MANAGING ARCHEOLOGICAL COLLECTIONS 6. CURATION IN THE FIELD AND LAB

Field collection

Screening fill from a pitstructure excavation. *From the photograph collection of the Bureau of Land Management, Anasazi Heritage Center, Dolores, Colorado.*

Collections management in the field starts with implementing the field collecting and statistical sampling methods presented in the project research design. Many archeological projects yield classes of objects that are highly redundant (i.e., shell, fire-cracked rock, window glass, etc.) and/or do not fit into the research design (i.e., undiagnostic body sherds from a time period that is not the focus of research). These materials can occupy a lot of storage room at the repository, yet may or may not have research, interpretation, and/or heritage value. However, given the strong ethic in archeology to save everything for future research and interpretation, selective field collection and statistical sampling may constitute a good compromise if **carefully** conceived and executed.

Selective field collecting may or may not involve statistical sampling. For contract work, field collecting is often dictated by federal, state, tribal, or local requirements or policies (see Section III). There are some states and federal agencies, for example, that require a "no-collection" procedure during most survey projects. The Department of Defense, however, does not recommend such a practice for several cost-related reasons (Griset and Kodack 1999). These include the need for physical samples to perform laboratory analyses, the difficulties and costs in verifying field observations, and the difficulty in enforcing a "no collection policy" with the result that some collecting may occur and a statistical bias is created in the collections. Other states and federal agencies require selective collection of diagnostic objects, which may be designated historic or prehistoric, during survey.

Statistical sampling, which involves systematic collection of a certain percentage of a specific artifact class(es), may be appropriate for both contract work and research. The exact percentage of a designated artifact class to be collected may be stated in the research design if careful examination of similar collections from the area is used to determine the sampling strategy, and that strategy can be replicated.

On the other hand, the need for statistical sampling may be best resolved in the field during consultation between a specialist on a particular artifact class and the principal investigator. The specialist can advise on whether or not collecting a systematic sample is warranted and how best to do it. Close monitoring of the amounts and types of materials found as fieldwork progresses is essential in making a decision. It is generally best to do major sampling in the field or off-site laboratory after cleaning and basic assessment, as discussed in a later sub-section. In this case, no sampling should occur until the quantity and range of variation of the object class(es) is known. Unfortunately, there are currently no professional standards to aid archeologists in determining correct sample sizes. There are, however, several useful articles and books by archeologists on statistical sampling that may be helpful in this context (e.g., Baxter 1994; Nance 1994; Shennan 1997).

The collection of non-cultural materials can also impact the overall size and long-term care of collections, since they are often bulky and require a large amount of storage space. A strict sampling strategy should be followed for these materials in order to collect only enough samples as are actually needed to meet project goals. Processing non-cultural materials prior to packing a collection for submittal to a repository is another way to limit the volume of these materials in the collection. Processing can include running soils through flotation tanks.

It is important to keep sampling procedures consistent and well documented throughout a project, both in the field and the lab. Every effort should be made to record such information on long-lived media, such as archival quality paper. Unexpected discoveries at the site may necessitate changes in the collecting strategy and sampling plan. When changes are made they should be well documented and continue to support the research goals of the project.

Field conservation and preservation

In-situ or on-the-spot conservation of archeological materials can be an essential aspect of a field project and can significantly affect the long-term preservation of objects in the resulting collection. The conservation and preservation care that an object receives in the field may be the only care it ever receives. Similarly, all the records produced in the field, including field notes, maps, photographs, standardized

forms such as site forms, artifact catalogs, audio tapes, and a variety of digital data, must be created, managed, and handled with care in the field and lab.

Archeologists should consider and practice some basic principles and methods of conservation at all times. On a large site or one where there is likely to be a wide range of complex conservation needs, it is preferable to have a professional conservator on site.

Stabilizing a ceramic during lifting in the field. *Photograph courtesy of Jessica Johnson.*

Material Remains

An archeological object in the ground is in a state of equilibrium with, or is adapting to its surroundings when found (Sease 1994). When it is taken out of the ground and exposed to air and different temperature and humidity levels, that equilibrium is disturbed. The object immediately begins to react to the changes in ways that are both visible and invisible to the archeologist. Most often these changes are in the direction of object deterioration. Planning for conservation in the field is therefore essential for the long-term preservation of archeological objects through condition assessment and appropriate actions. When planning for field conservation needs, it is important to consider:

- The kinds of material remains anticipated;
- What types of conservation treatments may be needed in the field;
- Volume and kinds of archival quality storage materials that will be required to transport the collection from the field to the lab or repository;
- How the material remains can best be collected to facilitate their long-term preservation.

The type of soil in which objects lie can be used to anticipate the condition and conservation needs of the recovered objects. Below is a chart that outlines the general preservation of objects in some basic types of soil conditions. Alkaline soils have a pH above 7.0 and are most common in arid climates where evaporation exceeds precipitation. Acidic soils, with a pH below 7.0, usually occur in areas of high rainfall and low evaporation. They are also found in areas where there has been an incomplete breakdown of organic materials in an anaerobic environment (e.g., peatbog). Saline soils contain a preponderance of salt. They are usually found in areas that have been inundated by seawater, but can also be created by human objects and actions (e.g., deterioration of metal objects; concentration of waste matter or wood ash). Crystallization of the salt in the soil can occur in areas where evaporation exceeds precipitation.

Soil Type (adapted from Sease 1994)

	Acidic	Alkaline	Saline	Water-logged Acidic	Water-logged Alkaline	Desert	Arctic
Ceramics	R-calcar-eous fillers dissolve	P-basic structure affected	P	R	P	G-wind erosion possible	G
Lithics	G	G	P-soluble salts	P	P-insoluble salt encrus-tation	G-wind erosion possible	G
Glass & Glazes	R-alkali leaching	P-basic structure affected	P	R	P	G-wind erosion possible	G
Wall Plaster	P	G	P	P	P	G	G
Shell	P	G	P-soluble salts	P	P	G	G
Metals							
Iron	P-corrosion	G	P-corrosion	G	G	G	G

Copper Alloys	P-corrosion	G	P-corrosion	G	G	G	G
Lead	P	P	R	G	G	G	G
Silver	P	G	G-slight saline P-high saline	G	G	G	G
Organics							
Bone, Ivory, Antler	P	G	P-soluble salts	P	P	G	G
Wool, Leather, Hair	deter-ioration of protein	P	R-dehyd-ration	G	G	G	G
Wood, Cotton, Linen	P	P	R-dehyd-ration	G	G	G	G

G=good preservation
R=reasonable preservation
P=poor preservation

While the conservation needs of different classes of material remains differ, there are a few key principles that should be followed in the field to help ensure proper conservation of all materials:

1. Choice of excavation tools affect the materials and condition of an object. Determine the best tools that will inflict the least harm prior to field work.
2. A number of factors, such as water, temperature, humidity, and sunlight, affect the stability of an object in the ground during and directly after excavation.
3. Always immediately cover up an object or a group of objects that seem unstable. Contact a professional conservator for advice on *in situ* treatment and methods to remove the object(s).
4. Objects should be kept in bags or containers with like materials. Improper mixing can cause damage to some objects (e.g., placing bones or soft ceramics in containers with large and heavy lithics).

Field conservation measures can range from simple, common sense activities to complex procedures. The following are some general guidelines for conservation in the field. Remember that any procedures applied to an object should be reversible -- they can be later be removed without any damage to an object and its constituents. A professional conservator should always be consulted for complex treatments or if there are any questions about correct conservation procedures. In particular, be sure appropriate adhesives and consolidants are selected.

Handling

- Always assume an object is fragile. The true condition of an object may not be immediately apparent.
- Handle objects as little as possible. Do not pick up objects by handles, rims, or other attachments.
- Avoid bending flexible objects.

Lifting

- The method chosen to lift an object out of the ground depends on its strength, size, weight, composition, and condition, as well as the condition of the soil matrix.
- Assess the object condition, then record information, sketch and/or photograph the object before lifting it out of the ground.
- Remove as much dirt surrounding an object as possible before removal. Do not flick or pry an object out of the ground.

- Support the object at all times. A pedestal of dirt may be left underneath the object for support while continuing to excavate around it.
- Lifting an object out of the ground with its surrounding dirt (block lifting) is useful for extremely fragile objects. The appropriate method of block lifting depends on the size and weight of the object and on soil condition.


Physical support created for lifting delicate bone in the field. *Photograph courtesy of Jessica Johnson.*

Bandaging and Consolidation

- A bandage can be used to support fragile objects once they have been excavated. A bandage consists of gauze or cloth strips wrapped around an object in layers. Adding plaster or resin can strengthen the bandage, but do not glue or plaster a bandage directly to an object. It is critical to apply a separate layer between the bandage and object.
- Backing an object is useful for fragile, flat objects. Backing usually involves the application of a rigid bandage to the object. Some PVA emulsion, Acryloid B72, or plaster can be used for rigidity. Do not use Elmer's Glue-All®.
- Consolidants should only be used when absolutely necessary and in consultation with a professional conservator. The choice of consolidant will depend on the type and condition of the materials involved. Consolidation should not be attempted on waterlogged materials.
- Consolidants can be applied to fragile objects to join pieces and allow for lifting and handling. Consolidants should have: 1) good adhesive and cohesive properties; 2) achieve good penetration; 3) be durable, stable, and reversible; and 4) not alter the appearance of the material consolidated.
- Do not consolidate any material that will be used for dating or scientific analysis.
- Clean an object thoroughly before applying a consolidant. The most common consolidants are PVA emulsions or resins and Acryloid B72. Allow the consolidant to dry completely before lifting the object out of the ground.

Records

The records created in the field, as well as in the lab, are vulnerable to insects, vermin, mold, humidity, light, temperature changes, and mishandling. They are also vulnerable to a variety of environmental threats, such as roof leaks, flooding, fire, and asbestos problems, and to theft or other malicious action.


Mapping a dog burial in the field. *From the photograph collection of the Bureau of Land Management, Anasazi Heritage Center, Dolores, Colorado.*

There are a number of general recommendations to follow in the field and lab in order to promote the long-term preservation and viability of the great variety of records created:

- use appropriate long-lived media for all record types;
- use permanent and archival stock in paper, ink, lead pencil, folders, and boxes;
- inspect and redo damaged or inadequate records;
- label everything, or their containers;
- use appropriate storage for all media in the field in order to protect them from poor environmental conditions and threat of fire or theft;
- carefully consider existing guidelines and equipment for digital and audiovisual media, make sure backup copies and hard copy printouts exist, and migrate data to updated software on a regular schedule; and,
- ensure that project information and data is captured by appropriately knowledgeable staff.

There are also a number of conservation principles to consider for each of the primary types of media used for associated records.

Paper records

- Use high alpha cellulose, lignin free, acid-free paper, especially for field notebooks and standardized forms.
- Record information using archival (permanent carbon) inks or #4 (HH) pencils.
- Protect paper from water and humidity, and minimize its exposure to light.
- Try not to fold or roll paper.
- Store papers in archival folders in polyethylene boxes.

Photographs

- Protect all photographic materials (e.g., film, prints, slides, negatives, and transparencies) from heat, rain, and wind. Store them in archival folders in polyethylene boxes.
- Maintain a log of all photographic images.
- Only handle photos along their edges. Do not touch the image with bare fingers.
- Do not use paper or plastic clips, rubber bands, pressure sensitive tape, adhesive or pressure sensitive labels, or Post-it® notes directly on photographs.
- Do not put photographic materials, except unused film, in cold storage without reformatting them for access and duplication.

Magnetic Records

- Protect all magnetic materials (e.g., audio tapes, video tapes) from heat, dust, and dirt.
- Consider the equipment required to play the audiovisual material and the longevity of that equipment.
- Label all records in a permanent, carbon-based ink.
- Store the records in their cases in polyethylene boxes.

Cartographic and Oversized Records

- Oversized records should be stored flat in folders, preferably in map cases. Do not roll or fold.
- Protect paper from water and minimize its exposure to light.
- During storage and use, protect oversized records from tears and rips. Do not use tape to repair tears.
- Label the oversized folders in permanent, carbon-based ink.

Digital Records and Data

- Produce your master records in uncompressed TIFF format, if possible. Avoid using proprietary file formats or lossy compression.
- Protect all digital records from heat, dust, dirt, and ultraviolet radiation.
- Choose a storage medium that is considered a standard. Research its longevity.
- Keep digital records away from magnetic or electric fields that are created by old telephones, static, and field and lab equipment such as magnetometers and 12 volt transformers. Computer diskettes can be partially or completely erased by such exposure.
- Label the records in permanent, carbon-based ink.

Laboratory sampling and management

Artifact processing at the Stabilization Laboratory of the U.S. Army Corps of Engineers, St. Louis District's Mandatory Center of Expertise for the

Once a collection has made it to the archeological laboratory, whether it is at the site or off-site, more decisions and actions affect the proper long-term care and management of the collection. Again, it is essential that all decisions and actions are well documented and become part of the project record.

The first step of good collection processing in the lab is the use of appropriate cleaning methods. The different classes of material remains should be cleaned in the appropriate manner. Most objects, especially metals, should not be cleaned with water, detergents, or other liquids. In fact, an untrained individual should not clean metal objects. Dry brushing with a soft bristled brush is best for many object classes, including dirty field records. Vigorous brushing can destroy decoration or the surface finish on many materials. Water should only be used to clean non-porous objects, such as lithics or certain ceramics. Some objects should not be cleaned if they are going to be used for dating or other scientific analysis. For example, lithics with surfaces that may have residues remaining from use should not be cleaned.

Statistical sampling and culling of material remains, including non-cultural soil, dating, or other samples, usually occurs in the laboratory rather than during field collection as discussed in a previous sub-section. There are always inadvertently collected objects that are found to be non-cultural after they are cleaned, which are culled from the collection by tossing them in the trash.

Curation and Management of Archaeological Collections. *From the photograph collection of the U.S. Army Corps of Engineers, St. Louis District.*

A statistical sampling procedure, which should have been first presented in the project research design, may be implemented in the lab. Careful use of statistical sampling procedures results in a collection of appropriate and manageable size that still has maximum research, interpretation, and heritage value and potential. Improper sampling (or not sampling at all) can lead to a collection that is either too big due to unnecessary redundancy, too small due to oversampling, or not well organized for optimal use by researchers, educators, curators, or culturally affiliated groups.

The first step to statistical sampling in the laboratory is a preliminary analysis of *all* material remains. This includes separating, counting, and weighing the different classes of objects to determine the range of variation of each. A specialist in the object or material class should work with the principal investigator to determine the exact extent of the variation and what object features should be used for classification and analysis. The specialist and principal investigator should then determine if statistical sampling of artifacts should occur. This decision should be based on:

- evaluation of the relative quantities of objects in each artifact class and how they are distributed over the project area;
- the range of variation within a class;
- the scientific methods that could be used to study the objects (and the number and variety of objects needed for those scientific methods); and
- the potential of future research by other specialists and colleagues (although this can never be fully anticipated).

If the principal investigator supports the recommendation to statistically sample an object class, the next step is to determine the appropriate sample size. This will generally depend on the anticipated needs of researchers, educators, curators, descendent communities, and others, both currently and in the future. Estimates should take into account any destructive analytical methods that may be used, which impact the total sample size available over time.

Due to the variables listed above, sample sizes may differ for each artifact class. Important diagnostic artifacts should be retained (sampled at 100%), while more common, highly redundant artifacts may be sampled at 10, 25, or 50%.

Whatever sample size is determined, it is essential that all decisions are well documented so that the repository staff and future researchers, interpreters, and culturally affiliated groups can properly understand the history of the collection in order to make maximum use of it.

Laboratory conservation and management

After statistical sampling is complete and the contents of a collection have been determined, the material remains and associated records can be processed and conserved for the long term. The necessary activities usually include labeling, object treatment, records arrangement and rehousing, packing, and project cataloging. As has been noted, repositories often charge for this type of initial processing if they do not formally own the collection. Consequently, this work is now often being done in the project lab by the principal investigator and his/her staff rather than at the repository.

Lab technician inserting ethafoam supports in baskets. *Photo courtesy of the Art Conservation Center @ Univ. of Denver (formerly RMCC), Denver, CO.*

Conservation in the lab follows many of the same principles as conservation in the field. The treatments, however, are often more complex and geared towards active stabilization. Therefore, it is wise to seek advice from a professional conservator familiar with archeological material remains before beginning any treatment. Some key principles of lab conservation are:

- The less done the better. Handle objects and associated records as little as possible. Minimize the use of treatments and interventive materials. Every effort must be made to use treatments that are reversible or as nearly so as possible.
- Always think about the tools being used to process and conserve objects. Can they damage the object in any way?
- Do not use any treatments that may contaminate an object used for scientific analysis. If it is likely that future analyses will be conducted, retain a sizable, untouched sample.
- All conservation treatments should be reversible over the long term. Glues or consolidants should be stable and removable without any negative effects to the object and its constituent materials. Acids that remove concretions or additions of foreign material always permanently alter the object.
- Use only treatment materials that have been tested by professional conservators over time and their aging properties are well known.

- All treatments must be fully documented, especially materials used (i.e., percentage of solution, type of acid, etc.). This information is very important for future conservators and researchers.
- Treatment records need to become part of the permanent record of the project.
- Treatments often use chemicals that must be properly and carefully transported, stored, and disposed. It is essential to properly train staff in the use of such chemicals.
- Be aware of potential health and safety risks involved in all treatment work and with many materials that may have acquire mold, hanta virus, etc.

After objects have been analyzed and stabilized, they should be labeled, cataloged, and then packed in containers for long-term care and management. This should be done in a manner that is consistent with the standards of the repository where the collections are to be housed. Details on packing, labeling, and cataloging of both material remains and associated records are discussed in a later section. Once these procedures have been completed, the collection is ready for long-term storage and management. Again, it is important to make sure that all procedures have been fully documented along the way. All the associated records must be given to the repository along with the collection.

Bibliography

Alper, Diana
1993 "How to Flatten Folded or Rolled Paper Documents." *Conserve O Gram* 13/2.

Baxter, M.J.
1994 *Exploratory Multivariate Analysis in Archaeology*. Edinburgh: Edinburgh University Press.

Childs, S. Terry
2004 *Our Collective Responsibility: The Ethics and Practice of Archaeological Collections Stewardship*. Washington, DC: Society for American Archaeology.

Cronyn, Janey M.
1990 *The Elements of Archaeological Conservation.* New York: Routledge.

Foley, K.
1995 "The Role of the Object Conservator in Field Archaeology." In *Conservation on Archaeological Excavations*, 2nd ed., N.P. Stanley Price, ed., pp. 11-20. Rome: International Center for the Study of the Preservation and Restoration of Cultural Property.

Gregson, C.W.
1981 "Post Excavation Conservation." *BAR British Series* 89:131-132.

Hamilton, D.L.
1996 *Basic Methods of Conserving Underwater Archaeological Material*. Washington, DC: U.S. Department of Defense, Legacy Resource Management Program.

Hodges, H.M., ed.
1987 *In Situ Archaeological Conservation.* Century City, CA: The J. Paul Getty Trust.

Johnson, Jessica S.
1999 "The Long-Term Effects of Acid-Cleaning Archeological Ceramics." *Conserve O Gram* 6/6.

Jones, Julie M.
1980 "The Use of Polyurethane Foam in Lifting Large Fragile Objects On Site." *The Conservator* 4:31-33.

Keene, Suzanne
1977 "An Approach to the Sampling and Storage of Waterlogged Timbers from Excavation." *Conservator* 1:8-16.

Kenworthy, Mary Anne, Elenor M. King, Mary Elizabeth Ruwell, and Trudy Van Houten
1985 *Preserving Field Records: Archival Techniques for Archaeologists.* Philadelphia: University of Pennsylvania, University Museum.

Kilby, Virginia
1995 "Buffered and Unbuffered Storage Materials." *Conserve O Gram* 4/9.

Nance, Jack D.
1994 "Statistical Sampling, Estimation, and Analytic Procedures in Archaeology." *Journal of Quantitative Anthropology* 4(3):221-248.

1990 "Statistical Sampling in Archaeology." In *Mathematics and Information Science in Archaeology: A Flexible Framework.* Studies in Modern Archaeology, v. 3. Bonn: Holos.

National Park Service
1990 "Museum Object Conservation Treatment." *Museum Handbook, Part I, Museum Collections*, Chapter 8. Washington, DC: National Park Service.

1996 Museum Archives and Manuscript Collections." *Museum Handbook, Part II, Museum Collections Use*, Appendix D. Washington, DC: National Park Service.

2000 "Curatorial Care of Archeological Objects." *Museum Handbook, Part I, Museum Collections*, Appendix I. Washington, DC: National Park Service.

Peebles, Christopher and Patricia Galloway
1981 "Notes from Underground: Management from Excavation to Curation." *Curator* 24(4):225-251.

Plog, Stephen
1993 "Sample Size-Richness Relation: The Relevance of Research Questions, Sampling Strategies, and Behavioral Variation." *American Antiquity* 58(3):489-496.

Pye, Elizabeth
1986 "Conservation and Storage: Archaeological Material." In *Manual of Curatorship*, pp. 203-238. London: Butterworths.

Pye, Elizabeth and Janey M. Cronyn
1987 "The Archaeological Conservator Reexamined: A Personal View." In *Recent Advances in the Conservation and Analysis of Artifacts*, J. Black, ed., pp. 355-357. London: Summer Schools Press.

Raphael, Toby
1993 Preventive Conservation Recommendations for Organic Objects." *Conserve O Gram* 1/3.

Riss, Dan
1993 "Preservation of Magnetic Media." *Conserve O Gram* 19/8.

Ritzenthaler, Mary Lynn
1993 *Archival Fundamentals Series: Preserving Archives and Manuscripts.* Chicago: Society of American Archivists.

Ruwell, Mary Elizabeth
n.d. *Easy Steps for Preserving Your Anthropological Records.* CoPAR Bulletin 3. Reno, NV: Council for the Preservation of Anthropological Records.

n.d. *Locating Archival Quality Materials.* CoPAR Bulletin 11. Reno, NV: Council for the Preservation of Anthropological Records.

Sease, Catherine
1994 *A Conservation Manual for the Field Archaeologist*, 3rd edition. Archaeological Research Tools 4. Los Angeles: UCLA Institute of Archaeology.

Selwitz, Charles M.
1992 "Use of Epoxy Resins in Field Projects for Stone Stabilization." In *Material Issues in Art and Archaeology III*, pp. 925-934. Pittsburgh: Materials Research Society.

Shennan, S.
1994 *Quantifying Archaeology*, 2nd ed. Edinburgh: Edinburgh University Press.

Singley, Katherine R.
1995 "Caring for Artifacts After Excavation: Some Advice for Archaeologists." *Historical Archaeology* 15(1):35-48.

Sullivan, Lynne P.
2003 The Curation Dilemma: A Mutual Problem for Research and Resource Management. In *Protecting the Archaeological Heritage of America*, Robert Drennan and Santiago Mora, eds. Washington, DC: Society for American Archaeology.

Sullivan, Lynne P., and S. Terry Childs
2003 *Curating Archaeological Collections: From the Field to the Repository.* Walnut Creek, CA: AltaMira Press.

Walker, K.
1990 *Guidelines for the Preparation of Excavation Archives for Long-Term Storage*. London: United Kingdom Institute for Conservation, Archaeology Section.

United Kingdom Institute for Conservation
1983 "Packaging and Storage of Freshly Excavated Artifacts from Archaeological Sites." *Conservation Guidelines*, No. 2.

1987 *First Aid for Finds*, 2nd edition. London: Rescue, UKIC Archaeology Section.

Vogt O'Connor, Diane
1996 "Care of Archival Digital and Magnetic Media." *Conserve O Gram* 19/20.

1996 "Housing Archival Paper-based Material." *Conserve O Gram* 19/16.

1997 "Caring for Photographs: General Guidelines." *Conserve O Gram* 14/4.

1998 "Caring for Color Photographs." *Conserve O Gram* 14/6.