Article: A Medley of Map Treatments
Author: Heather Hendry
Source: Book and Paper Group Annual 43, 2024
Pages: 12-18
Editors: Roger S. Williams, Managing Editor, and Amy Crist, Assistant Editor
Editorial Office: bpgannual@gmail.com
ISSN: 2835-7418

The *Book and Paper Group Annual* is published once each year by the Book and Paper Group (BPG), a specialty group of the American Institute for Conservation (AIC). It was published in print from 1982 to 2021, and transitioned to a digital publication in 2022. All issues are available online at https://culturalheritage.org.

Print copies of back issues are available from AIC. All correspondence concerning back issues should be addressed to:

American Institute for Conservation
727 15th Street NW, Suite 500
Washington, DC 20005
info@culturalheritage.org www.culturalheritage.org

HEATHER HENDRY

A Medley of Map Treatments

INTRODUCTION

The Conservation Center for Art and Historic Artifacts (CCAHA) is a regional laboratory that provides conservation and preservation services to a wide range of clients. We do not have our own collection, which leads to a wide variety of objects coming into the laboratory, as well as a range of client needs and storage considerations. The objects that our clients send for treatment may be based on our recommendations through collection surveys but more often come from the clients' judgment of their most vulnerable and important objects. There is often some plan for display after treatment, although clients' goals may also include digitization or general collections stewardship.

Our clients frequently select maps for treatment both because of their importance and their precarious condition. For many local historical museums or archives, a historical map of the area is an important grounding framework to understand the rest of their collection. Private clients often feel a great connection to a historic map because of their connection to the area. At the same time, these maps can be extremely fragile due to their history of use. Maps may be made with a wide range of sizes, media, and supports. This article describes treatment solutions for three very different types of problems that occurred during treatments of historic maps but could also apply to other works on paper.

BACKING REMOVAL AND LINING OF A WATER-SOLUBLE HAND-DRAWN MAP

The Map of Essex County, belonging to the Millburn Short-Hills Historical Society Museum, is a hand-drawn map from 1872 (fig. 1). It is drawn in red, brown, black, and blue inks, with additional annotations in red, blue, and graphite pencils. The paper is lined overall on cloth. When it was received at CCAHA, the paper of the map was heavily fragmented and the cloth no longer provided a secure physical support. The

Fig. 1. Map of Essex County, Millburn Short-Hills Historical Society Museum collection. Courtesy of Andrew Pinkham, CCAHA.

adhesive was so weakened that it could be released mechanically, which risked the loss of more fragments. Additionally, there were many tight wrinkles in the paper where it appeared the paper had expanded while the cloth had not; these areas were vulnerable to further physical damage. Overall, the paper was discolored and brittle, with strong liquid stains along the right side.

A standard conservation treatment at CCAHA would be to remove the cloth lining with moisture, keeping the pieces aligned by surface tension on a non-woven polyester web such as Hollytex or Bondina, wash the map in calcium-enriched deionized water, and reline it onto a mulberry paper with wheat starch paste. However, the solubility of the inks would not allow standard washing or drop lining techniques. Careful testing determined that the inks could tolerate humidification or a brief suction wash, but not the full saturation of a blotter or Tek-Wipe wash, any immersion bath, or

Papers presented during the Book and Paper Group Session, AIC's 52nd Annual Meeting, May 20–24, 2024, Salt Lake City, Utah

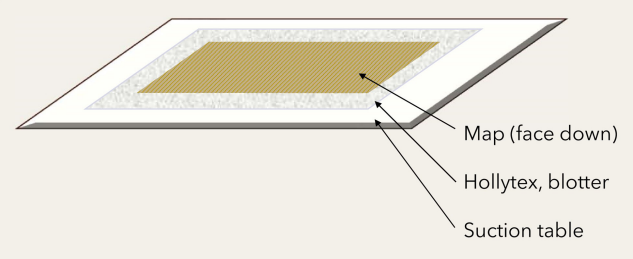

Fig. 2. Diagram of the map laid on the suction table.

the contact involved in either drop lining or being placed face down while wet.

Because of the solubility concerns, the cloth lining was removed and a new mulberry paper lining was applied almost completely dry, using the suction table. First, the map was placed face down on the suction table (fig. 2). The suction held the map in place, with no loss or displacement of fragments, while the lining was mechanically detached in strips (fig. 3). Once the cloth lining was removed, a new lining of Hiromi Self-Adhesive Tengucho was laid on the back of the map. This relatively newer product is a 5 gsm mulberry tissue that has been precoated with jin shofu wheat starch paste—it behaves similarly to remoistenable tissues that conservators prepare by hand but has a much thinner adhesive layer. The

Fig. 3. Detaching the lining mechanically while the map is held with suction. Courtesy of Jilliann Wilcox, CCAHA.

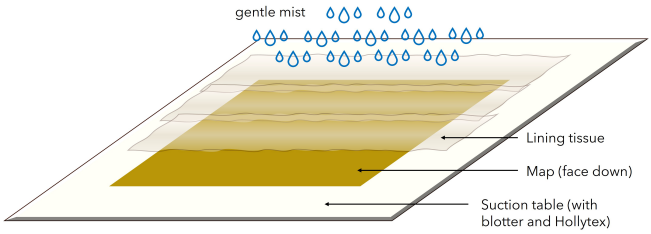

Fig. 4. Diagram of the lining activation process.

lining was activated by gently misting with water while the map was still under suction (fig. 4). In this case, using a new technique, the lining was applied in several 6 inch wide strips for greater control, but an overall single lining may also be possible.

Once the lining was applied with minimal moisture, the map could be removed from suction. The very thin lining was not strong enough to support it permanently but allowed safe handling with no fragment loss throughout the rest of the treatment. The lining tissue was also thin enough that hard creases could be humidified and eased out, even with the lining attached. The map was then washed face up on the suction table, allowing conservators to monitor the soluble media throughout the washing process. During suction washing, the remoistenable lining stayed securely adhered. The map was then lined again overall on a heavier, toned mulberry paper that provided stronger support and bridged the losses visually (fig. 5).

Overall, using the suction table in combination with the remoistenable lining allowed us to prevent any displacement

Fig. 5. Map of Essex County, after treatment. Courtesy of Andrew Pinkham, CCAHA.

or loss of fragments while replacing the unstable cloth lining with minimal moisture. In this example, the media solubility allowed some suction washing after relining, but the suction table, mechanical backing removal, and remoistenable lining could be successful even on media that was too soluble for any amount of washing.

RESOLVING HARD TENTS IN OVERSIZED CLOTH-LINED MAPS

The Schillner maps are a series of 71 hand-drawn maps of the Erie, Oswego, and Champlain canals. They were drawn between 1896 and 1908 based on careful surveying from the winter of 1896, and are colloquially named after George L. Schillner, New York State civil engineer and mapmaker. Each map is approximately 6 × 8 feet and is drawn on a single large sheet of heavy wove paper. The maps are mounted on white fabric supports and have been stored rolled. Currently in the collection of the New York State Archives (NYSA), they will continue to be stored rolled on sturdy alkaline-buffered tubes due to their size.

The paper of the maps remains somewhat flexible, so each map can be rolled and unrolled; however, it retains such a strong memory of rolling that it will not lie flat without restraint. Additionally, there are strong horizontal creases or "tenting" where the ingrained curvature of the paper has resulted in a peak, cracking the paper along the peak (fig. 6). The fabric backing was mostly intact, sturdy, and well adhered but did not pull the paper flat enough to prevent the tenting. Most of the 20 maps examined at CCAHA had three to five major tents across most or all of the width of the map. There were also tented areas that were shorter or less severe, but were expected to develop into larger and more dramatic tents over time. The tenting made the maps unsafe to view or handle, and would also distort the appearance during digital imaging, which was an important goal for the NYSA.

Fig. 6. Tenting on the Schillner maps, NYSA collection.

In determining the treatment plan for this group of maps, CCAHA conservators considered several options, including removing the fabric backings and relining, overall flattening prior to mending, and local flattening and mending. Although the fabric backing could be removed fairly easily either mechanically or with moisture, this did not seem practical because the hand-drawn media was too soluble for washing and lining, and also the size and number of these maps limited the time that could be spent on each. Overall flattening without removing the cloth backing seemed questionable due to the large size of the maps and the strength of both the paper and the cloth, which would create tension when humidified. Additionally, the size of the maps necessitated rolled storage after treatment, so it made more sense to keep them in a rolled format. This left local mending and flattening, which seemed possible but would require fairly strong reinforcement to counter the strong curl of the paper while avoiding creating distortions in the surrounding areas.

Once the client agreed to pursue local flattening and mending of the tented areas, several variations were explored. Local consolidation with methylcellulose was tested but was not strong enough on this heavy paper support. We also tested local humidification, introducing moisture gently through Gore-Tex strips, nano-mist, and humidified blotters, but any method that relaxed the paper enough to lie flat caused radiating distortions, and the weakened crack along the tent meant that the tent would recur as soon as the map was rerolled once.

Because local moisture was a concern, we also tested several nonaqueous adhesives, including films of Lascaux 360 and 498 in various dilutions, activated with either heat or solvents, and Klucel G in ethanol. In combination with testing a nonaqueous adhesive, we compared three mending supports: Hollytex 3257, Bondina, and mulberry paper. We also tested the location of the mending support, whether it could be placed on the verso of the intact cloth or on non-image areas of the recto of the map, or inserted between the paper and cloth backing.

After thoroughly testing mending options, we concluded that applying mending supports to the verso of the cloth could not provide adequate support. Mends with any degree of flexibility applied to the cloth would allow the tent to recur as the fabric bent and the separated edges of the paper split at the peak. Mending the paper on the recto would detract from both the aesthetic and informational value. The only suitable option was to locally peel up the cloth backing to mend the paper on its verso. Once this was decided, we also felt it was necessary to reattach the cloth afterward to avoid having some areas left without cloth backing, which would lead to local tensions and vulnerability.

Based on the adhesive testing, the only adhesive that adhered strongly enough to the tented paper yet remained reversible was wheat starch paste. However, pure wheat starch paste had a tendency to detach from the cloth, which appeared to have a mildly water-repellent finish. To counteract

Fig. 7. Working on the verso by rolling the map onto its storage tube.

this tendency, we used a 2:1 mixture of wheat starch paste and Klucel G (hydroxypropyl cellulose) when adhering to the cloth (note 1). Although the Klucel G was still prepared in water, it is a slightly less polar molecule than starch and was predicted to have a better affinity for the nonpolar finish on the cloth. As expected, the 2:1 wheat starch paste to Klucel G mixture did not peel off the cloth the way the pure wheat starch paste did.

The final hurdle in this treatment was the large size of the maps, which were even more difficult to handle safely with their pronounced curl and fragile tents. To minimize handling, a group of benches slightly larger than the map dimensions was dedicated to this project, with one map undergoing treatment at a time. As each map was unrolled for treatment, the before-treatment photography was completed in that location. A team of five paper conservators would sign up for times on the map workspace so that no single conservator was overwhelmed by the size of the project. When complete, the treated map would be checked and photographed in situ before rerolling. Most significantly, the maps were never placed face down throughout treatment. All verso treatments (surface cleaning, mends, and fills) were completed by rolling the map onto its storage tube to access the verso in sections (fig. 7).

The following treatment steps were used to mend the deep tents:

- The map was rolled onto its tube up to the horizontal tent, with a Hollytex interlayer under the treatment area. When rolled snugly, the tents lie flat.

Fig. 8. Separating the fabric lining and securing the crack with small bridging mends.

- The fabric backing was scored with a scalpel about an inch above or below the tent.
- The cloth was detached mechanically to expose the primary support on either side of the tent crack. As the fabric was removed, small mulberry paper mends were used to hold paper edges in place as needed (fig. 8).
- Any losses along the tent crack were bridged with toned mulberry paper.
- The primary support was mended with 1 1/2 inch wide strips of 30 gsm mulberry paper and wheat starch paste (fig. 9). These mends were dried under small pieces of blotter and weights for a minimum of 1 hour. Because the weights were balanced on the top of the roll, a "crash pad" of acid-free, buffered corrugated cardboard was placed over the exposed map to prevent damage if a weight slipped off the tube.
- The lifted cloth flaps were re-adhered to the map with 2:1 wheat starch paste to Klucel G in water.
- The verso of the cloth was immediately mended with a wider strip of 30 gsm mulberry paper and the 2:1 wheat starch paste to Klucel G mixture (fig. 10).
- The map was unrolled, and the mended area was dried under weights overnight.
- Non-image areas on the recto were given an almost invisible reinforcement with remoistenable tissue (fig. 11). The

Fig. 9. Mending the primary support.

Fig. 10. Reinforcing the secondary support.

Fig. 11. Applying remoistenable tissue to non-image areas of the recto.

remoistenable tissue was prepared in advance by coating 3.5 gsm mulberry tissue with a 1:1 mixture of wheat starch paste and methylcellulose and reactivated with moisture (note 2).

Although an unusual approach to a map treatment, this technique stabilized the vulnerable tents while minimizing handling. Minimizing handling was more important than usual because of the maps' large size and the potential for physical damage from their tenting and curl. The mended tented areas became slightly stiffer, but they could lie flat for digital imaging or roll tightly for storage, as well as being stable to handle either rolled or open. Due to budget constraints, CCAHA conservators completed treatment on 10 of the 71 maps. The rest of the maps will be mended by NYSA conservators as staff time allows, following the protocol developed at CCAHA.

CONDUCTING LARGE-SCALE SOLVENT TREATMENTS

This final treatment described in this article is not specific to one object, but is a solution frequently used at CCAHA when an object requiring an overall solvent treatment exceeds the size of the fume hood. This most commonly occurs with varnish removal from wall maps but can also be applied to any other situation that requires solvents. CCAHA is fortunate to have a large fume hood, but the depth is limited to a natural arm's reach. As paper objects can easily exceed these dimensions, a solution for larger objects was needed.

Several variations of the following design have been used for decades at CCAHA, and the description has been generally approved by an industrial hygienist. However, the specific configuration of any paper conservation laboratory and fume hood may vary. As with any treatment involving solvents, there is some risk of exposure. In our experience, this system

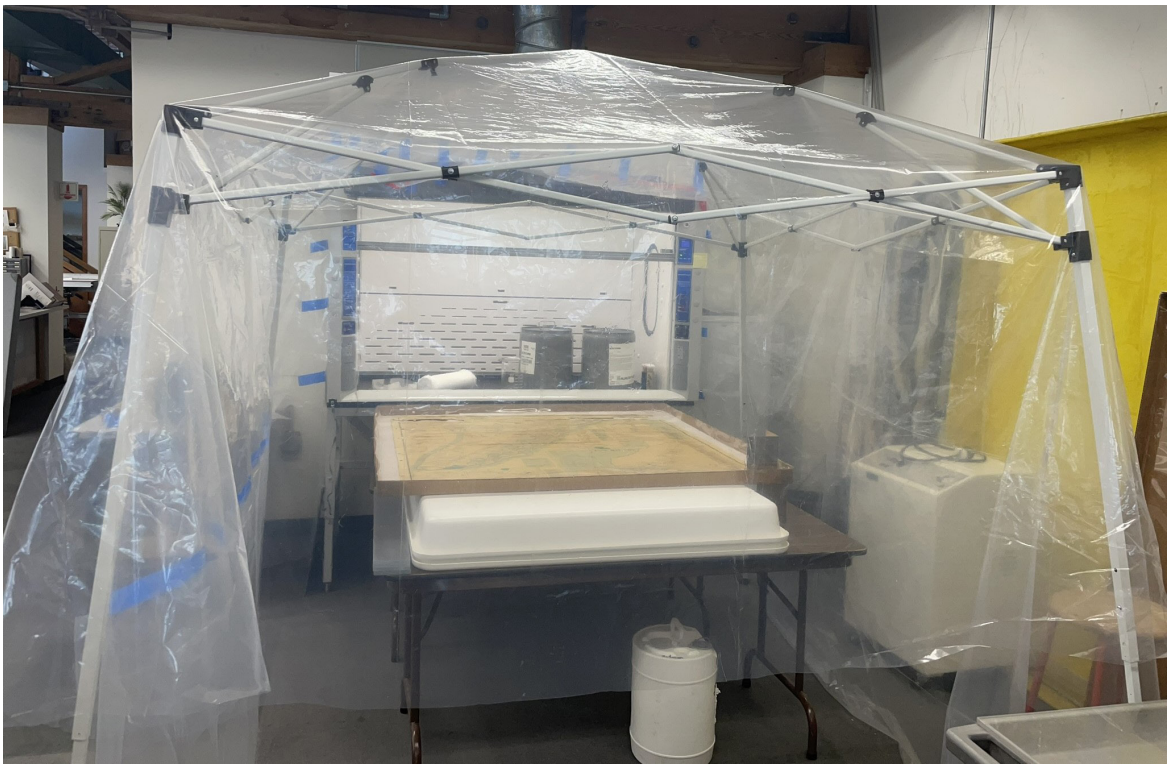

Fig. 12. The temporary tent fume-extraction room.

prevents noticeable solvent odor from escaping into the laboratory, but we have not tested the face velocity of the external opening, nor performed air sampling for solvents in the rest of the laboratory. Please use caution and common sense to minimize exposure with any solvent treatment.

A negative pressure room is constructed outside the fume hood by erecting the frame of an 8 foot pop-up shade tent. The tent's original canopy is not used. The sash of the fume hood is opened fully. The frame is then draped with a large sheet of polyethylene, secured to the fume hood opening with low-tack tape. The plastic sheet should hang low on each side, leaving about a 1 foot gap opposite the fume hood for air intake. When the fume hood is turned on, there will be a steady airflow from outside the plastic tent and up the fume hood exhaust (fig. 12).

Conservators inside the tent wear fit-tested respirators with appropriate filters while using solvents. If staff working outside the tent notice a solvent odor, the setup should be adjusted to reduce leakage. Following treatment, the object will be left inside the tent while the solvent evaporates. The tent has been used successfully with a variety of solvents including ethanol, acetone, and xylene. Because these large solvent treatments are relatively rare, this temporary solution allows the use of a solvent exhaust room when needed without having a permanent dedicated solvent space.

CONCLUSIONS

The three treatment solutions presented in this article were developed to respond to specific problems that were outside of the bounds of everyday paper conservation. This type of problem solving happens naturally in a co-operative laboratory like CCAHA, with many talented conservators working together to tackle new challenges. After delivering this work at the Book and Paper Group session in Salt Lake City in 2024, many other conservators approached me with similar but slightly different scenarios that some aspect of my presentation could contribute to solving. This collaborative creativity is one of the most rewarding aspects of the paper conservation field, and it is my hope that the ideas shared here can be taken and adapted by other conservators to solve future problems.

ACKNOWLEDGMENTS

The author gratefully acknowledges the skills and contributions of the CCAHA paper conservation laboratory, especially Jilliann Wilcox for her work on the Map of Essex County and Joanna Hurd and Basia Nosek for their testing on the Schillner maps. The New York State Archives and Education Department and the Millburn-Short Hills Historical Society Museum graciously allowed sharing of their treatments and object images. Both CCAHA and the Foundation for

Advancement in Conservation Book and Paper Group Speaker Stipend contributed funding to present this work at the AIC Annual Conference in 2024.

NOTES

1. For this project, the initial concentrations used were 1:3 wheat starch to water by volume, strained, before mixing with 5% (w/v) Klucel G. After combining, the adhesive was thinned to a workable consistency with water.
2. There are many recipes for remoistenable tissue in paper conservation literature. CCAHA uses wheat starch paste that is prepared in a 3:1 v:v, water to starch ratio and 5% w/v methylcellulose in water. The paste is strained and mixed with an equal amount of methylcellulose, then the adhesive mixture is thinned with water to a workable consistency.

AUTHOR INFORMATION

HEATHER HENDRY
Senior Paper Conservator
Conservation Center for Art and Historic Artifacts
Philadelphia, PA
hhendry@ccaha.org