Taking Care of Wet Archaeological Artifacts

Although few readers actually do wet archaeology, this article, adapted from the paper that Paul Storch delivered at the shipwrecks conference in Duluth in October, will help even us general readers appreciate the value and methods of this still-developing field of historical inquiry. And note the central role that ethical principles play in this field of work. Paul Storch, Objects Conservator of the John and Martha Daniels Conservation Laboratory at the Minnesota Historical Society, has been on the staff at MHS since January 1991.

Archaeology at Freshwater Sites

by **Paul Storch**

Introduction

In this article I can only give a brief introduction to the conservation of artifact materials from freshwater archaeological sites. I say "freshwater" rather than "underwater," because there are significant differences between conservation of objects from a marine, or salt water, environment, and conservation of objects from a freshwater environment, such as Lake Superior and most Minnesota rivers. Treatments developed for marine sites may be unnecessary and uneconomical at best, and do irreversible damage at worst.

The field of archaeological conservation is evolving rapidly from its roots in classical restoration and chemistry into a specialized applied science; we need further development of methods specifically suited to freshwater sites and information exchange at conferences such as the shipwrecks conference.

Well pulley from Fort Snelling, ca 1820-30s; wrought iron is in direct contact with wood. The iron is heavily corroded and the wood is swelled. It is not possible to dismantle objects such as this to attempt to treat the components differently without destroying the object and its integrity.

Under the Water

The major types of materials found on most Great Lakes shipwrecks from the 19th through the late 20th centuries include inorganic (e.g. iron and brass) and organic materials. Most organic objects are made of wood, but often other organics, such as leather, and textile fibers, such as wool and cotton, are preserved.

The key concept to remember with archaeological materials, whether they are buried in the ground, submerged in the water, or buried in submerged sediments, is that these objects have equilibrated with their burial conditions. That is, deterioration has progressed to a certain point and then stopped, or the rate has drastically slowed down.

If the equilibrium conditions are maintained in the burial environment, then the materials will remain in a state of preservation. If something happens to disturb the equilibrium— such as archaeological excavation or a natural change, like a drastic drop in waterlevel—the materials will begin to reach equilibrium with the new conditions. This results in renewed deterioration, which in the case of metals can mean the formation of additional oxides, and for wood the loss of water and resultant shrinkage and cracking.

The logical extension of this concept in practical terms is that one must be prepared—with the proper methods and supplies—to re-create as closely as possible the equilibrium after excavation and removal from the burial environment. Failure to do this is the antithesis of ethical conservation practice, and inevitably leads to the loss of information at the least, and total loss of the object at the most.

Chemical considerations

Although freshwater does contain dissolved minerals, we do not have to contend with the large amount of chloride ions that are in sea water. Chlorine is particularly troublesome with metals such as iron and copper because of its strong negative charge, which gives it a strong attraction to positively

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charged metals. When combined with an electrolyte solution such as sea water, this strong attraction sets up galvanic electrical currents that lead to corrosion and metal loss.

The iron handle of this copper kettle has completely corroded, but has left the iron minerals from the corrosion products behind on the copper surfaces.

In freshwater, metals combine with oxygen and other dissolved anions (electrically charged particles) such as sulphates and phosphates. The biological activity in freshwater is different from that in seawater and there is no precipitation of the calcium carbonate that leads to the massive concretions that occur on marine objects. One corrosion problem that does occur with metals in freshwater is increased galvanic corrosion, which happens when two dissimilar metals are indirect contact. (See the picture of the copper kettle.) When copper and iron are in direct contact, the iron corrodes preferentially, becoming what is termed a sacrificial anode. This kettle is from an inland submerged riverine site, at Horsetail Falls of the Granite River, in the Gunflint Trail region of Minnesota.

Water-logged organic materials such as wood, leather, and other fibrous materials can be very fragile, while appearing to be in good condition. Do not be fooled by appearances! If allowed to dry out completely without special treatment, these objects will be destroyed with little hope for restoration. Valuable historical and archaeological information will be lost forever.

The conservation of water-logged organic materials requires extensive knowledge of chemistry and currently available practices, and often requires specialized equipment and supplies. Treatment is often slow, and can be expensive. It is for these reasons, and others, that it is best to leave these objects where they are. If that is not possible, then contact a qualified conservator to help with detailed recovery and conservation plans and specifications.

"Put it back"

An option that is somewhat akin to the conservation philosophy is the current "put it back" movement among well-meaning avocational and professional underwater archaeologists. Although it sounds simple and effective enough at first look, this is not necessarily the correct option in all cases.

Some Definitions

CONSERVATION is the profession that is devoted to the preservation of cultural property for the future. It includes examination, documentation, treatment, and preventive care, supported by research and education.

TREATMENT is defined as the deliberate alteration of the chemical and/or physical aspects of cultural property, aimed primarily at prolonging its existence and preserving as much inherent information as possible.

STABILIZATION denotes treatment procedures that are intended to maintain the integrity of cultural property and to minimize deterioriation.

RESTORATION denotes treatment procedures that are intended to return cultural property to a known or assumed state, often through the addition of non-original material(s).

A CONSERVATOR is a professional whose primary occupation is the practice of conservation and who, through specialized education, knowledge, training, and experience, formulates and implements all the activities of conservation in accordance with an ethical code such as, but not limited to, the AIC Code of Ethics and Guidelines for Practice.

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Particularly with organic objects, re-submerging them after they have dried or been treated can spell disaster. Water-logging them again will cause stresses in and between fibers and structures that have already been weakened first by the previous water-logging, then by the equilibration to the air. Treatments may have introduced chemicals into the materials that make them water-resistant and have changed their density. Metal objects will be less affected by putting them back into water, but there are still risks and

Trade axe head found in 1960 at Horsetail Falls with the nested kettles. The steel blade edge has annealed to a wrought iron body. Wrought iron and steel is stable in fresh water.

questions to be answered. These include: Is the object structurally stable? Will the increased pressure affect it adversely? Is the environment to which it will be returning the same over all as when the object came out, or have certain parameters changed?

It would help answer the questions we have about putting objects back on sites if we had a body of data on objects that have been put back so far. Written and photographic documentation of the bjects, with as much recovery and treatment history as is possible, will help conservators assess and analyze the effects of resubmergence on objects.

This article may have raised more questions than it has answered. Wet and water-logged objects pose complicated problems, but the stories that they can tell us are invaluable historical resources. Cooperation among all interested and involved parties can go a long way in solving some of these problems.

General Guidelines for Conserving Objects Excavated from Freshwater Sites

- **Do not hesitate to ask for professional advice.** Contact the John and Martha Daniels Laboratory (JMD) at the Minnesota Historical Society or a professional conservator in your area; telephone, (612) 297-5774. The American Institute of Conservation (AIC) in Washington, D.C. has a computerized referral service that lists AIC members who consider themselves qualified in specialized fields; call (202) 452-9545.

- **Have a plan**. Anticipate what types of objects and materials will be brought up. Plan to have the funds, equipment and supplies necessary to properly store and stabilize the objects.

- **Know where the objects will end up** for long term storage and/or exhibit. Contact the repository, if known, for their guidelines for storage. Make adequate provisions for proper storage supports and materials.

- **Good archaeology is proactive.** Contact a conservator before proper object care becomes a major problem.

- **Provide adequate security for the objects,** especially if they are in outdoor holding tanks.

- **Take water samples and object materials to a conservator for testing,** if at all possible. This will help establish the condition parameters and help to design proper treatments. It is usually easier to send samples than the objects to an out-of-town conservator.

- **Keep wet materials wet.** Try to maintain the objects' environmental equilibria.

- **Monitor the water quality** in the holding tanks regularly for mold growth.

Note: Electrolysis is usually not necessary for metal stabilization. "Traditional" methods for treating marine objects are not always directly applicable to objects from other environments.