
MUSEUM HANDBOOK



PART I MUSEUM COLLECTIONS APPENDICES

APPENDIX K: CURATORIAL CARE OF TEXTILES

A. Overview

1. *What information will I find in this appendix?*

This appendix discusses the physical characteristics of textiles and outlines guidelines for their long-term care and preservation. Many different kinds of objects are called textiles. They include:

- quilts and bed covers
- clothing
- tapestries and wall hangings
- rugs
- baskets and mats
- upholstery
- embroidered samplers and other household decorations

The main topics covered in this appendix are:

- textile materials, added materials, and their manufacture
- agents of deterioration
- handling, storage, display, and transportation of textiles
- working with a conservator when treatment is needed
- specific emergency procedures for textiles

2. *Why is it important to practice preventive conservation with textiles?*

The role of preventive conservation is to avoid, block, or minimize the **agents of deterioration**. This practice will decrease the need for costly and time-consuming conservation treatments.

Textile objects are among the most sensitive in museum collections. They are affected by light, require controlled relative humidity and temperature, and are susceptible to damage from dirt, mold, insects, pollutants and abrasion. A textile's rate of deterioration slows significantly with proper preventive care. Practicing preventive conservation also reduces the likelihood of accidents.

3. *How do I learn about preventive conservation?*

Read about the agents of deterioration that affect textiles so that you can create a preventive conservation plan. These agents are discussed in detail in section D. Understanding how to protect your textiles from the agents of deterioration will lengthen the life of your textiles. See Chapter 3: Preservation: Getting Started, and Chapter 4: Museum Collections Environment, for a discussion on the agents of deterioration. Also refer to *Museum Handbook, Part III (MH-III)*, Chapter 7: Using Museum Collections in Exhibits.

4. *Where can I find the latest information on care of these types of materials?*

There are a variety of sources for up-to-date information about textiles:

- Read the NPS *Conserve O Gram* series.
 - Review the references in the bibliography. Especially note practical information found in *CCI Notes*, Section 13, Textiles and Fibres.
 - Look up the World Wide Web sources that are listed at the end of this appendix.
 - Consult a textile conservator.
 - Consult a curator or collections manager of a large textile collection.
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B. The Nature of Textiles

The history of textiles goes back to the Stone Age. Long plant fibers were intertwined and made into baskets and mats. Basket making formed the basis of weaving technology. *Spinning*—twisting short fibers together to make a long thread—made it possible to use wool, cotton, and silk to make textiles.

Textiles are combinations of fibers, dyes, and finishes. Some textiles are decorated with thread (*embroidery*) and non-textile materials like shell, bone, and metal. It isn't possible to discuss all of these materials in this appendix. Consult the bibliography and list of resources at the end of this appendix for more detailed information

1. *What fibers are used to make textiles?*

Before the 20th century, natural fibers were used to make textiles. These fibers come from two main sources:

- animal fibers
 - hair
 - wool
 - silk
- plant fibers
 - stems
 - leaves
 - seeds

Twentieth century textiles may include synthetic fibers. These include fibers made from natural materials, mainly cellulose or proteins, and include:

- rayon
- cellulose acetate

- triacetate
- natural rubber

Other polymers are created in the laboratory. These include:

- nylon
- polyester
- polyurethanes

Some textiles include metal threads or yarns that are metal and fiber combinations. These can include any combination of metals and alloys, and backings or support materials.

2. *What are the characteristics of animal fibers?*

Animal fibers are made of chain-like molecules of proteins. The basic properties of the fibers are determined by the arrangement of these proteins. The arrangement of the proteins in wool explains why wool stretches and silk is more rigid.

Hairs are usually long and coarse and come from the outer coat of an animal. They are not always woven into fabric. Two examples of their use are:

- padding in furniture and clothing (horse hair)
- felt (made of rabbit hair rather than wool)

Examples of hair fibers that can be spun into yarn that is knitted or woven are:

- cashmere (goat hair)
- angora (rabbit hair or goat hair)
- mohair (rabbit hair)

Wool is the undercoat of sheep. Four factors determine the quality of wool yarn:

- the breed of animal
- the health of the animal
- the shearing process
- the cleaning process

Wool fibers have a “crimp” that lets the fibers cling together and makes them easy to spin. The elasticity and crimp of wool fibers varies by the breed of the sheep.

Silk is the long, continuous filament that comes from the cocoon of silkworms. The molecular structure is rigid. Therefore, silk does not stretch easily. Silk is sometimes treated with finishes and materials that add body and weight to the fabric. The effects of these materials are discussed in Section C.2 of this appendix.

3. *What are the characteristics of plant fibers?*

Plant fibers are composed mainly of cellulose molecules. The basic properties of the plant fibers are determined by the rigid structure of fairly regular chemical groups that attract water. The presence of water makes the fibers flexible and resistant to breaking.

Fibers can come from the stem, leaf, or seeds of plants. After harvesting, the fibers are separated, cleaned, and processed for spinning into thread. Each of these processes has an impact on the quality of the thread, and can influence the long-term preservation of a textile.

Flax is the most common stem (bast) fiber. Flax fibers are spun to make **linen** thread. Flax is soaked in water to loosen the fibers from the inner bark of the plant. This process, called *retting*, causes the fibers to decompose slightly. Further mechanical processing is needed to release the fibers from the bark. These fibers are hard, and not elastic. In processing, linen is:

- strong when wet
- resistant to heat
- difficult to bleach
- difficult to dye to concentrated colors

Leaf fibers are hard and strong. They are good materials for rope, cords, sandals, and baskets. Some examples that may be in collections are:

- sisal
- raffia
- abaca
- hennequin
- yucca

Cotton is the most common seed fiber. Cotton is nearly pure cellulose, and the fiber is relatively rigid. *Mercerization*, a common processing technique introduced in 1844 makes dyeing easier. It also adds softness and flexibility to cotton fabric. Other seed fibers are:

- coir (coconut fiber)
- kapok

4. *What are the characteristics of synthetic fibers?*

Synthetic fibers have been designed to have a variety of performance characteristics. For example, polyester is very strong and resists wrinkling. You should not assume that synthetic fibers are sturdier than older fibers, or even contemporary textiles made of natural fibers. Synthetic fabrics have only been available in large quantities since the 1930s. We already know that some of these fabrics do not age well. Others have not been studied long enough to know the long-term effects of aging. Monitoring the condition of 20th century textiles in collections will help conservators develop a picture of long-term changes in characteristics and preservation concerns for synthetic fibers.

5. *What are the characteristics of metal threads?*

Metallic threads can be woven into the structure of a fabric or used for embellishment. The metals are subject to oxidation (see Appendix O: Curatorial Care of Metal Objects). Metallic threads are produced in various forms including:

- gold metal layer on silver strip
- gold, silver, and other metals and alloys cut into thin strips
- small diameter metal wires of gold, silver, and copper alloys
- thin strips of metal wound around a core of thread (usually silk or linen)
- thin sheets of metal applied to leather or paper
- metallic powders and pigments applied to Mylar® or other synthetic backings

C. The Fabrication of Textiles

There are many techniques that result in cloth or cloth-like materials. Fabrication also includes the addition of color (dyes), finishes, and other decorations. It is the structure that is important in determining the characteristics of the cloth and is directly related to its ultimate use.

1. *What techniques are used to make textiles?*

Some of the techniques used to make textiles are included here:

Felting is the process of using heat, water, and pressure to interlock loose fibers together. The best raw material is sheep wool because of its chemical structure and crimp. Lacquers and sizings can be used to stiffen the felt for particular uses. The same basic techniques for making wool felt are used today with synthetic fibers to produce synthetic felt.

Spinning is the process that converts short fibers into long threads or yarns. Loose fibers are pulled from a mass of prepared animal or plant fibers and twisted to create the yarn. This can be done by rolling the fibers down the spinner's thigh, by using a spindle, or by using a spinning wheel.

Netting is produced from a single, continuous strand using a tool called a shuttle. The thread is looped and may be knotted. Netting is the basis of some lacemaking and tatting. Knitting and crocheting are other looped structures.

Lacemaking refers to a variety of techniques that involve the intricate twisting of fine threads to form a pattern. These include needlelace and bobbin lace that use combinations of twisted, crossed, plaited, and knotted structures.

Macramé is a knotting technique that uses more than one strand of yarn. This technique is used primarily for fringes and edgings.

Weaving is the making of cloth by interlacing threads of the warp and weft on a loom.

- *Warp* is the parallel yarn stretched on a loom (lengthwise).
- *Weft* is the transverse yarn interlacing with the warp in a pattern.

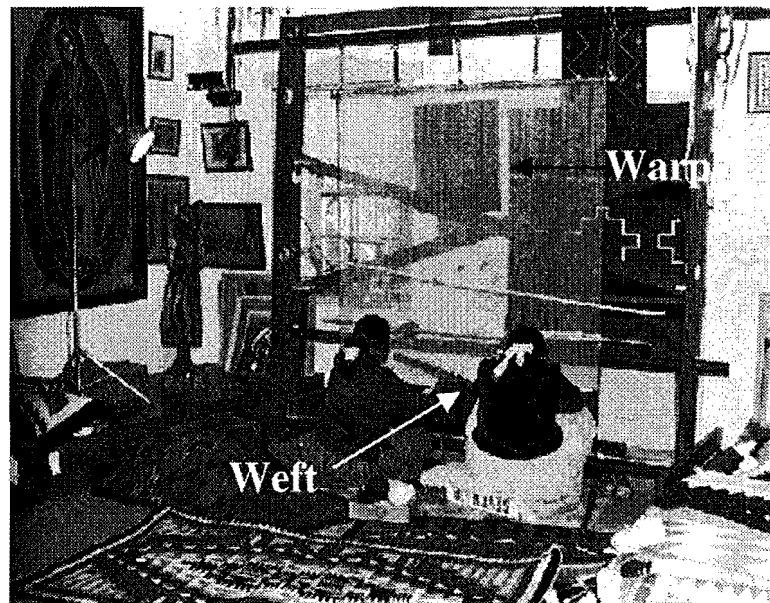


Figure K.1: Upright loom. (Weavers Mae and Sadie Curtis of Ganado at Hubbell Trading Post. Photograph by Fred Mang Jr. HUTR-23347)

Many structures and variations have been developed to produce fabric. The simplest structure of weaving (*plain weave*) is over-one, under-one interlacing of perpendicular warp and weft elements. The structure determines the characteristics of the fabric. Detailed discussions of weaving can be found in references listed in section Q of this appendix.

2. *What kinds of finishes are used on textiles?*

Few textiles are simply processed fibers made into cloth. Dyes, lubricants, chemical compounds, mechanical treatments, sizing, water and stain repellents, mothproofing, and flameproofing are some of the treatments that prepare fabrics for use.

- *Dyes* are plant materials and various chemicals that add color to textiles. There are two general categories of dyes:

- natural (from plants, some insects, and some mollusks)
- synthetic (chemically produced colors developed in the 19th century)

Many natural dyes have good wash and light fastness. Early synthetic dyes are known for their harsh, bright colors, and poor wash and light fastness.

Some dyes have an affinity for textile fibers, but most require assistance to attach to the fibers. These chemicals, called *mordants*, are usually metallic salts applied to the cloth before dyeing begins. Mordants also can modify the dye color (different mordants used with the same dye material produce different colors).

Natural dyes mordanted with iron produce a black or brown-black color. These dyes deteriorate and destroy the fiber. Many printed cottons and tapestries used iron-mordanted yarns to outline designs. Often there are holes left in the fabric where these yarns used to be.

- *Cropping, napping, and shearing* of cloth raise the fibers to produce a soft, slightly piled fabric. *Rubbing, pressing, and glazing* give a smooth, lustrous surface. These mechanical processes are sometimes combined with oils, gums, starches, beeswax, varnishes, pitch, and gelatin. Egg white and water, or gum arabic was used on glazed woolens and linsey-woolsey blends in the 18th century. These finishes are fragile and can be damaged by handling and moisture.
- During weaving, oils, lubricants, and sizing are often used to keep yarns from tangling and to strengthen the warp against the friction of the loom. These materials are usually washed out by a laundry method called *scouring*. Scouring can range from gentle cleaning to processes using heat, pressure, and agitation.
- *Fulling* involves the use of lubricants, detergents, and other additives with water, heat, and agitation to produce felt. Felting causes the fibers to shrink and adds softness, body, and strength to the fabric. Very thorough felting produces strong, nearly waterproof fabrics that have been used for tents, coats, and shoes.
- Cotton threads and fabrics can be treated with a strongly alkaline chemical to add strength, durability, and luster to the fiber. This process of *mercerization* also reduces shrinking and makes the fiber more receptive to dying.
- During the 18th and 19th centuries, silk fabrics were sometimes treated with a variety of metallic salts to produce fuller, heavier textiles. These *weighted fabrics* were used for clothing, flags and banners, fringes, and tassels. When they were new, these fabrics had a fuller feel and drape than pure silk. However, weighted fabrics are not strong, and when aged, fracture and powder very easily. Washing and dry-cleaning easily damage weighted silks. They are very sensitive to the effects of light, moisture, and air pollution.

Finishing processes for synthetic and newer fabrics include:

- synthetic resins
- plasticizers
- mothproofing agents
- flame proofing chemicals
- emulsions used for soil, crease, and water repellency

Some of these processes are chemically active and their degradation products destructive to the textiles. Others are so recent that their long-term effects are not known.

Finishes are responsible for the performance and many of the characteristics of textiles. However, some of these treatments and chemicals enhance deterioration and limit the possibilities of conservation treatments.

3. *What other kinds of decorations are used on textiles?*

In addition to dyes, the texture of different weaving structures, and the effects of cutting and piecing fabrics together, textiles can be decorated with *embellishments* including:

- paint, pigments, and gilt
- braids and fringes
- added stitches
- metals
- beads
- fur and feathers

Embellishments may or may not be a structural component of the textile. Some embellishments, like beads, may be quite heavy. The areas where they are attached may be weak, and require extra support and care in handling.

- **Paint, pigment, and gilt** can be added to textiles to create surface designs. Printers' gums, waxes, starch, and adhesives may be present as well. These materials often are soluble in water. They also tend to stiffen the textile. Paints and gilt can crack when the textile is flexed or folded. Special care is needed for display, handling, and storage of painted textiles.
- **Fringes** may be a part of the structure of a textile or added after manufacture. In historic houses, fringes on rugs and carpets are subject to damage if they are in a public pathway.

- **Added stitches or embroidery** is a common form of decoration. All types of thread and yarn are used for embroidery. Embroidered textiles are most vulnerable to damage where the yarn or thread is stitched through the ground fabric. Cutting or tearing of the fabric is a result of the stress from tension on the yarn, or the interaction of the ground fabric and the thread together. For example, metallic thread is heavy and sometimes has sharp edges. It can cut or tear the textile.
- **Metals** in the form of metallic threads, metal strips, braids and wires, are used to decorate textiles. These decorations are often heavy and place strain on the underlying textile. A variety of metal combinations (alloys) have been used on textiles. The preservation concerns for these materials vary with the type of alloy (see Appendix O: Curatorial Care of Metal Objects).
- **Beads, buttons, and sequins** also can be used for decoration on textiles. These can be made of a wide variety of materials including glass, bone, stone, plastic, ceramic, and wood. All of these materials have different rates of deterioration and interaction with the textile. For example, early sequins were made of gelatin. In situations of high humidity these sequins become sticky and can dissolve.
- **Fur and feather trims** are particularly vulnerable to pest infestations and need to be monitored carefully.

D. Deterioration of Textiles

1. *What agents of deterioration affect textiles?*

Many factors contribute to a textile's deterioration. These *agents of deterioration* can occur naturally, or they can result from external forces. Avoiding agents of deterioration is the key role of *preventive conservation*. The agents that affect textile collections most are:

- light (visible and ultraviolet)
- temperature
- humidity
- pollution
- pests

Knowing the ideal settings for temperature, relative humidity, and visible light, and knowing how to filter UV radiation and pollution is essential for preserving your collection. An Integrated Pest Management (IPM) Program is essential to protect your collection from pests. For more information about these agents of deterioration, see Chapter 3: Preservation: Getting Started.

2. *How do textiles change over time?*

As all materials age, they slowly break down and constantly deteriorate. The basic deterioration of textiles is the gradual breaking down of long-chain fiber molecules into shorter chains. The result is brittleness. Other forms of natural deterioration are:

- *gradual loss of inherent moisture:* Natural fibers come from living sources with biological functions. As they age and the structure of the fiber changes, fibers become less elastic and resilient.
- *effects of impurities:* The presence of small amounts of metals, such as copper, can accelerate deterioration in the presence of bleaching agents, ozone, ultraviolet radiation, and moisture.
- *impact of manufacturing:* Iron mordants, oils and lubricants used to facilitate the weaving process, and bleaching are some of the manufacturing processes that can contribute to the deterioration of textiles.
- *inherent vice:* Sometimes methods of manufacture and the nature of materials cause deterioration that cannot be controlled and may not be treatable. The most striking example of inherent vice is the impact of the addition of certain metallic compounds to silks to add weight and drape to silk fabrics. These compounds bond to the silk fiber and cause their eventual splitting and powdering. Another example is the interaction of some metal threads and decorations with textiles. The natural deterioration of wool accelerates deterioration of silver metallic threads causing tarnish. The tarnish can then stain the wool.
- *oxidation:* Fabrics are naturally degraded by the presence of oxygen. The result is an overall brownish discoloration on white or natural-colored textiles. When treated with water, some of these oxidation products are dissolved. However, the oxidation process begins again immediately.

3. *How does the environment affect my collection?*

Temperature, relative humidity, light, and pollution directly affect the rate at which a textile ages. Storing and displaying textiles in areas where temperature is too high and RH is too high or low will increase deterioration rates and promote pest activity. Constant or large fluctuations in temperature and RH are harmful, too. Textile fibers are *hygroscopic*—they readily take up and lose moisture. Fluctuations of relative humidity and temperature cause textiles to take up or lose moisture. These fluctuations cause dimensional change and mechanical stress that can lead to breakage and structural damage of weak yarns. Natural and artificial lighting cause textile dyes to fade. UV radiation causes fading to happen quickly and fibers to become brittle. Pollution, including dirt, settles in the structure of a textile, causing its character to change completely. Pollutants also affect dyes, finishes, and many embellishments.

4. *What are the ideal temperature and RH ranges for textiles?*

Store textiles at temperatures between 65° and 75° F and relative humidity as close to 50% as possible. Low temperatures are not a problem for textiles and may help slow down the rate of deterioration for textiles that are damaged by weighting. High temperatures can embrittle textiles, and together with high relative humidity, promote biological activity. Low relative humidity (under 35%) can embrittle textiles. Avoid temperature and relative humidity fluctuations.

5. *How does light affect textiles?*

Light causes textile dyes to fade and undyed textiles to bleach or darken. Light can also be a catalyst for deterioration of weighted silks. Light damage is cumulative and irreversible. The amount of light damage depends on the type of light (ultraviolet and/or visible), intensity of the

light, and duration of exposure. Evaluating your collection's lighting conditions and making appropriate adjustments can prolong the life of your collection. Review the natural and artificial light sources in your storage and display areas. Use monitoring equipment to identify levels of UV radiation and illuminance (levels of visible light are measured in "lux").

Reduce your collection's exposure to light by storing and displaying textiles in rooms without windows. (Clear UV-absorbing films will reduce UV levels, but will not reduce illuminance.) Cover all windows with drapes or blinds to further protect textiles. Avoid storing and displaying textiles in rooms with doors that open to the outside.

The maximum illuminance recommended for textiles is 50 lux. All UV light should be filtered. Consider ways to limit the total light exposure, such as automatic dimmer switches, or simply turning out lights when visitors are not present.

6. *What kinds of pollution affect textiles?*

Outdoor pollutants, such as dust and pollen, can easily be brought into a museum through open doors and windows. Industrial emissions as well as natural processes of erosion create pollutants. Cleaning products, asbestos fibers, building materials, paint, carpeting, and other indoor materials can generate pollution from within a museum. Cigarette, cigar, and pipe smoke are also harmful forms of pollution.

Dirt disfigures, dulls, and stains textiles. Dirt and dust also contain a high proportion of silica. The sharp surfaces of silica can cut and abrade textile fibers, especially when the fibers expand and contract in response to changes in RH.

Sulfur dioxide bleaches, discolors, and embrittles textiles. Hydrogen sulfide in the presence of moisture darkens lead pigments, tarnishes metals, and reacts with finishes and some embellishments.

Formaldehyde in paints, varnishes, wood products, and carpeting damage some dyes.

Tar and particulates from tobacco products stain textiles and are difficult to remove.

7. *How can I control pollution in my storage or display area?*

Follow these practices:

- Keep doors, windows, and outside vents closed whenever possible.
- Never allow smoking or fireplace fires in the building.
- Choose new building materials, paints, and carpeting that do not emit harmful gasses.
- Don't use custodial cleaners that emit harmful gasses (for example ammonia).
- Use appropriate particulate and gaseous pollution filters in your HVAC system.
- Store textiles in closed cabinets with appropriate gaskets.

- Keep particularly vulnerable objects in sealed display cases. Make sure these cases meet the recommendations in *MH-III*, Chapter 7: Using Museum Collections in Exhibits, and NPS *Exhibit Conservation Guidelines*.

For more information on controlling pollutants, see Chapter 4: Museum Collections Environment.

8. *What pests are attracted to textiles?*

Textile fibers are an excellent source of food for microbes and insects. Sizing, starch, gelatin, binding media for pigments, soils, and stains also are attractive to pests.

- Case bearer and webbing clothes moths are attracted to high protein material including wool, silk, hair, fur, feathers, and skins. The female moth lays eggs within the weave structure of the textile. The eggs hatch and the larvae feed on the textile material. Larvae take on the color of the materials they consume, making them difficult to see. Moths channel through the textile making holes, or “graze” on the surface thinning the yarns and weakening the textile structure.
- Silverfish, cockroaches, termites, and woodworms eat cellulose and graze on parchment, leather, paper, fabrics, glues, and painted decorations.
- Woodworm, termite, and carpet beetles can be found in furniture and associated furnishing fabrics, upholstery, and the inner structure of upholstery materials. Carpet beetles also attack silk and wool textiles.
- Mold and mildew grow in warm, damp locations. Irreversible brown stains are caused by enzyme attacks from the digestive processes of these organisms.

9. *How can I protect textile collections from pests?*

Follow these practices:

- Develop and implement a regular housekeeping plan. Pests are attracted to soils and a dirty environment.
- Develop and implement an IPM plan. Regular inspection and recording sightings of insects or insect debris is crucial to any pest management system. All park staff can be integral to systematic preventive conservation through identification of problem objects or areas.
- Prevent the initial entrance of insects into the collections. Flowers, plants, and potting soil are good sources for introducing an insect problem to the site. These materials should not be permitted in buildings that house collections.
- Isolate newly acquired collection objects from the rest of the collection. Determine if any insects are present and make sure they have been eradicated before new collections are integrated into storage or exhibition areas.

- If an infestation is suspected or located, isolate affected objects from the rest of the collection. Examine the surrounding area to locate possible sources of infestation (such as beneath floorboards, inside a cushion, or in bird and rodent nests under eaves and between walls).
- Immediately consult with a conservator and your park or regional IPM coordinator to identify appropriate treatments.

For more information about IPM and pest infestations, see Chapter 5: Biological Infestations

Controlling pests and the environment—light, temperature, relative humidity and air pollution—are keys to the long-term preservation of textiles.

E. Proper Handling of Textiles

1. *What do I need to consider before handling a textile?*

Following are a few guidelines:

- Keep hands away from textiles unless handling is absolutely necessary. The body gives off acids and oils through its pores that can damage textiles. Wash hands often and use white cotton gloves whenever possible.
- If the textile is fragile, carry it flat on a support.
- Make sure there is a clean surface of adequate size available before you move a textile from one place to another.
- Avoid carrying all but the smallest textiles by yourself. Get another person to help when you are transporting large, heavy textiles. Use a well-padded cart in good condition to transport boxed and smaller items.
- Remove jewelry, badges, belt buckles, and watches that might catch on and tear textiles, especially during installation and preparation of textiles for storage.
- Use clean, padded surfaces when working with textile collections. Keep tools, inks, and other writing materials away from the work area. Use only pencil when working around textiles.
- Avoid placing textiles one on top of another. When stacking them is absolutely necessary, interleave textiles with unbuffered, acid-free tissue paper, and be aware of the weight of one textile on another.

2. *How should I handle textile objects?*

Unlike a ceramic or wooden sculpture, textiles are not rigid, and need to be supported when they are lifted. Lack of support can result in stretching and tearing of the fabric.

- Roll a flat textile around an archival tube for transport or storage.

- Textiles with fragile surfaces, beads, heavy embroidery, or other surface attachments can be fan-folded and supported on a muslin-covered, corrugated archival board or in an archival cardboard tray (see Figure K.2).
- Place a muslin-covered, corrugated archival board or archival cardboard tray under fragile textiles and fragments for support.
- Large, heavy textiles (such as carpets and tapestries) require two handlers even if rolled on a support tube.
- Pad the interior of costumes with crumpled unbuffered, acid-free tissue and transport them in archival textile boxes.
- Fold pieces as little as possible. Textiles tend to break along fold-lines in time. Pad folds with crumpled unbuffered, acid-free tissue paper.
- Transport supported textiles on a well-padded cart.

Always use a support or container when moving textiles.



Figure K.2: Fan folding a textile into archival tray

F. Storage Specifications

1. *What do I need to know about storing textiles?*

Improper storing of textiles can be a catalyst for deterioration. Consider the elements that affect a textile in storage.

- Control the agents of deterioration.
- Choose appropriate storage space and equipment. Use only archival materials (tubes, unbuffered tissue, cardboard) in contact with textile objects (see Chapter 7: Museum Collections Storage).
- Ensure that proper security and fire detection and suppression equipment is installed and maintained (see Chapter 9: Security and Fire Protection).

2. *Where should I store my textiles?*

Your collection size is an important consideration when you determine where to store your textiles. If you have many textiles, consider creating a dedicated storage room. If you have only a few textiles in your collection, dedicate a space or cabinet in your museum storage area for your textiles. As much as possible, store textiles in properly gasketed closed cabinetry. Closed cabinets provide extra protection from pests, as well as potential water damage that might result from a flood or fire. Never store textiles:

- in attics or basements
- against exterior walls
- near furnaces or heating/air conditioning vents
- in spaces below water pipes

3. *How should I store my textiles?*

The structure of a textile, its condition, and size determine the best storage method. In general, you will choose from the following storage methods:

- archival rolling tubes
- flat-file cabinets
- archival boxes
- costume wardrobe cabinets
- shelving units
- specialized containers

G. Storing Flat Textiles

1. *Which textiles are stored flat?*

Flat storage is ideal for most textiles because it provides complete support for the object. Small textiles (for example, samplers and some household linens), fragments, and particularly fragile textiles should be stored flat. Flat storage is impractical for most large items like carpets and tapestries. However, permanently gathered or pleated curtains should be stored flat in archival costume boxes or drawers using padding techniques described for costume (see H.5 below).

Shallow drawers, like flat file cabinets, are well suited to flat textile storage. Sturdy textiles can be stored between sheets of unbuffered archival tissue. Avoid stacking textiles as much as possible. More delicate textiles may require a support to protect the fabric as it is lifted from the drawer. A simple support can be constructed by covering a piece of corrugated archival cardboard with washed muslin. Line drawers with closed cell polyethylene foam such as Volara®.

Very fragile small textiles (for example, brittle archeological textiles) may require additional protection. A modified print mat provides space economy as well as protection for handling and storage. (see *MH-I*, Appendix I, Figure I.8 Construction of a Portfolio Mount for Archeological

Textile Fragments or *Conserve O Gram* 16/3 “A Simple Storage Mat for Textile Fragments”).

Other textiles that are best stored flat include:

- velvets, and other textiles with a pile structure that could be crushed if rolled or folded
- textiles with a fragile surface, such as gilt or paint
- textiles that are particularly brittle or stiff
- textiles with a very uneven surface, such as strongly raised embroidery
- textiles with heavy beading or metallic embroidery
- costumes cut on the bias

2. *Which textiles are rolled for storage?*

Flat textiles (for example, Navajo rugs, tablecloths, and tapestries) are usually rolled for storage because they are too large to handle safely if stored flat. Archival rolling tubes are available in 2” and 3” diameters. Choose a tube with a diameter suitable for the object being stored. The 2” diameter tube is ideal for thin textiles, for example, a length of lace. The larger diameter tube is suitable for carpets or coverlets. The outside of a tube can be covered with bubble wrap to create an even larger diameter tube for oversized, fragile textiles. The tube should be at least 6” longer than the width of the textile.

3. *How do I roll a textile for storage?*

Work on a clean, well-padded surface (mattress pads make good covers for worktables). Lay the textile flat, gently smoothing wrinkles. Most textiles should be rolled face in so that the design will be face up when the textile is unrolled. Textiles with raised surfaces should be rolled face out. If the textile has a lining, roll lining side in. When a double thickness of fabric is rolled, the inner layer tends to wrinkle. It is preferable to create wrinkles on the lining rather than on the face of the textile.

- Roll unbuffered archival tissue once around the tube to provide a “leader” to guide the textile onto the tube (see Figure K.3). The tissue should extend slightly beyond the width of the textile but not beyond the edge of the tube.
- Interleave unbuffered archival tissue as you roll to protect the face of the textile.
- Two or more people should roll large pieces to maintain a uniform tension.
- To protect the roll from dust, cover it with washed muslin tied in place with cotton twill tape. Attach catalog and other identifying numbers to the dust cover to prevent unnecessary unrolling.
- Long or uneven fringes are difficult to roll. Make a “fringe folder” from a piece of unbuffered archival tissue to enclose fringes and simplify the rolling process.

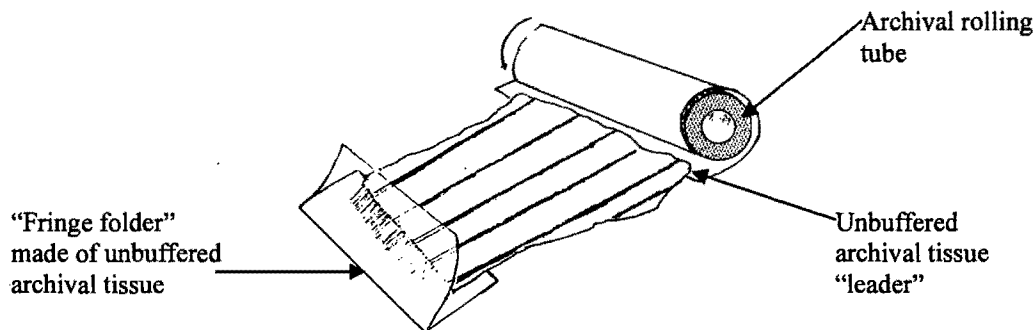


Figure K.3: Technique for rolling flat textiles for storage

4. *Is it safe to roll quilts and counterpanes for storage?*

Quilts and counterpanes are usually three layers thick (face, padding, lining). If the fabrics are in stable condition and there is no weakness in the stitching, they can be safely rolled. As with lined textiles, roll quilts and counterpanes **face out** with the lining or backing side in.

Many Victorian "crazy quilts" are made of weighted silk and velvet fabrics. These fabrics split and become powdery as they deteriorate. They should **not** be rolled for storage. Fragile over-sized textiles, like crazy quilts, can be fan-folded on a support board and stored in a drawer. Alternatively, these textiles can be stored, with minimal folding, in an archival costume box using the same general techniques described in H.5 below.

H. Storing Costume Collections

1. *How do I store dimensional textiles such as costume?*

Costume objects are stored in one of two ways depending on condition:

- hanging in a wardrobe cabinet
- folded in an archival textile or costume box

2. *How do I know which method of storage is best for costume?*

In general, fitted, constructed garments in good condition can be hung for storage (for example, dresses, bodices, coats, and jackets coming from the European clothing tradition). Museum storage hardware companies manufacture both costume wardrobe cabinets and clothing racks for this purpose. This type of storage is the most economical for costume storage because it takes less space than flat storage.

Ask the following questions to evaluate the best form of storage for costume items:

- Are shoulder seams strong and intact?

- Is the fabric in the hanging area free of splits, holes, or other weakness?
- Can the waistline support itself without causing strain at the shoulders or waist?
- If the waistline can't support itself, can it be adequately supported with the addition of waist tapes? (See Question 3 and Figure K.4)

If the answer to all of these questions is "yes," proceed to prepare the costume for hanging storage. If "no," store the costume flat following the instructions in Question 5 below.

Unconstructed clothing is better stored flat, or with minimal folding, in an archival box (for example, kimonos, and many forms of ethnic dress that use the rectangular shape of fabric yardage in clothing construction). The following are also best stored flat in boxes or drawers:

- fragile costume and garments with weakness at the shoulders
- men's breeches or pants
- dresses with fragile waistlines
- skirts
- costume with heavy beading
- bias cut garments (for example, some couture costume and "flapper" dresses from the early 20th century)

3. *How do I properly support and protect a garment for hanging storage?*

The goal of good hanging storage is to provide sufficient support to reduce strain across the shoulders and other vulnerable areas (for example, the waistline of a dress with a heavy skirt). See *Conserve O Gram* 4/5, Storage Techniques for Hanging Garments: Padded Hangers, and 4/15, Storage Techniques for Hanging Garments: Dust Covers.

Choose or modify a wooden hanger to provide the base for a hanging support. The ends of the hanger should reach into the sleeve, just beyond the sleeve seam.

- Reduce potential strain from heavy, bulky, or awkward garments by providing waist supports.
- Use a dust cover to protect each costume from dust, light, and abrasion from contact with other garments.
- Label dust covers with catalog and other identifying numbers to avoid unnecessary handling of the garment.
- Hang costumes in closed, properly gasketed cabinets, leaving at least 1.5 inches of space between each object. If costumes must be stored on open racks, always use closed dust covers.

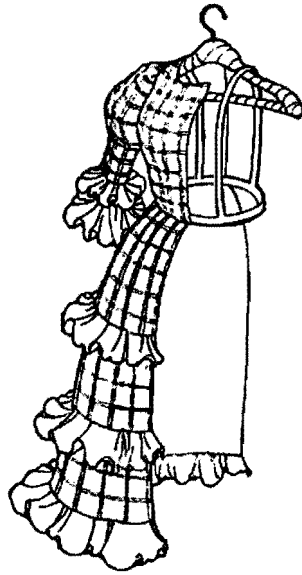


Figure K.4: Twill tape waist supports (illustration by Jian Wu, reproduced with permission of Abrams Publishers)

4. *Why should I use dust covers for hanging costume?*

Dust covers do more than protect a garment from dust and light. For example dust covers:

- protect the textiles from oils and acids from your hands
- prevent the transfer of fugitive dyes from one object to another
- prevent metallic embroidery and other attachments (for example braid and buttons on military uniforms) from catching on and tearing other garments
- prevent abrasion of adjacent objects as costume items are moved in and out of storage cabinets

5. *How do I prepare an unconstructed garment for storage?*

Unconstructed garments (such as Pueblo and Hopi kilts and dresses) are stored flat in archival boxes or in drawers. The goal of good flat storage for these garments is to:

- use as few folds as possible
- provide adequate padding in folds to prevent creasing
- provide adequate support to safely lift the garment from the box or drawer

A muslin “sling” is useful to lift a garment from a box (see Figure K.5). A muslin-covered corrugated board, with or without a muslin wrapper, is useful to lift a garment from a drawer.



Figure K.5: Muslin “sling.” Muslin can be placed under and folded over a garment to be used as a “sling” to lift and move the item. The “sling” also acts as a dust cover to protect the textile from handling.

To prepare an unconstructed garment for storage using a support board

- Lay the garment flat on a clean, padded surface.
- Cut corrugated board slightly larger than the size of the folded garment and slightly smaller than the interior dimensions of the drawer.
- Cut one piece of washed and ironed muslin the same length as the support board and three times the width, and one piece the exact length and width of the support board.
- Clean-finish the edges of both muslin pieces with pinking shears or a zigzag machine stitch.
- Attach the smaller piece of muslin to the support board with four small tabs of archival double-sided tape at the corners.
- Center the larger piece of muslin below the board and secure it to the board with strips of double-sided archival tape (1/3 of the muslin will extend beyond the edge of the support board on either side).
- Lay the garment on the support board with the neck or top edge just below the edge of the board, and the other three sides hanging over the edges.
- Place padding (for example, crumpled unbuffered archival tissue or batting “sausages”) in the garment seams.
- Using as few folds as possible, placing padding in each fold, fit the garment onto the backing board.
- Drape the muslin extensions over the folded garment and tie closed with cotton twill tape.

- Label the cover with catalog or other identifying numbers to prevent unnecessary unwrapping.

To prepare storage without a support board:

- Cut one piece of muslin the same length as the storage box and three times its width.
- Center the garment on the muslin and fold as above, making sure to keep the final size of the folded garment slightly smaller than the box interior.
- Drape the muslin extensions over the folded garment and tie closed with cotton twill tape.
- Using the muslin cover for lifting, lower the folded, wrapped costume into the costume box.
- Label the cover and the outside of the box with catalog or other identifying numbers to prevent unnecessary unwrapping.

Use two people to transport costumes on support boards and to lift costumes from drawers and storage boxes.

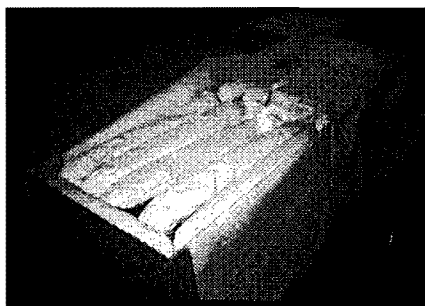


Figure K.6: Rolled or crumpled archival tissue pads the folds of the dress. To keep the garment from shifting as the box is transported, additional rolls of tissue fill the empty space in the box.

I. Storing Costume Accessories

1. *What are costume accessories?*

There are many objects besides clothing included in costume collections. These objects are often composed of several materials, including wood, leather, bone, ivory, metal, paper, fur, and feathers. For example, costume accessories include:

- hats and bonnets
- shoes

- gloves
- purses
- fans
- umbrellas and parasols

Costume accessories are composite objects made of several materials. The care of these objects requires attention to the specific needs of those various materials. Refer to the *Conserve O Gram* series for information on the care of individual materials. See also *MH-I*, Appendix N: Curatorial Care of Wooden Objects, Appendix O: Curatorial Care of Metal Objects, and Appendix S: Curatorial Care of Leather and Skin Objects. You will need to provide special storage supports for most costume accessories.

2. How do I store hats and bonnets?

Construct padded polyethylene foam supports for hats and bonnets to maintain their shape (Figure K.7). The support should raise the brim slightly off the shelf to prevent distortion. Hats with weak brims will require a full support in the crown and under the brim. Hats with weak crowns should have a soft insert (rather than rigid polyethylene foam).

- Store hats in closed, gasketed cabinetry.
- Store hats separately from original hat boxes.
- Construct a drop-sided box to facilitate handling if a hat needs to be stored in a box for its protection (Figure K.8).
- Do not stack hats.
- Protect bows, feathers and other appendages from abrasion and crushing by padding with unbuffered archival tissue.

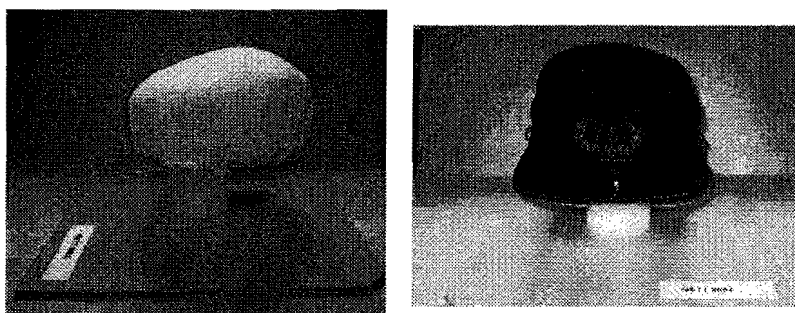


Figure K.7: A fabric-covered polyethylene foam support has been created to support the crown of this Civil War cap. A thin piece of Plexiglas® supports the bill.

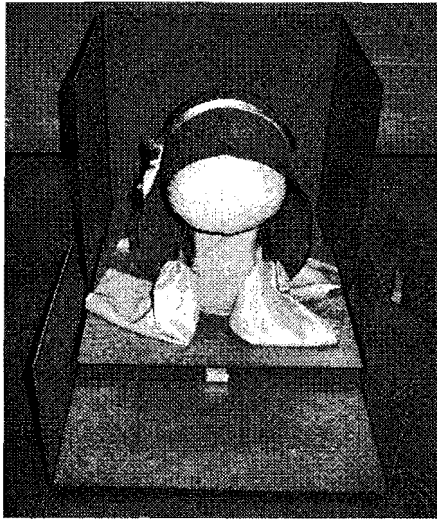


Figure K.8: Leghorn bonnet on a support inside a drop-front archival storage box.

CAUTION: Hats made of fur, feathers, and pieces of taxidermied birds and animals may contain pesticide residues including arsenic. Test all bird and mammal skins collected and prepared prior to the mid-1980s (see *Conserve O Gram* 2/3, Arsenic Health and Safety Update). If arsenic or another pesticide is suspected, use the following handling precautions:

- Do not touch specimens with bare skin. Wear plastic gloves and a protective smock or lab coat. Wear a dust mask rated for toxic dust. If possible, handle the object or specimen by a container or a mount.
- Always wash hands after working with specimens. Discard gloves. Keep the protective smock or lab coat clean. Do not take protective clothing home to wash—especially if you live with small children or elderly people.
- Obtain a Material Safety Data Sheet (MSDS) on arsenic and other pesticides and keep in the park’s curatorial workspace/office. Consult the MSDS for specific information.
- Label museum cabinets or storage spaces that house specimens contaminated with pesticides with warning signs. Also label individual specimens that have been tested. Prepare and post a written set of instructions for handling specimens contaminated with arsenic and other poisons.

Consult *MH-I*, Chapter 11: Curatorial Health and Safety, for more information.

3. *How do I store shoes?*

Shoes should be padded for support on display and in storage. Supports should fill the entire shoe all the way to the back of the heel. Make a “sock” of cotton stockinet to fit the interior of the shoe. Stuff the sock with polyester batting from the toe to the arch. Insert a shaped piece of rigid polyethylene foam from the arch to the heel, and stitch the sock closed. The sock should provide uniform, solid support without stuffing the shoe tightly.

- Support the entire shoe. Do not handle shoes by the heel alone.
- Provide adequate support to the ankle and leg sections of boots by constructing a second “sock” filled with polyester batting to fill that area. If the ankle is weak, the support can be constructed of shaped polyethylene foam.
- For the protection of staff as well as the shoes, do not store shoes and boots on upper shelves or movable shelves. It is best to contain shoes and boots within shallow boxes for storage.
- Store shoes and boots in closed, gasketed cabinetry. If this is not possible, provide dust covers of washed muslin for each pair. Label the dust cover with catalog and other identifying numbers to prevent unnecessary handling.

4. *How do I store gloves and mittens?*

Gloves and mittens may require internal supports to prevent crushing or creasing. Do not force a support into the fingers of the glove. A simple support can be cut from 2-ply archival matboard. Be sure to sand or burnish the cut edges of the board so that there are no rough spots. If more padding is required, pad the matboard with polyester fleece Pellon and finish with a layer of cotton stockinet (Figure K.9).

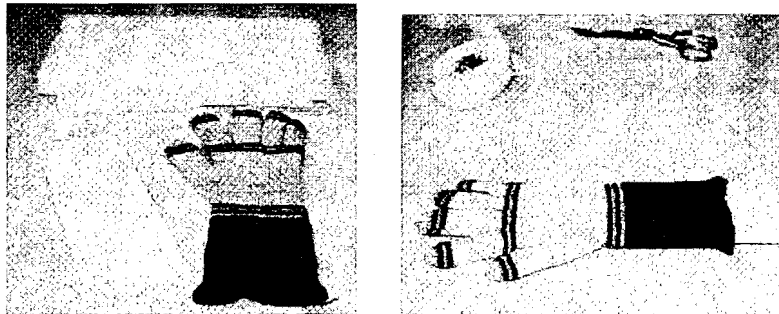


Figure K.9: Internal support for gloves and mittens. Internal supports should be smooth and slightly smaller than the object. Do not over pad the interior of a dimensional textile.

5. *How do I store bags and purses?*

Bags and purses may need to be gently stuffed with unbuffered archival tissue to maintain their shape. The best way to prevent damage to handles, chains, and clasps, is to wrap them with tissue, or create cavity packs in storage drawers. Cavity packing offers the additional benefit of isolating the metals and other materials of the handles and chains from the textile.

6. *How do I store fans?*

Fans should be stored closed if they are in good condition. Storing fans open may cause distortions that will prevent their being closed in the future. However, if the paper or fabric body of the fan is cracked or split, repeated opening and closing will cause damage. In this case, the fan should be stored open on a graded support (see Figure K.10).

- Provide support for tassels attached to the heel of the fan.
- Store fans separately from original cases or boxes.

Step 1: Cut a fan-shaped support board from 4-ply archival mat board or archival corrugated board at least 1" larger in dimension than the fan.



Step 2: Cut wedge-shaped pieces of polyester batting, layering them on the support board to match the profile of the opened fan.



Step 3: A small roll of batting will be necessary to support the uppermost fan sticks.



Step 4: Cover the padded support with washed cotton fabric, stitching the cover together in the back. Make two parallel cuts through the mount on both sides and thread twill tape ties through to the front. Secure the fan sticks with the twill tape ties.



Figure K.10: Padded support for a fragile fan.

7. *How do I store parasols and umbrellas?*

Parasols and umbrellas are composite objects made of combinations of fabric, paper, bone, wood, and ivory. The condition of individual objects will determine the best storage method.

- Check for metal corrosion and sharp edges. These will need to be wrapped or padded to prevent damage to the rest of the object.
- Store parasols and umbrellas slightly furled, padding the folds with unbuffered archival tissue that is rolled into narrow cones (Figure K.11).
- Do not open a parasol or umbrella completely unless it is absolutely necessary.
- If the parasol or umbrella fabric is relatively sturdy, wrap the padded object in muslin secured with twill-tape ties before laying it in a drawer.
- If the parasol or umbrella fabric is weighted silk or another fragile material, wrap the padded object in unbuffered archival tissue before securing it in a muslin wrapper.
- Label the muslin wrapper with catalog and other identifying numbers to prevent unnecessary handling.



Figure K. 11: Pad the folds of an umbrella with cone-shaped rolls of archival tissue.

J. General Considerations for Exhibition

1. *How often should I rotate textiles in exhibitions?*

Textiles are fragile. They are subject to deterioration by improper levels of temperature and RH, UV and visible light, pests, pollutants, and improper handling. Like other sensitive materials, you should periodically change textiles in exhibitions.

Rare or fragile textiles should remain on display for periods of three to six months. Sturdy textiles, properly mounted and displayed in optimum exhibition conditions may remain on display for six to nine months.

Long-term and permanent exhibitions should be designed to allow for rotation of textile objects at three, six, or nine month intervals, depending on the condition of the item.

2. *What are special considerations for exhibiting textiles in open displays in historic houses?*

Location of objects within the display is important. Check the location of lighting fixtures, air vents and intakes, and entry and exit locations for visitors. Avoid placing textiles in these locations in the display. Use these guidelines:

- Place furniture cups or small discs of archival corrugated cardboard under furniture legs and casters when furniture is placed on historic carpets or floor coverings.
- Separate textiles from polished wood and other surfaces with a sheet of thin Mylar® or unbuffered archival tissue.
- Use barriers to prevent visitors from sitting on furniture or entering rooms.

Ropes and chair cords are not always completely effective in preventing visitors from touching fragile objects or sitting on furniture. Place delicate objects beyond reach. Construct chair cords so that they will give way if a visitor sits on the chair. If the cord is tight, it may stress the furniture joints and cause them to break.

3. *What are special considerations for using rugs and carpets in historic house displays?*

Avoid using valuable historic carpets and rugs on the floor unless they are where the public will not walk on them. For all rugs and carpets used on the floor, use the following guidance:

- Appropriate rug pads should be used. Some synthetic padding (Dacron polyester) has a non-skid surface that is placed against the floor to prevent the rug from slipping. Avoid rubber non-skid pads, jute, and horsehair.
- Remove shoes, or cover shoes with operating room "booties" when performing maintenance activities on and around historic carpets.
- Do not use vacuums with beater attachments on historic rugs. All parks should have a vacuum that is reserved for collection objects rather than routine maintenance of the building. Use that vacuum and control the suction. The plastic wood-floor attachment is usually adequate for vacuuming rugs that are not walked on regularly. Vacuum in the direction of the pile.
- Vacuum the back of the rug, padding, and floor underneath at least once a year.
- Monitor pest traps for carpet beetle and moth evidence regularly, and act quickly if an infestation is suspected.
- If visitor traffic must be directed across a carpet, use a runner to designate the walkway. A runner made from synthetic carpet is the

best choice. If clear plastic runners must be used, choose one that does not have pointed tabs on the back that are meant to pierce the carpet underneath to hold the runner in place.

- Avoid traffic across the fragile fringe of any carpet.
- Consider using a reproduction carpet.

4. *How should I treat original draperies, fabric wall coverings, and upholstery if they must be replaced by reproductions?*

It is important to keep representative samples of all components of furnishing fabrics as part of the collection. This will include fringe, gimp, decorative tacks, and linings. If samples of materials like horsehair padding are kept, be sure to enclose them in polyethylene zip closure bags to prevent insect infestation. The original material, its location, method of attachment, and any other data should be thoroughly documented in writing and with photographs before it is replaced. Consult with historic furnishing experts before any disassembling or decisions on replacement are taken.

K. Exhibition of Flat Textiles

1. *How should flat textiles be displayed?*

Carefully assess the condition of an object before deciding upon a display technique. If there is any question, consult with a textile conservator for guidance. Use the least interventive method of installing textiles in exhibition wherever possible. Use minimal stitching, or avoid stitching if possible. Pinning is sometimes an option. Use only rustproof entomological pins to secure textiles to supports.

Preparing a stitched textile mount requires skill and care. In most cases, a textile conservator should prepare a stitched mount.

Small and fragile textiles can be placed flat or on a slanted support in an exhibition case.

- Display cases must be constructed of appropriate materials (see the *NPS Exhibit Conservation Guidelines* CD available from the Division of Conservation at Harpers Ferry).
- Avoid folding textiles wherever possible.
- Minimize handling during installation and de-installation by using rigid, padded supports (see Question 2. below).

2. *What is the best way to construct padded supports for flat textiles?*

Choose a lightweight but sturdy material like archival corrugated cardboard, archival honeycomb panels, or corrugated polyethylene sheets (Core-X®) for the support. The board should be equal to or slightly larger than the size of the textile.

- Pad the board with a thin layer of polyester quilt batting or Pellon fleece.
- Wrap washed cotton fabric around the padding and board and secure the fabric to the back of the mount with double-sided archival tape or polyethylene hot-melt adhesive.

- Lay the textile on the fabric surface. Use a few rustproof entomological pins to secure the textile to a slanted support. Try to slide the pins between, rather than through, yarns.
- Avoid using pins if a textile is brittle or fragile. Instead, place the textile on its support flat in the exhibition case.

3. *What are appropriate supports for large textiles?*

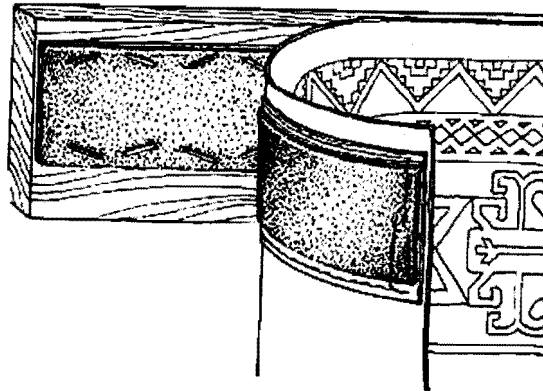
Consult with a conservator before attempting to mount large textiles for hanging. A fine silk hanging will have different requirements than a heavy wool tapestry.

- A textile should be hung in the warp direction whenever possible. Do not hang along the bias.
- The mount should distribute the weight of the textile without causing stress to any particular point.
- Roll, rather than fold, excess length for oversized textiles.
- There are several display options for large textiles, including hook and loop tape, draping, rolling, and large slant supports.

4. *What is a hook and loop tape mount?*

Hook and loop tape (also known as VELCRO®) is an appropriate hanging material for large textiles in sturdy condition. Do not use the adhesive-backed tapes. The soft (loop) tape should be machine-sewn to a strip of upholstery webbing, and the webbing hand-sewn to the back of the textile. The stiff, hook tape is attached with rustproof staples to a sealed wooden batten. The wooden batten is installed on the wall, and the two tapes pressed together (see Figure K.12). Hook and loop tapes are sometimes used on the sides of textiles to stabilize areas that are uneven. The bottom of large textiles should not be fastened down to allow the textile to expand and contract in response to small environmental changes.

Figure K.12: Installation of a hook and loop tape mount (drawing by Jian Wu courtesy of Abrams Publishers).



5. What if the textile is too long for the exhibition space?

Hang large textiles at least twelve inches above the floor to prevent damage by visitors and cleaning equipment. If a textile is too long for the space, consider the following options:

- Hang the upper edge of the textile with hook and loop tape. Allow the extra length to drape onto a platform in front of the textile. Separate the textile from the platform with a sheet of Mylar®.
- Cover an archival rolling tube with washed cotton fabric and roll the top edge of the textile object onto the tube. Mount the tube on the wall with brackets.
- Drape the textile over a fabric-covered archival rolling tube and install the tube on the wall with brackets. This method is safe for many textiles, but is not very secure against theft. If you use this mounting technique, provide a barrier or enclose the textile in an exhibition case.

6. What is a slant support?

Large textiles that are too fragile to be hung by the top edge alone can be displayed flat on a platform, or on a slanted, fabric-covered support. Use the following materials to construct large slanted supports:

- Rigid paper honeycomb panels are among the best materials to use in constructing large supports. Use aluminum channel frames to construct a support with several panels.
- Some woods and plywood can be used to construct a support if properly finished (see Technical Notes 5: Exhibit Case Construction Materials from *NPS Exhibit Conservation Guidelines* available from the Division of Conservation, Harpers Ferry).
 - Choose well-seasoned, air-dried poplar, exterior grade plywood or high or medium-density boards using formaldehyde-free adhesive.

- Finish these boards with several coats of moisture-borne polyurethane varnish and allow to dry completely.

NOTE: Not all moisture-borne polyurethanes are safe for use. Also, formulations can change without notice. Test the varnish prior to use to guarantee its acceptability.

- Place a layer of polyester quilt batting or Pellon® on the finished wood.
- Cover the board with washed cotton fabric. Fabric can be secured at the back of wooden boards with rustproof staples.
- Attach the textile to the display board with hook and loop tape mounts. If the textile is fragmentary or uneven, several short lengths of the hook and loop can be attached strategically behind the textile.

Install slant boards at a maximum angle of 15° to reduce the stress of gravity on weakened textiles.

7. *What are the considerations for framing textiles?*

Small and medium-sized textiles can be framed with stitching techniques, or by using a specialized mount called a “pressure mount.” A stitched mount is an interventive technique that must be carried out by a textile conservator. A conservator or technician with specialized training constructs pressure mounts.

Specify the following in working with a conservator to frame a textile:

- Whenever possible, choose cotton fabric as the exhibition fabric. Linen is a second choice. Silk is a poor choice because of dye stability and poor light fastness. Wool is susceptible to insect infestation and should not be used.
- Exhibition fabric should be pre-washed to remove sizings and finishes.
- Wooden elements of stretcher frames should be made of low-resin wood (such as poplar). All wooden framing elements should be coated with an appropriate moisture-borne polyurethane varnish and thoroughly dried before use.
- Stretcher frames should be faced with archival matboard to provide a solid support for the mount.
- One or more layers of padding (thin polyester quilt batting or Pellon® fleece) should be placed behind the exhibition fabric for cushioning. Pressure mounts require several layers that are graded in size, to provide even support (see Question 13 below).
- Use Acrylic® as the glazing material. Avoid glass when working with textiles because it can break and damage the object. Specify ultraviolet-filtering Acrylic® in framing textiles if exhibition lighting conditions are imperfect.

- In a stitch-mount, make sure that the glazing does not come in contact with the textile. Archival mat board or thin acrylic strips at the edges of the frame can act as a spacer between the frame and the textile.
- Never turn under ragged edges or turn part of the textile over the edge of the stretcher. If the edges of the textile are unsightly, consider using a window mat of archival mat board to cover that part of the object.

8. *What is a pressure mount?*

A pressure mount uses the friction of the backing fabric and the glazing material (acrylic) to hold a textile in place without stitching. Padding behind the exhibition fabric provides cushioning to the textile object. This kind of mount is ideal for short-term exhibition of moderate to small-sized textiles and textile fragments. It is often the most suitable mount for somewhat brittle or fragile textiles that might be damaged by sewing techniques. A diagram of a typical pressure mount can be found in Figure K.13.

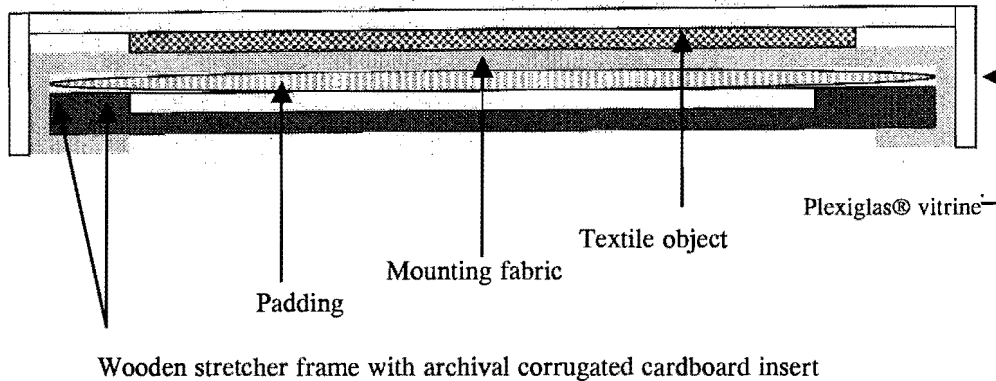


Figure K.13: Diagram of a pressure mount

9. *When do I know if a pressure mount is the most appropriate display method?*

A textile conservator should determine whether a pressure mount is appropriate for a specific textile. There are some risks in using this kind of mount even though no stitching is involved. The Plexiglas® face of the mount often carries a static charge. That charge can lift fibers from a brittle textile. In those cases, a slanted or flat mount in an exhibition case would be a better choice.

The other limit on pressure mounts is size. The maximum size of a pressure mount is limited by the size of acrylic sheet used for the face of the mount. It also is very difficult to maintain complete contact between the textile and the acrylic over a large span. Large sheets of acrylic bow at the center. It requires substantial padding, and sometimes trial and error, to create a pressure mount for a large textile.

L. Display of Historic Costumes

Wearing original historic costumes is unacceptable in a museum context. Accidents, perspiration, make-up, stress of dressing and wear, and sudden gestures or movements create excessive, immediate hazards that cannot be justified. Reproductions can be made and used for educational purposes in conjunction with appropriate display of the collection.

Each costume item should be carefully evaluated before deciding on a display method. If the seams and fabric are sufficiently strong, a mannequin may be the most appropriate choice. If the garment is fragile, it may be necessary to use a flat or slanted display. However, costumes are three-dimensional, and it is important to pad the interior of a garment to prevent folding and creasing.

Costumes need the support of a mannequin of correct size and proportion. The mannequin must represent the fashionable profile of the period to provide appropriate internal support. Certain period costumes may also require the construction of period undergarments such as bustles, hoops and corsets for correct presentation.

Bias cut garments prevalent in costume of the 1920s and 1930s should not be on extended display because of the tendency of the fabrics to stretch. Dresses of this period often have few closures and can be difficult to install on a mannequin.

No seams should be undone in order to put a piece on display.

1. *Where do I find appropriate mannequins to display costumes?*

There are several companies that provide both generic and custom-made mannequins for museum use (see Section R. Additional Resources below). Castoff store mannequins can sometimes be adapted for use. In particular, child and youth mannequins may be adapted to historic costumes that often are smaller in size than current adult clothing.

Simple supports can be constructed by carving polyethylene foam blocks to shape. These forms are covered with layers of batting to pad the form to the correct shape, and then can be finished with cotton knit "skin" (see Figure K.14).

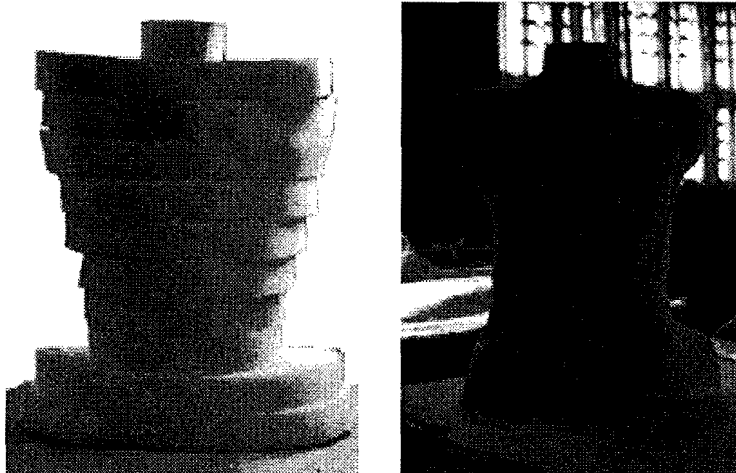


Figure K.14: Polyethylene foam cut to the shape of a torso, then padded with quilt batting and covered with cotton knit.

2. *How do I display unconstructed garments?*

Traditional mannequins may not provide sufficient support for fragile, unconstructed garments like ponchos. An archival tube padded with quilt batting and covered with cotton fabric is a simple mount for display of these kinds of garments.

M. Conservation Treatment

The following section discusses particular considerations before any treatment is carried out either by park staff or a conservator. NPS policy emphasizes stabilization as the goal of conservation treatment. Maintenance of proper environmental control, use of appropriate storage and display techniques, and careful handling can reduce the need for costly, interventive conservation treatments.

1. *What NPS guidance is available to help me make decisions about conservation treatment?*

Review Chapter 3: Preservation: Getting Started, for information on the roles of the curator/collections manager and the conservator and information on the Collection Condition Survey (CCS), and Chapter 8: Conservation Treatment, for information on conservation treatment issues and working with a conservator. In addition, *NPS Management Policies*, (Dec 2000) Chapter 5: Cultural Resource Management, discusses NPS policy for conservation treatment of museum objects.

2. *What kinds of treatment and maintenance can be undertaken by park staff?*

Park staff with appropriate training can undertake many maintenance activities associated with textile collections, such as:

- preparing appropriate storage housings
- constructing mannequins and other support mounts for exhibition
- vacuuming textiles, costume, upholstery and historic carpets on display to remove dust and protect from insect infestation

3. *What kinds of treatment and maintenance should be undertaken only by a conservator?*

All **interventive** treatments must be undertaken by a textile conservator including:

- wet and dry cleaning

- repair using needle and thread techniques
- consolidation with adhesives
- application of linings
- restorations and reconstructions
- specialized mounts (including stitched and pressure mounts)

There are many considerations in developing a conservation treatment. Some of the factors that a textile conservator will take into account before recommending a treatment are:

- no treatment is undertaken that is not absolutely necessary for the preservation, safe storage, or safe display of the object
- no treatment is completely reversible, so conservation should involve materials and methods that are the least harmful to the object
- treatment should not interfere with future research about the properties of the textile and the techniques used in its fabrication

4. *What cleaning methods are used on textiles?*

Cleaning of textile objects requires a different approach from that normally used for your own clothing. Even gentle cleaning is a drastic treatment, but it can be essential to the long-term preservation of a textile object (see Sections D.7 and D.9 above).

There are four categories of cleaning:

- surface (suction cleaning by vacuum)
- wet (cleaning with water or water plus detergent)
- dry (cleaning with organic solvents)
- spotting (treating of localized stains with wet or dry-cleaning solvents)

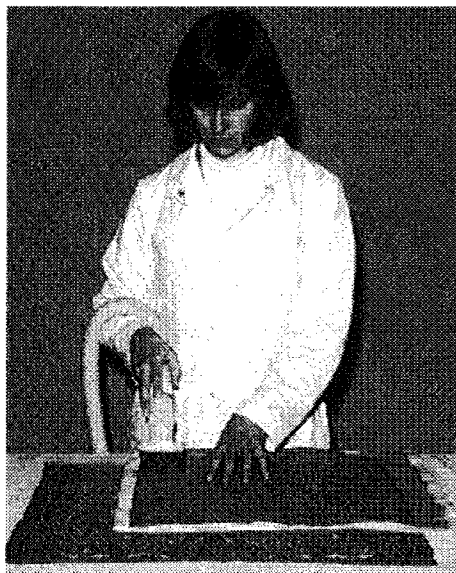
Wet, dry, and spotting treatments must be carried out by professionals. Vacuum cleaning is a regular form of maintenance of materials on open display, textiles being returned to storage, and newly acquired textiles before they are placed in storage or on display.

5. *What should I know about vacuuming textiles?*

Every park should have at least one vacuum cleaner that is reserved for use on museum objects. A vacuum with a HEPA filter (High Efficiency Particulate Air) that removes 99.97% of particulates 0.3 microns or larger in size is the most appropriate for removing dust and particulates from textiles (see *Conserve O Gram* 1/6: Choosing a Vacuum Cleaner for Use in Museum Collections, and *Tools of the Trade*). Your vacuum also should have a rheostat to allow for suction control. Most textiles should be vacuumed with very low suction. The upholstery or crevice wand is the best tool for vacuuming most textiles and upholstery; an upholstery brush works well on pile carpets.

It is easy to pick up loose threads and surface embellishments like embroidery when vacuuming. To prevent damage when vacuuming, protect the textile surface with polyester or nylon window screening. Sew cotton tape over the cut edges of the screen.

Figure K.15: Proper vacuuming technique. Loop the vacuum hose over your arm to keep from dragging it across the textile. Place the brush down on the surface of the screen. Lift the brush to move it to the next location (do not rub the brush back and forth across the screen).



6. *What techniques are used to repair textiles?*

Many repair techniques involve the use of needle and thread to close broken seams, compensate for fabric loss, or provide support to weakened areas. Work with a conservator to determine which repair technique is appropriate for your textile. Some questions you might want to discuss are:

- What is the goal of the treatment?
- Are repairs necessary to strengthen the textile structurally?
- Are repairs necessary to aesthetically improve the textile?
- What new materials will be introduced into the textile?
- Is it more appropriate to use synthetic or natural fabrics and thread for repairs?
- What is the wash and light-fastness of new materials?
- How will new materials be distinguished from the original?
- Will repairs of seams attempt to use original sewing holes?
- Will repair fabrics be dyed to a shade slightly different than the original?
- What kind of documentation will be used to record the use of new materials?

Some fabrics like weighted silks may be too brittle for needle and thread repairs. Adhesive techniques may be the only way to safely consolidate and repair those textiles. Adhesive techniques cannot be reversed easily. They also change the drape and “hand” of the fabric. Consider all of the options carefully before deciding on an adhesive treatment. You may want to discuss the following questions with the conservator:

- Are any other consolidation and treatment techniques available?
- Is it possible to use an overlay of translucent fabric or netting to hold the damaged areas in place?
- Are there less stressful display and storage techniques that could preserve the textile without further treatment?
- Will the textile continue to deteriorate or be in danger of further damage from handling if it is not treated?

Successful conservation treatment is the result of collaboration between the curator and conservator. Conservation treatments can be expensive and time consuming. Not all treatments result in striking visual changes. A well-structured plan and continuing communication with the conservator can avoid surprises and result in the best possible outcome.

7. *What textile conservation terminology should I be familiar with when talking to a conservator?*

Following are some of the common terms and practices used in textile conservation:

- **Wet cleaning.** Using water or water plus detergents to remove soils from a textile. Water is a powerful solvent. It can solubilize and react with dyes, degraded fibers, chemical pollutants, and other materials and additives found in and on a textile. Wet cleaning requires an understanding of the:
 - physical and chemical nature of the textile
 - source and chemical character of the water to be used
 - properties of the detergent system
 - type and nature of the soils to be removed

A textile conservator will always test the dyes and finishes of a textile before attempting wet cleaning to make sure that the textile can be safely treated.

- **Dry cleaning.** Cleaning using organic solvents with or without detergents or additives. Dry cleaning may be recommended when dyes or finishes are affected by water and there is no other safe cleaning treatment.

Dry cleaning solvents are extremely volatile and should only be handled by experienced professionals. Few historic textiles can withstand conventional dry cleaning. There are few dry cleaners offering hand cleaning. If dry cleaning is recommended, the conservator should provide supervision and oversight to the cleaner undertaking the work.

- **Spotting.** Spotting or spot cleaning is the treatment of localized stains with water or an organic solvent. Spot cleaning requires specialized equipment to prevent the stains from migrating into surrounding areas. This technique is often used to remove oily stains from a textile prior to wet cleaning.
- **Support.** The term “support” can refer to materials that provide shape and structure (such as a mannequin) or materials used to stabilize weakened areas of a textile. A support also can be a box or tray used to safely transport a textile.

A support often is a piece of new fabric used as a *patch* or *backing*. Support patches and backings are attached by stitching or adhesive techniques. The fabrics are chosen for their visual and chemical compatibility with the original, as well as light and wash-fastness.

- **Mount.** A mount is a kind of support used to prepare a textile for exhibition or storage. Unlike other kinds of supports, mounts are not permanently attached to the textile. A few examples of mounts are:
 - mannequins
 - frames
 - slant boards
 - structures that provide shape to hats
 - cavity packs
 - padded hangers
- **Lining.** Linings are protective dust covers for the back of a textile. In a garment, linings are integral to the garment structure. A conservator may add additional linings to a garment to protect the original fabric from abrasion from handling or display on a mannequin. Linings for large wall-hung textiles, like tapestries, are usually a tightly woven fabric. Linings are separate from supports, and like mounts, are not permanently attached to the textile.

N. Packing and Shipping Textile Objects

For general information on packing and shipping museum collections see Chapter 6: Handling, Packing, and Shipping. Flat textiles, costumes, and costume accessories should be packed in boxes, and the boxes packed in crates. Rolled textiles should be immobilized in crates by polyethylene foam blocks that suspend the roll in the crate (see Figure K.16).

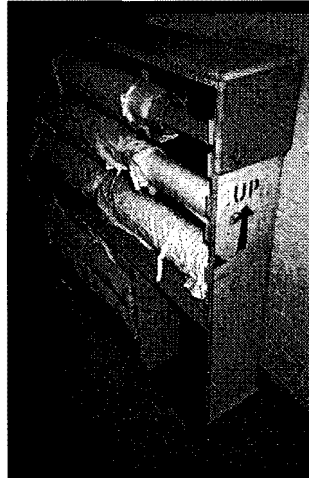


Figure K.16: Shipping crate with suspended textile rolls. (Photograph courtesy of Harold F. Mailand)

1. *Are there special considerations for packing and shipping textile objects?*

The condition of a textile will determine appropriate packing and shipping techniques. The most difficult situations will occur when it is necessary to ship a fragile textile to a conservator for treatment. Work with the conservator to determine the best method. In general:

- Roll medium to large-size flat textiles if possible. Roll the textile as you would for storage. Wrap clear polyethylene sheeting around the rolled textile and seal completely with packing tape to protect against water damage.
- Fragments and small textiles can be shipped in storage mats (see Appendix I, Figure I.8 Construction of a Portfolio Mount for Archeological Textile Fragments) or padded in archival boxes of various sizes. If you are using a box, be sure to use sufficient padding to fill the box completely. Polyethylene foam blocks covered with polyester batting and muslin are good for this purpose.
- Do not use crumpled tissue in packing textiles and costume. The tissue tends to shift and compress. Use tissue folded into pillows, or batting-stuffed cotton-knit “sausages” in place of crumpled tissue to pad folds and provide interior supports.

2. *Are there special considerations for packing and shipping framed textiles?*

Never ship textiles framed behind glass. Replace glass with acrylic (Plexiglas®). Always wrap framed textiles in clear polyethylene sheeting and seal with packing tape to protect against water damage. Use the “box-within-a-box” method to pack and ship framed textiles.

3. *Are there special considerations for packing and shipping costume accessories such as hats?*

Three-dimensional textiles require the same kinds of interior supports for packing and shipping as for storage. The ideal packing method for three-dimensional textiles are cavity packs within archival boxes (see Chapter 6, F.4).

O. Emergency Procedures for Textile Objects

Appropriate response to emergencies from a natural disaster or vandalism should be incorporated within the park's Emergency Operations Plan (EOP). Consider the following:

- Close off the affected area and assemble sufficient personnel to deal with the problem. Unnecessary or inappropriate handling can create greater loss than the initial situation.
- Prepare a clean, dry workspace. If the emergency includes water or other liquids, have fans and dehumidifiers ready.
- Be aware of the size of doorways, stairways, corridors, and objects that cause difficulty in maneuvering to get to the workspace.
- Deal first with objects that are in danger of additional damage, such as those hanging precariously or with elongated tears.
- Water-soaked textiles are heavy and weaker than when they are dry. Carry one object at a time. Use auxiliary supports such as rolling carts or trays to move wet textiles.
- Be careful to support the whole textile. Avoid handling by edges and corners to avoid stretching and tearing.
- Collect and preserve all fragments.
- No piece should be in contact with another object.
- The immediate danger to wet textiles is dye bleed and mold. Do not attempt to dry textiles with heat. Instead, set up fans and dehumidifiers, and try to absorb excess water. Your emergency supplies should include clean toweling and boxes of disposable baby diapers for this purpose.
- If the liquid is unknown, assume the worst. It might be a corrosive or caustic chemical that could cause damage to personnel. Do not flush the textile with water as this could spread the chemicals and cause further damage and additional chemical reactions. Locate protective equipment, warn other staff of the potential hazard, and contact the park or regional HAZMAT coordinator according to the park's EOP.

P. Glossary

| | |
|-------------------------------|--|
| <i>Constructed Garment:</i> | clothing that has been made by cutting and piecing fabric(s) together. Most Western dress is made this way (see also: <i>unconstructed garment</i>) |
| <i>Costume Accessory:</i> | objects associated with costume collections including hats, bonnets, shoes, gloves, purses, fans, umbrellas, and parasols |
| <i>Dry Cleaning:</i> | textile conservation treatment using organic solvents and detergents |
| <i>Dye:</i> | plant materials and various chemicals that add color to textiles |
| <i>Felting:</i> | the process of using heat, water, and pressure to interlock loose fibers together |
| <i>Fibers:</i> | the raw materials used to make textiles. Fibers come from natural (animal and plant) and synthetic sources and may also include metals and alloys |
| <i>Finish:</i> | manufacturing process to prepare textiles for use. Finishes include dyes, lubricants, chemical compounds, mechanical treatments, sizing, water and stain repellents, mothproofing, and flameproofing |
| <i>Lacemaking:</i> | a variety of techniques that involve the intricate twisting of fine threads to form a pattern |
| <i>Lining:</i> | protective dust cover for the back of a textile. Linings for garments are integral to the garment structure |
| <i>Macramé:</i> | a knotting technique using more than one strand of yarn to create fringes and edgings |
| <i>Mercerization:</i> | cotton processing technique using a strongly alkaline chemical to improve dyeing, add softness, and add flexibility |
| <i>Mordant:</i> | chemicals (usually metallic salts) applied to yarn or cloth to fix dyes |
| <i>Mount:</i> | a type of support used to prepare a textile for exhibition or storage |
| <i>Netting:</i> | textile produced from a single, continuous strand by looping and knotting |
| <i>Pressure Mount:</i> | a temporary framing technique for flat textiles |
| <i>Retting:</i> | soaking flax to loosen fibers from the plant stem |
| <i>Spinning:</i> | twisting short fibers together to make a long thread |
| <i>Spotting:</i> | treatment of localized stains with wet or dry-cleaning solvents |
| <i>Support:</i> | materials that provide shape and structure, or are used to stabilize weakened areas of a textile |
| <i>Unconstructed Garment:</i> | clothing that uses the rectangular shape of fabric yardage for construction. This type of garment is common in many forms of ethnic dress such as Hopi and Pueblo clothing and Japanese kimonos |

| | |
|----------------------|---|
| Warp: | the parallel yarns stretched on a loom (lengthwise) |
| Weaving: | making cloth by interlacing threads of the warp and weft on a loom |
| Weft: | the transverse yarns interlacing with the warp in a pattern |
| Weighting: | an 18 th and 19 th -century silk processing treatment using metallic salts to produce fuller, heavier fabrics |
| Wet Cleaning: | conservation treatment using water or water plus detergents |

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R. Additional Resources

Handling, Storage, and Care

Canadian Conservation Institute. *CCI Notes*. Ottawa: Canadian Conservation Institute
1030 Innes Road
Ottawa, Ontario
K1A 0C8
Canada
<<http://www.cci-iiic.gc.ca/>>

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Society for the Preservation of Natural History Collections (SPNHC)
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National Park Service. *Conserve O Gram*. Washington, DC: National Park Service.
<http://www.cr.nps.gov/museum/publications/conservoogram/cons_toc.html>

The Textile Museum <<http://www.textilemuseum.org/care.htm>>
“A Hanging System for Textiles in Sturdy Condition”
“Storing Oriental Rugs”
“Guidelines for the Care of Textiles”
“Pestbusters”

Conservation Resources

Conservation On-Line: <<http://palimpsest.stanford.edu/>>

American Institute for Conservation of Historic and Artistic Works (AIC): <<http://palimpsest.stanford.edu/aic/>>

Mannequins

Dorfman Museum Figures, Inc.: <<http://www.museumfigures.com/>>

Anatomic Studio: <<http://www.anatomic.net/>>

Professional Societies and Research Organizations

Costume Society of America
<<http://www.costumesocietyamerica.com/>>

Pasold Research Institute (publishers of the periodical *Textile History*)
<<http://www.maney.co.uk/textilehistory.html>>

Textile Society of America
<<http://textilesociety.org/>>

