



the common buffering agents. Because this alkaline reserve depletes over time, storage containers that were once acid-free can become acidic. *Buffered paper is alkaline at about 7.5 to 8.5 pH.*

### ***Unbuffered and Neutral Paper***

Unbuffered acid-free paper products are neutral or slightly alkaline but do not contain an alkaline reserve. *Neutral paper has a pH of 7-7.5*, and does not contain acid. It has a limited capacity to absorb acids from the environment or from objects housed inside, whereas alkaline buffered materials can help neutralize acids as they form. (See *Conserve O Gram 14/2*, Storage Enclosures for Photographic Prints and Negatives.) Unbuffered acid-free paper is pH neutral at the time of manufacture; however, the pH value will drop when exposed to normal atmospheric conditions.

**NOTE:** Most objects can be safely housed in unbuffered neutral pH material (exceptions are listed in the table). *When in doubt about the type of enclosure or container to use, an unbuffered neutral pH enclosure is recommended.*

The following table serves as a quick reference for the use of buffered or unbuffered products for the storage of objects. Refer to NPS *Museum Handbook*, Part I (Rev 9/90) for the specific types of storage enclosures and containers recommended for each object type and condition. Often, depending upon condition and stage of deterioration, similar objects should be placed in very different types of storage containers. Consult a conservator for advice if questions remain concerning proper housing.

### ***Sources***

NPS curatorial staff should refer to the current NPS *Tools of the Trade* for information on the various types of housing enclosures available.

Unbuffered neutral pH and buffered storage enclosures and containers can be purchased from archival-quality material suppliers, such as the following:

Conservation Resources International, 8000-H Forbes Place, Springfield, VA 22151; (800) 634-6932 or (703) 321-7730; Fax (703) 321-0629.

Gaylord Bros., Box 4901, Syracuse, NY 13221-4901; (800) 448-6160 or (315) 457-5070; Fax (800) 272-3412.

Light Impressions Corporation, 439 Monroe Avenue, P.O. Box 940, Rochester, NY 14603-0940; (800) 828-6216 or (716) 271-8960; Fax (716) 442-7318.

University Products, 517 Main Street, P.O. Box 101, Holyoke, MA 01041-0101; (800) 628-1912 or (413) 532-9431; Fax (800) 532-9281.

Virginia Kilby  
Staff Curator  
Curatorial Services Division  
National Park Service  
Washington, DC 20013-7127

Object Type	Buffered Materials	Unbuffered Materials	Remarks
<b>Archeological Materials</b>		Depending on the objects, many are housed in plastic such as polyethylene and polypropylene; use unbuffered tissue if padding is needed.	Buffered is not recommended because of the possibility of influencing research chemical analysis by placing object in an alkaline environment. See NPS, <i>Museum Handbook</i> , Part I (Rev 9/90), Appendix I, for storage guidelines.
<b>Archival &amp; Library</b>	Books, damaged or rare, (house in archival rare book boxes) Flat documents Manuscripts Maps Most papers (with exceptions listed under unbuffered); Posters	Albums and collages with wool or silk components Blueprints Dialzo reproductions Handtinted materials (maps, etc.) Friable media (especially pastel and charcoal) should be stored in shallow boxes.	Buffered materials are preferable for storage of archival items with exceptions listed at left under <i>Unbuffered</i> .  Buffered materials can alter the pigment color, so when storing handtinted or other color friable media mounted on acidic board, place in unbuffered pH neutral enclosure with a slip sheet of buffered next to the acidic board.
<b>Archival &amp; Library: Photographic Materials</b>	Cellulose-nitrate and acetate and early safety film negatives <b>NOTE:</b> Cellulose-nitrate is a fire hazard. The NPS policy for preserving it is by duplicating it onto safety film and storing the original in an appropriate storage facility. See NPS <i>Museum Handbook</i> , Part I (Rev 9/90), Appendix M, Curatorial Care of Cellulose Nitrate Negatives.	Monochrome processes, including: Albumen prints Ambrotypes Collodion prints Cyanotypes Daguerreotypes Gelatin prints Glass negatives Lantern slides Palladian prints Platinum prints Salted paper Sunprints  Color images and negatives, including: Chromogenic photographs Dye transfer prints Polaroid prints	Current research indicates that buffered enclosures housing salted paper, albumen, gelatin, platinum and collodion-processed prints are <i>not detrimental provided RH levels are maintained</i> . It is <i>not</i> necessary to <i>replace present</i> buffered enclosures with unbuffered materials for these media.  Any materials used to store photographs should have passed the Photographic Activity Test (PAT). See <i>Conserve O Gram 14/2</i> , Storage Enclosures for Photographic Prints and Negatives.
<b>Works of Art on Paper</b>	Prints Drawings	Watercolors Handtinted prints, drawings and other art	
<b>Ethnographic Materials</b>	Cellulosic (plant-derived) materials: Bark Cotton Linen Paper Wood	Proteinaceous (animal-derived) materials: Antler Quill Bone Silk Horn Skin Ivory Wool Leather	Ethnographic objects are often complex and could contain materials sensitive to buffered environment. If in doubt, use unbuffered neutral pH materials. See also <i>Remarks</i> under <i>Textiles</i> below.

<i>Object Type</i>	<i>Buffered Materials</i>	<i>Unbuffered Materials</i>	<i>Remarks</i>
<i>Film</i>	Black/white motion picture film	Color motion picture film	<b>NOTE:</b> Cellulose nitrate film is a fire hazard. The NPS policy for its preservation is by duplicating it onto safety film and storing the original in an appropriate storage facility. See NPS Special Directive 93-2 "Preserving NPS Cellulose Nitrate Film Collections," and NPS <i>Museum Handbook</i> , Part I (Rev 9/90), Appendix M, Curatorial Care of Cellulose Nitrate Negatives.
<i>Metal</i>		Silver (Use acid- and sulphur-free tissue for wrapping to prevent tarnish.) Iron, lead, and other metals	Heavy, stiff tissue may scratch some soft metal; use a soft, neutral pH tissue.
<i>Natural History Specimens</i>	Herbarium collections	Insects (pinning trays) Skeletal material Birds and mammals	Does not apply to wet specimens except for label (unbuffered).
<i>Textiles</i>		All Textiles	Many references recommend buffered for plant derived material (cotton, linen) and unbuffered for animal derived material (wool, silk). The NPS Harpers Ferry Center Division of Conservation recommends that all textiles be wrapped in soft, unbuffered, neutral pH tissue. This recommendation is not based on chemistry, but is offered as a means to eliminate confusion because there are many buffered tissues. Many have hard, sharp corners when folded or crumpled and are too heavy or stiff for some fabrics.

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