Lakeside Dr.
Waukegan, Il
USA 60085

Tel: 1-800-958-5463
Fax: 1-800-295-5571
www.uline.ca

Instabox
Tel: Edmonton: 1-800-661-9949
Tel: Calgary: 1-800-482-6173
Tel: Vancouver: 1-888-543-1113
www.instabox.com

Plastic Suppliers

(heavy-duty polyethylene Tubs)

Bonar Plastics
7240 Woodbine Avenue
Markham, ON
L3R 1A4
Tel: (416) 475-6980
www.bonarplastics.com

Canus Plastics
300 Lisgar Street
Ottawa, ON
K2P 0E2
Tel: (613) 232-2657
www.canusplastics.com

THE ROLE OF THE CONSERVATOR

All professional actions of the conservator are governed by a respect for the physical, historic and aesthetic integrity of the object.

A conservator is a professional with extensive training who has a thorough understanding of the composition of cultural objects, how they respond to their environment, and the processes that contribute to their deterioration. Some conservators work for public agencies i.e. museums. Others deal directly with private clients. Their task is the same: to ensure the long-term preservation of art and artifacts.

The conservator's first task is to examine objects in order to assess their present condition and make recommendations for their care and treatment. The conservator recommends, carries out and monitors procedures that will ensure the long-term preservation of objects. These include safe handling, transportation, display and storage.

The conservator cleans, consolidates and repairs objects where necessary. In order that an object may be understood and appreciated, the conservator may replace what has been lost with new materials. In carrying out restoration, however, the conservator observes strict guidelines: it must not involve damage, destruction or removal of any part of the original object and the compensatory material must be fully removable [1]1.

FINDING A CONSERVATOR

In addition to the conservation agencies identified below, there are freelance conservators working in Canada. The conservation staff at the provincial or territorial museums can provide the names of qualified conservators.

Prince of Wales Northern Heritage Centre
Government of the Northwest Territories
P.O. Box 1320
Yellowknife, NWT
XlA 2L9

Tel: 1-867-873-7664
Fax: 1-867-873-0205
Rosalie_Scott@gov.nt.ca
http://www.pwnhc.learnnet.nt.ca

Provides: advice and referrals upon request.

Canadian Conservation Institute
1030 Innes Road
Ottawa, ON
K1A 0M5

Tel./tél: 1-613-998-3721 (Press 7 for Client Services)
Fax/téléc: 1-613-998-4721
cci-icc_services@pch.gc.ca
http://www.cci-icc.gc.ca (Contact Client Services)

Provides advice, training, research and treatment services.

[1] Summarized from the AIC Code of Ethics/Guidelines for Practice. http://aic.stanford.edu/about/coredocs/coe/index.html

Canadian Association of Professional Conservators (CAPC)
c/o Canadian Museums Association,
280 Metcalfe Street, Suite 400
Ottawa, Ontario
K2P IR7
http://www.capc-acrp.ca

The Canadian Association of Professional Conservators (CAPC) is a non-profit association dedicated to the accreditation of professional conservators and the maintenance of high standards in conservation of art and cultural property in Canada. Their web site lists private conservators and their specialties.

SELECTED REFERENCES

Cronyn, J.M. **The Elements of Archaeological Conservation.** Routledge: London, 1990.

Leigh, David, David Watkinson and Virginia Neal. **First Aid for Finds: Practical Guide for Archaeologists.** UKIC, Archaeology Section: London, 1998.

Pearson, Colin, ed. **Conservation of Marine Archaeological Objects.** Butterworth: London,1987.

Robinson, Wendy. **First Aid for Underwater Finds**. Archetype Publications and the Nautical Archeology Society: London, 1998.

Sease, Catherine. **A Conservation Manual for the Field Archaeologist**, Archaeological Research Tools, Vol. 4, Institute of Archaeology, University of California: Los Angeles, 1988.

CCI Notes. Canadian Conservation Institute: Ottawa, 2002
4/1 Identifying Archaeological Metal,
4/2 Vacuum Freeze-drying Archaeological Artifacts
4/3 Conservation of Wet Faunal Remains: Bone, Antler and Ivory

Websites:

Conserve-O-gram. National Parks Service.
http://www.cr.nps.gov/museum/publications/conserveogram.pdf

1/4 Use of Acryloid B-72 Lacquer for Labeling Museum Objects
6/1 First Aid for Wet-Site Objects
6/2 Desalinization: Passive Alkaline Soak
6/3 Testing for Chlorides with Silver Nitrate
6/4 Making Percent Solutions of Chemicals
6/5 Soluble Salts and Deterioration of Archeological Materials
6/6 Long-Term Effects of Acid-Cleaning Archeological Ceramics

Cost Estimates

Archaeologists are able to access conservation services through institutions (see Finding a Conservator). The following estimates may assist archaeologists when calculating budget estimates for hiring private conservators. This may also be helpful in time estimates for treatments.

Treatment Time Estimates by Material & Object Type

Material type: Organic artifacts	**Task**	**Number of objects**	**Estimated Time (hours) per object**	**Examination condition & treatment report documentation**	**Total time per object**	**Hourly rate**	**Total cost per object**
Small Wooden objects, waterlogged or dry Large wooden objects require an increase in examination, cleaning, impregnation, and freeze-drying time. The time required increases geometrically with the size of the object	**If wet:** Clean, PEG Impregnation Freeze drying Assemble if necessary Mount Total **treatment** time per object **If dry:** Brushing consolidation Assemble if necessary Mount Wood species ID & other special analyses as required		2-20 2-10	3 3 1-2	6-25 5-17		
Small Leather / rawhide, semi tanned skin object, waterlogged or dry Large leather objects require an increase in examination, cleaning, impregnation, and freeze-drying time. The time required increases geometrically with the size of the object.	**Leather, rawhide, semi tanned skin** **Wet:** Support if needed Clean Degrease Impregnate with PEG 400 Freeze dry **Leather, rawhide semi tanned skin,** **Dry:** Support if needed Clean Surface coatings as needed		1-8 1-2	3	2-9 2-3		
Small textile object waterlogged or dry Large textile objects require an increase in examination, cleaning, impregnation, and freeze-drying time. The time required increases geometrically with the size of the object.	**Textiles, wet:** Support as needed Clean Treat with consolidant Freeze dry Create mount Textiles, dry Support as needed Clean Mount		1-8 1 - 2	3 3	4-11 4-5		

Estimates are based on previous experience and should be used for planning purposes only. Specific artifacts may require more or less time than indicated, depending on individual differences such as degree of degradation, object size, moisture content, etc. Objects that can be treated in bulk, i.e., PEG treatment of wood may be priced at a bulk rate, not the individual times shown below.

"**Treatment**" = hands on time by staff person. Packing and shipment costs are not included in the calculations.

Rates for Conservation Services: $60 per hour (estimate)

Material type: Organic artifacts	Task	Number of objects	Estimated Time (hours) per object	Examination condition & treatment report documentation	Total time per object	Hourly rate	Total cost per object
Bone /ivory / tooth / horn/ antler/ baleen, waterlogged or dry	**Treatment** **Dry** Gently dry brush Consolidate as necessary Mount if needed **Wet or damp** Wash gently Controlled drying Coat/consolidate if needed		1-3 1-4	3 3	4-6 4-7		
Amber, waterlogged or dry	**Treatment** **Dry** Gently dry brush Consolidate as necessary Mount if needed **Wet or damp** Wash gently Controlled drying Coat/consolidate if needed		1-3 1-4	3 3	4-6 4-7		
Composite Object (typically waterlogged metal or wood with other organic or inorganic components) Large composite objects require an increase in examination, cleaning, impregnation, and freeze-drying time. The time required increases geometrically with the size of the object.	Wood species ID, iron chloride content & other special analyses as required **If wet:** Clean, remove stains & concretion Iron desalination PEG Impregnation of wood Freeze drying Assemble if necessary Mount **If dry:** Brushing & cleaning, consolidation Assemble if necessary Mount		1-2 10–50	 4	 15-56		

Material type: Inorganic artifacts	Task	Number of objects	Estimated Time (hours) per object	Examination condition & treatment report documentation	Total time per object	Hourly rate	Total cost per object
Small Iron objects – (Nails, hardware, etc.):	**Treatment** Cleaning, desalination, protective coatings.		3-4	3	6-7		
Medium to large iron artifacts (stove, cannonball, kettle, etc):			16-20	5	21-25		
Large to Extra-large iron artifacts (cannon, anchor, etc):	Remove superficial corrosion. Paint strippers, walnut hell abrasive		48-72	10			
	Mechanically remove burial or marine encrustations		40-100				
	Desalinization by electrolytic reduction or caustic soak. Sodium hydroxide, testing solutions		1 hour/week for 1-4 years				
	Apply protective coating. Tannic acid, acrylic resins, microcrystalline wax		24				
	Packing and preparation for transportation.		5				
Small Non-Ferrous (copper, lead, white metal) objects: (coins, buckles, household items)	Cleaning and protective coatings.		1-6	3	4-7		
Ceramcs and Stone	**Treatment:** per group of sherds in batch lot. Consolidation of unstable surface or body		1-2	3	4-5		
Glass, Pottery and Ceramics – Reconstruction of Vessels:	**Treatment** 1. Consolidation of unstable body or surface 2. Reconstruction 3. Fills, in paint		1 - 2 1 - 8 1 - 8	3	6-21		

[2]

[2] Adapted from the Maryland Archaeological Conservation Laboratory, Conservation Program, Rates for Service 2006. http://www.jefpat.org/forms/Rates%20for%20services.pdf

Research Facility- Artifact Care Guidelines

Standard Practices
There is no smoking or food and beverage consumption in areas containing collections.

Artifacts are handled as little as possible. Handling is done with clean cotton or latex gloves. Artifacts are supported when handled, and are not picked up by appendages or projecting parts.

Unnecessary movement of artifacts is avoided. A tray or cart is used to move artifacts, rather than hand-carrying.

Artifacts are examined over a clean, padded surface.

Pencils are used when documenting artifacts.

Artifacts are not left unattended and uncovered on a counter or table. They are placed in a padded box or tray, and covered to protect them from dirt and light.

Artifacts are not altered in any way, such as cleaning or repair, without prior approval. *See Conservation Manual for Northern Archaeologists* on www.pwnhc.ca.

No destructive analysis is conducted without prior approval from the Curator of Collection, PWMHC.

Artifacts are not left with or loaned to a third party, or transported off-premises to homes or other locations, without prior approval from the Curator of Collections, PWNHC.

Work & Storage Areas
Artifacts are stored in a secure location, such as a locked cabinet or lab.

Key access to work and storage areas is controlled.

Work and storage areas are kept clean.

Storage areas are used only for storing artifacts not, for example, storing office or cleaning supplies.
Artifacts are not stored in attics or basements.

Work and storage areas are monitored for pest infestation and checked for leaks and risk of flood.

Lights are turned off in work and storage areas unless needed.

There is a fire suppression system in work and storage areas, and researchers know how to use fire suppression equipment.

Environment
Temperature should be kept in a normal range for dry treated artifacts. Frequent changes in relative humidity cause more damage than conditions that are too high or too low. Relative humidity should be monitored. Hygrometers are available at hardware stores.

Proper ventilation ensures air movement to discourage mold and mildew growth. This can happen in moist storage conditions.

Artifacts are kept away from direct sunlight, ultraviolet light, spotlights, other hot light sources, ventilation or heat ducts, exterior walls, and windows.

Housing & Padding Materials
Artifacts are kept in metal or sealed wooden cabinets or shelves. Wood is sealed with a polyurethane or acrylic coating to avoid damage from acidic vapours.

Shelves, drawers and containers are lined with an acid-free material. Artifacts are supported in their most stable position to prevent stress, rolling, and bumping against each other.

Storage and padding materials are inert and acid-free, such as archival boxes, plastic bins with lids, polyethylene foam ('microfoam'), washed white cotton, linen or muslin, and Ziploc bags. Polyvinyl chloride-free bubble pack is fine for short-term use.