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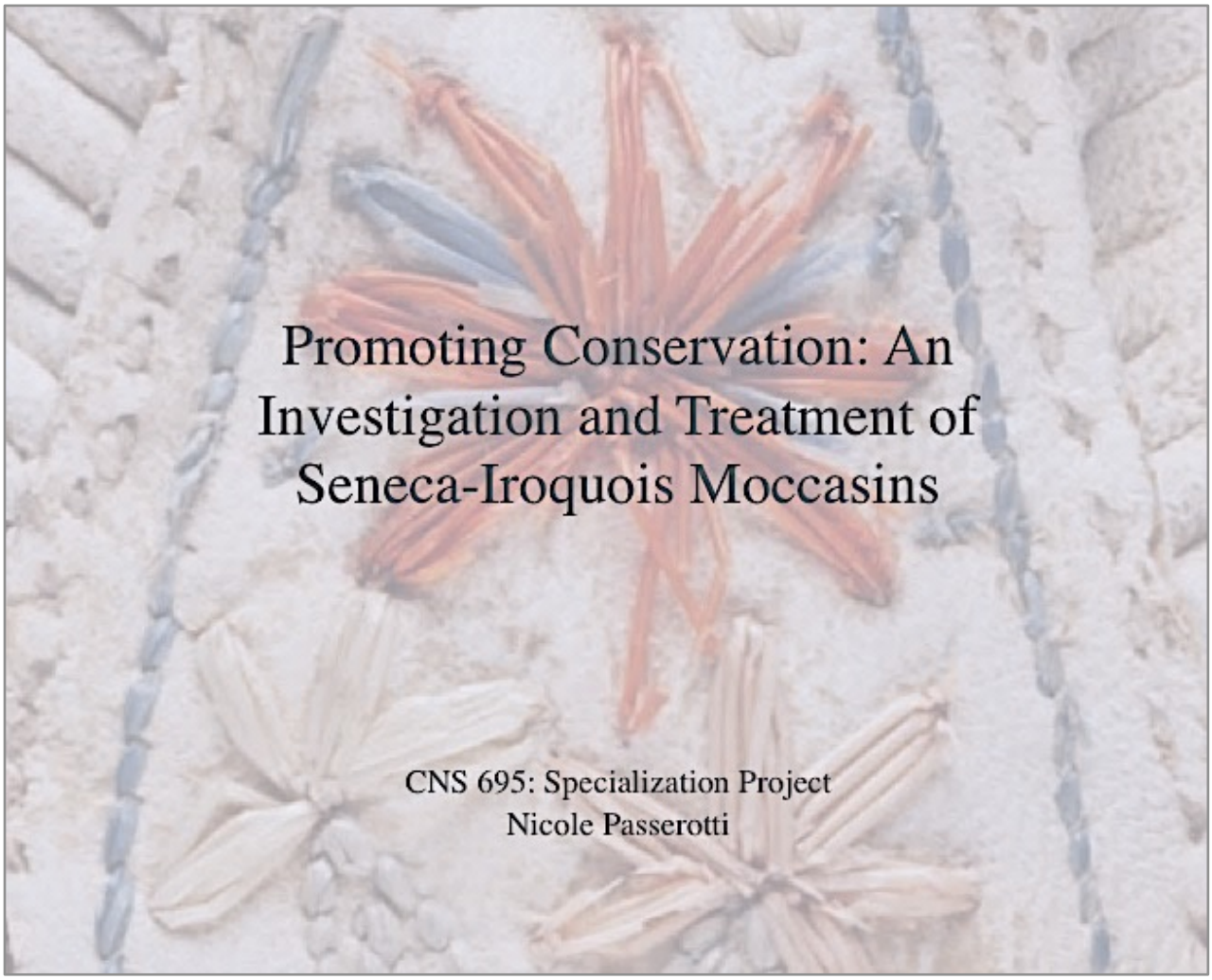
Promoting Conservation: An Investigation and Treatment of Seneca-Iroquois Moccasins

Nicole Passerotti



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ABSTRACT

In 2016 there are currently 566 federally recognized American Indian Tribes. Of these hundreds of tribes only a small portion operate tribal archives, libraries and/or museums. An even small percentage of these tribes are able to address conservation and preservation needs of their collections. The Seneca Iroquois National Museum (SINM) located in Salamanca, NY is currently building a new Cultural Center to help promote, protect, and safeguard their historical artifacts. By strengthening ties to the SUNY Buffalo State College Art Conservation Department in Buffalo, NY the caretakers at SINM will have access to current preservation information, state of the art analytical tools, and cost-effective treatment all of which can further promote conservation and potential funding at the museum. This project involves working closely with the staff at SINM, the treatment of a pair of lady's embroidered leather moccasins, material analysis with some surprising results, and the production of a short video to help promote conservation at the museum.

1. INTRODUCTION

1.1 The Iroquois and Seneca Nation of Indians

The Iroquois are a group of Northeastern tribes in the United States and Canada that can be divided into three distinct geographic and linguistic bands. The Iroquoian linguistic group (Figure 1) located in Southern Ontario, New York State, and the majority of the Saint Lawrence and Susquehanna Valleys is one of these three bands. The major tribes included in this group are the Saint Lawrence Iroquois, Mohawk, Onondaga, Cayuga, Seneca, Tuscarora (after ca. 1720), Huron, Erie, and Susquehannock (Taylor & Sturtevant 2002). A league of Iroquois created a powerful confederacy of five nations in 1570 in order to establish and maintain peace in a region that had been weakened by continuous wars with European settlers and their own kinsmen (Clifford). As a hunting, fishing, and agricultural people the Iroquois had compact villages typically on high land or bluffs with small vegetable gardens, orchards, and cornfields nearby. The characteristic dwelling of the Iroquois was a community longhouse (ganonh' sees) made of log and bark and could house five, ten, or twenty families. During the seventeenth century smaller, single-family dwellings made of elm bark and logs came into use.

Figure1: Map showing historic Iroquois Territory

The Seneca is the largest of the six Iroquoian nations comprising the Haudenosaunee (Hodinöhsö:ni) meaning "People of the Longhouse". The Haudenosaunee was also know as the Six Nations or the Iroquois Confederacy (Figure 2) and is a democratic government established in the 1700s. This government predates the U.S. Constitution and includes the Cayuga the "people of the murky land", the Onondaga the "people of the hills", the Oneida the "people of the standing stone", the Tuscarora the "hemp gathers", the Seneca "the great hill people", and the Mohawk "the possessors of the flint" who are the most eastern of the tribes. The English trader and interpreter John Long notes in his 1768-1782 journal that "All these nations express peace by the metaphor of a tree whose top they say will reach the sun and whose branches extend far abroad not only that which may be seen at a great distance, but to afford them shelter and repose" (Lyford 1945:78). The metaphorical pine tree known as the Tree of Life or Tree of Peace is the emblem of the Confederacy.

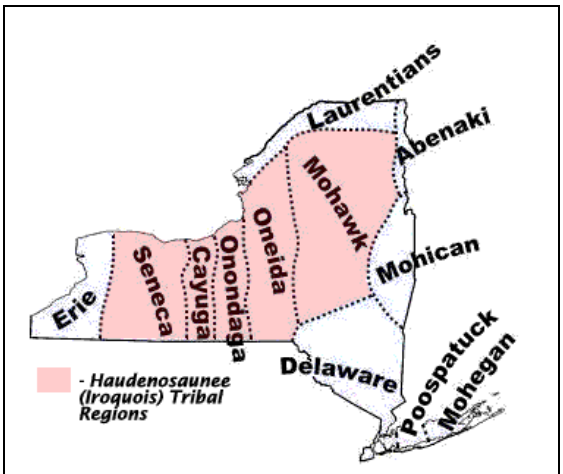


Figure 2: Regional map of the Haudenosaunee (Iroquois) Tribal regions.

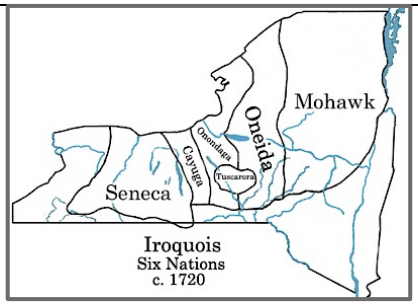


Figure 3: Regional map of the Six Nation Tribes ca. 1720

The Seneca Nation of Indians (SNI) (Onöndowa´ga:´) are a sovereign democracy known as the "Keeper of the Western Door" because they are the most western of the current Six Nations (Figure 3). The Seneca are a matrilineal society and the female members are held in high regard. They possess power and responsibility for their clan and tribe including land ownership. Traditionally, the oldest woman in the clan was responsible for nominating and removing chiefs, naming clan members, and had the right to command a war party. There are eight clans (Figure 4) Wolf (Hoñnat'haiioñ'n'), Turtle (Hadiniă''dĕñ'), Sandpiper (Hodi'ne`si'iu'), Deer (Hadinioñ'gwaiiu'), Beaver (Hodigĕn''gegā'), Heron, Hawk, and Bear (Hodidjioiñi''g') within the Seneca Nation. The Seneca have occupied territory throughout the Finger Lakes region in central and Western New York for more than a century. Today the SNI is a federally recognized nation with over 8,000 enrolled members. About half of the population lives on the Cattaraugus, Allegany, and Oil Springs territories in western New York State.

Figure 4: Seneca Nation of Indians eight animal clans.

1.2 The Seneca- Iroquois National Museum (SINM)

The Seneca – Iroquois National Museum (SINM) (Figure 5) was established in August 1977 on the Allegany Territory in Salamanca, NY about 60 miles south of Buffalo. The museum showcases both permanent and temporary exhibits that introduce visitors to the history and culture of the Seneca Nation of Indian (Onöndowa'ga:') and the Haudenosaunee (Hodinöhsö:ni'). Today the museum holds over one million objects in its collections (Figure 6) including ethnographic and archeological objects as well archival documents, photographs, and multi-media materials. The mission of the museum is to honor and promote the history and contemporary culture of the Iroquois people and in particular the Seneca by collecting, preserving, and displaying cultural objects. Furthermore, their mission aims to educate, revitalize, and promote the changing culture of the Seneca Nation of Indians. The SINM collection has been stored from 1977 to present day in a large warehouse (Figure 7) a few miles away from the museum. This space has a wall of loading dock doors that stretch almost the entire length of the building. This space was never intended to be permanent storage and although it is not climate controlled the collection has benefitted from years of low light exposure.

Figure 5: The Seneca Iroquois National Museum

Figure 6: A sample of displays at the current Seneca Iroquois National Museum.

On September 3, 2015 the Seneca Nation broke ground for a new Cultural Center (Figure 8) currently slated to open its doors in 2017. The collection will move from its current unregulated storage conditions to a well-maintained new facility that will house the SINM and Archives. In the Official Newsletter of the Seneca Nation of Indians (September 11, 2015) the current President Maurice A. John Sr. noted, "this new venue is designed to promote, protect, and safeguard our historical artifacts, expand our services and teach our children about their distinct cultural identity in new and exciting ways." He goes on to note that he was the master of ceremonies at the 1977 opening of the museum and that at the time the Nation recognized the value of building a museum and did the best they could with the money they had. President John recalled that since 1977, "it has been a dream among many in our Nation to build a better facility to better meet the needs of our local artisans as well as to promote the advancement of our cultural identity…after 38 years that dream has become a reality."

Figure 7: SINM current storage

Figure 8: Groundbreaking Ceremony September 3, 2015 for the new Seneca Cultural Center.

2. HISTORICAL BACKGROUND

2.1 American Indian Collections and Conservation in the U.S.A

In 1990 the U.S. Department of Interior and National Park Service created and submitted a report to congress discussing tribal preservation funding needs. *Keepers of the Treasures: Protecting Historic Properties and Cultural Tradition on Indian Lands* reported that of the seventy-four participating tribes (Figure 9), only twenty-seven had a museum or cultural center. In other words, almost sixty- five percent of the tribes participating in the survey did not have either. The Seneca Iroquois National Museum is the only institution in the New York region that participated in the survey. The report found that "museums and cultural centers are often seen as serving purposes beyond those of public interpretation; they are tools for using traditional culture to address contemporary social problems. The role of the museum/cultural center in sustaining or revitalizing the community and its artist and artisans was stressed by a number of tribes" (Parker & Banks 1990). Furthermore the study found that American Indian tribes have a common goal to retain, preserve and enhance their cultural heritage and that this goal requires adequate and consistent funding. Many tribes had developed a wide range of cultural preservation programs, but lacked sufficient resources to make these programs effective. The 1990 study found that tribal budgets are insufficient to meet the need for preservation efforts in the face of significant and competing priorities.

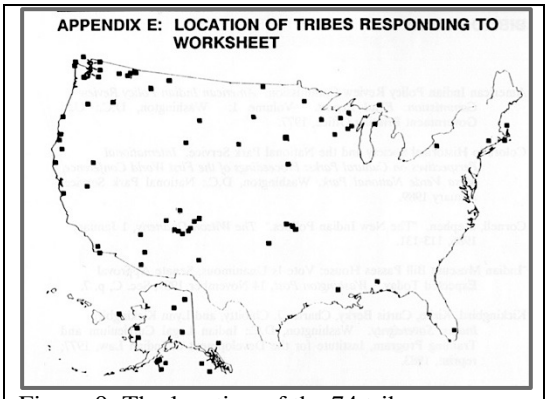


Figure 9: The location of the 74 tribes participating in the 1990 survey.

Twelve years after the National Park Service survey, The American Association for State and Local History (AASLH) conducted a series of surveys in 2002 funded by an Institute of Museum and Library Services (IMLS) grant. Seventy-four tribal institutions with an opening date range of 1932 - 2002 (Figure 10) including SINM participated. The AASLH study *Tribal Museums in America* points out that conservation work is almost entirely contracted out of the institution and that budgets typically cannot support a full-time conservator or staff training. This study also found that over half of the respondents (forty-seven) recognized the need for conservation, but were restrained by budgets. In addition, only 24% (of fifty) tribal institutions had a written conservation and care policy plan at the time.

INSTITUTION	YEAR OPENED
Ataloa Lodge Museum/Bacone College	1932
Tribal House of the Bear	1941
Navajo Nation Museum	1961
Cherokee National Historical Society, Inc.	1963
Three Affiliated Tribes Museum, Inc.	1964
Southeast Alaska Indian Cultural Center, Inc.	1969
Nohwike' Bagowa-White Mountain Apache Cultural Center & Museum	1969
Quechan Tribal Museum	1969
The Lower Muskogee Creek Tribe	1970
Institute of American Indian Arts Museum	1971
Sierra Mono Museum	1972
Southern Ute Museum Cultural Center	1972
Mashpee Wampanoag Indian Museum	1973
Hopi Museum (Hopi Cultural Center, Inc.)	1973
Hoopa Tribal Museum	1974
Arvid E. Miller Memorial Library Museum	1975
The Indian Pueblo Cultural Center, Inc.	1976
Seneca-Iroquois National Museum	1977
Cheyenne Cultural Center, Inc.	1977
Oneida Nation Museum	1979
Waponahki Museum & Resource Center	1980
Suquamish Museum	1983
Skokomish Indian Tribe	1984
Colville Tribal Museum	1986
Simon Paneak Memorial Museum	1986
Shoshone Cultural Center	1988
George W. Brown, Jr. Ojibwe Museum & Cultural Center	1989
Ak-Chin Him-Dak EcoMuseum & Archives	1991
Poeh Museum	1991
Shoshone-Bannock Tribal Museum	1993
The Museum At Warm Springs	1993
Agua Caliente Cultural Museum	1993
The People's Center	1995
Alutiiq Museum & Archaeological Repository	1995
Kanza Museum	1995
Cabazon Cultural Museum	1995
San Carlos Apache Cultural Center	1995
Community House (Sheet'ka Kwaan Naakahidi)	1997
Lummi Records & Archives Center & Museum	1998
Mashantucket Pequot Museum & Research Center	1998
Abenaki Tribal Museum and Cultural Center	1998
Walatowa Cultural and Visitor Center	1999
Barona Cultural Center and Museum	2000
Fond du Lac Cultural Center & Museum	2000
Shinnecock Nation Cultural Center & Museum	2001
Potawatomi Cultural Center and Museum	2002

Figure 10: The 74 tribal institutions participating in the AASLH 2002 survey.

The Association of Tribal Archives, Libraries, and Museums (ATALM) was formed in 2010 and launched a 2010-11 comprehensive survey with over 230 organizations, of which 176 operated a tribal archive, library, museum (TALM) or multi-function institution. SNI participated in this survey, which addresses conservation needs and concerns more explicitly than the 1990 U.S. Department of Interior and National Park Service report and The American Association for State and Local History (AASLH) 2002 survey.

In 2012, the ATALM published the report *Sustaining Indigenous Culture: The Structure, Activities, and Needs of Tribal Archives, Libraries, and Museums*. The study found conservation, preservation, and emergency preparedness to be challenging areas for TALMs and found that funding for planning, training, facility improvements for conservation and preservation was sparse. Specifically 41% of 118 respondents reported that they have no funds allocated in their budgets for conservation or preservation and only 27% of 113 respondents reported having a part or full-time conservation/preservation specialist on staff. In addition, 46% of 118 reporting facilities lack a climate control system and 69% note that they either have an outdated or not existent emergency/disaster plan. The report recommends that tribal collections should focus on immediate needs and the most cost-effective methods to internally address preservation urgency.

The contemporary American Indian socioeconomic condition is complicated with many problems carried over from the past and many challenges for the future. Today in the United States the Bureau of Indian Affairs reports there are currently 566 federally recognized tribes. The 2012 ATALM report illuminates the vast disparity of total federally recognized tribes to those operating tribal archives, libraries, and museums (TALMs), which are only 175 of the participating organizations. Of those operating TALMs, only a small percent are able to address conservation and preservation needs. In *Preserving What is Valued* Ed Ladd of the Zuni asks what is the significance of preservation "when there are only objects left" (Clavir 2002). This sentiment can and should inform a balanced approach when working with and for caretakers of tribal collections. It is through the process of preserving culture, not just caring for and conserving objects where the tangible importance of objects intersects with the intangible aspects of the cultural knowledge that they represent (Calvir 2002).

3. PROJECT

3.1 Proposal, Goals, and Process

In September 2015 the current director at the Seneca Iroquois National Museum (SINM) in Salamanca, NY was contacted to discuss projects that could benefit the museum and meet the requirements of a SUNY Buffalo State Art Conservation Department 695 Specialization Project. After an onsite meeting with the director David Shongo, a proposal was drafted, submitted, and approved by the museum board of directors in October 2015. With the limitations of a small staff, budget, and time restraints in mind three broad goals were proposed.

The first goal was to highlight basic preventative care and simple protocols for the upcoming move and beyond. This is a long-term and ongoing goal. The director requested assistance with creating a tailored conservation and care protocol booklet specific to this collection. To date, the museum has been using bound photocopies of various publications and other museum protocols for reference. The upcoming move to a new Cultural Center in 2017 is a unique opportunity for SINM. With careful planning the move can provide an updated condition survey, address storage issues, meet basic cleaning needs, and help to train the current staff and community on conservation and preservation protocols specific to their collection needs.

Figure 11: Storage areas where the onsite survey took place.

The second goal was to pinpoint objects in the collection that are in the most need of conservation treatment. From October – December 2015 an onsite survey (Figure 11) of the ethnographic collection was completed. The survey was conducted with assistance from Johnna "Jonie" Crouse the collection manager, Marissa Corwin the curator and David Shongo. This quick visual assessment occurred over four non-consecutive days and was aided by SINM's database, which includes condition reports from a 1996 survey completed by a grant-funded conservator. During that survey many items in the collection were rated from good, fair, to poor and more than 10,000 items in the database can be searched by these terms. A wide variety of materials (Figure 12) can be found in the collection storage ranging from cornhusk, turtle shell, gourd, feather, bone, leather, wood to stone, metal, and beads (Figure 13). The museum also stores artifacts that belong to tribes that do not have the facilities to house their own collection.

Figure 12: SINM Basket Collection

Figure 13: Beaded bag ca. 1870

The third goal was to complete a conservation treatment that would be beneficial to the collection and could promote conservation as part of an upcoming exhibition. SINM does not have a conservator on staff and although the director recognizes the benefits of having one on-site it is uncertain when and if the museum will have a fulltime conservator on staff. In Barbara Appelbaum's chapter in *Ethics and Critical Thinking in Conservation* many methods to promote conservation are discussed. These include exhibits that feature pieces that need treatment, before and after photographs of objects and renovated storages spaces, as well as interviews with conservators (Hatchfield 2013). Many of these ideas were considered when deciding on an object to treat and the plan of action for treatment. Subsequent proposal revisions included various options to use for an exhibition including a panel, poster, time- lapse photography or video.

After spending time with the collection and its caretakers, it was clear that they've done a remarkable job of maintaining it with very few resources. The overall condition of the collection is good, although most of the objects have a layer of storage grime and dust that should be removed. There is also a small mold outbreak found mostly on the cornhusk and basket collections. These items had been isolated before the survey and are not part of this study, but will need to be addressed as a different project.


Figure 14: Lady's Moccasins in storage

Once the short survey was complete, it was also clear that many objects in the collection could benefit from conservation treatment including a pair of lady's moccasins (82.0034.0295) from the 1800s. The moccasins (Figure 14) are highly valued for their fine craftsmanship and there are records of them being used for exhibition in 2007, 2009, and 2010. It's likely they were used in exhibitions prior to 2007 as well. The curator Marissa Corwin noted that the moccasins would be featured in the opening exhibit at the new Cultural Center in 2017. After onsite documentation was complete, a small group of objects including the moccasins were transferred from SINM to the SUNY Buffalo State Art Conservation Department in Buffalo, NY.

4. MATERIAL ANALYSIS

4.1 Objectives

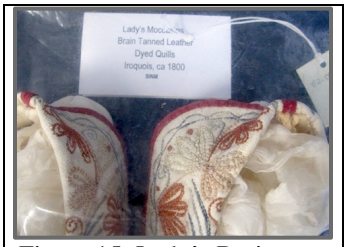


Figure 15: Lady's Brain Tanned Leather, Dyed Quill Moccasins

Material analysis was completed for the Lady's Brain Tanned Leather, Dyed Quill Moccasins from the 1800s (Figure 15) in order to identify materials and to help characterize their condition. Four categories of inquiry were investigated using a variety of analytical tools including Micro-chemical tests, Polarized Light Microscopy (PLM), X-Ray Fluorescence (XRF) Spectroscopy, Scanning Electron Microscope (SEM) Spectroscopy, Pyrolysis-Gas Chromatograph-Mass (py-GC-MS) Spectrometry, X-Radiology, and Microfadeometry. The four categories of analysis included attempts to identify the embroidery material, characterize the skin and tanning process, investigate the potential use of past pesticides, and to characterize the dyes used. Understanding individual components, such as the type of materials and the way they were processed can aid in making informed decisions about the course of treatment, display, and storage of the moccasins. Many loose embroidery and leather pieces were found in the bottom of the plastic storage bag so the removal of additional material was not necessary for the analysis. For the analytical tool specifications and methods please refer to Appendix F.

4.2 Identification of Embroidery Material

Porcupine quillwork and hollow hair embroidery are commonly found as decorative elements on North American ethnographic artifacts. "Unfortunately, it is common for hair embroidery to be misidentified as 'fine' quillwork" (Kronthal 1994). The appearance, application, and techniques of quillwork and hollow hair embroidery are similar which can make identification difficult. The fine nature of the quillwork on SINM's moccasins warranted further investigation. Using the loose samples found in the storage bag and reference samples (porcupine quill, elk, and moose hair) scale impressions were made using the method for scale casting found on the useful website Alaska Fur ID Project[1]. Polarized light microscopy (PLM) was used to compare the results of the samples, but the scale patterns (Figure 16) are quite similar and the results were inconclusive.

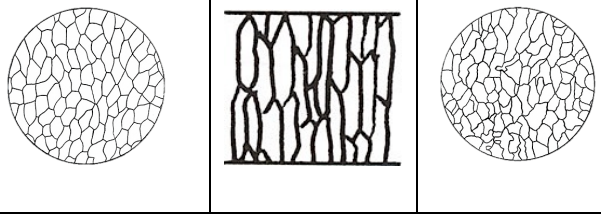


Figure 16: Scale Patterns (L to R), Moose, Elk, and Porcupine Quill

[1] www.alaskafurid.wordpress.com/tips/

Next, the unknown sample and references (moose, elk, and quill) were mounted in MeltMount™ and PLM was used to compare the results. The combination of reflected and transmitted light were used to make the samples more visible. PLM confirmed that the unknown was likely moose, elk, or quill (Figure 17), but the diameter of the material and the degraded state of the sample made it difficult to compare the slight variations. Ultimately, the use of Scanning Electron Microscopy (SEM) Imaging provided a clearer picture (Figure18).

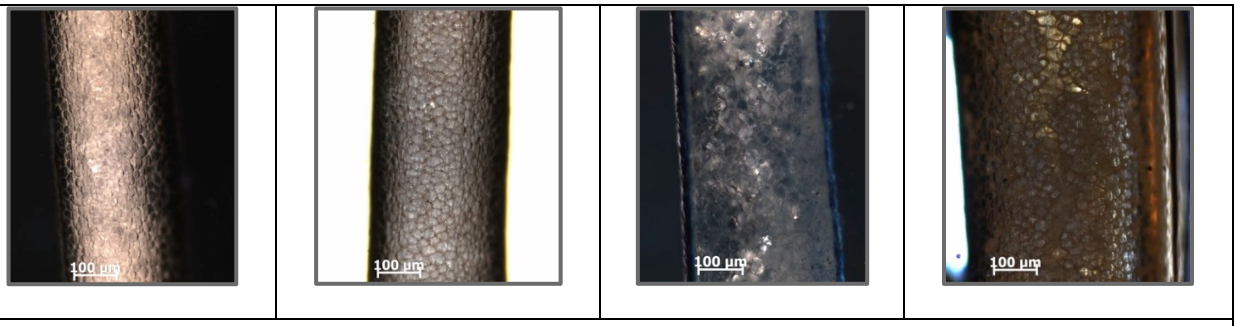


Figure 17: PLM Images comparing scale patterns (L to R) Moose, Elk, Quill, and Unknown.

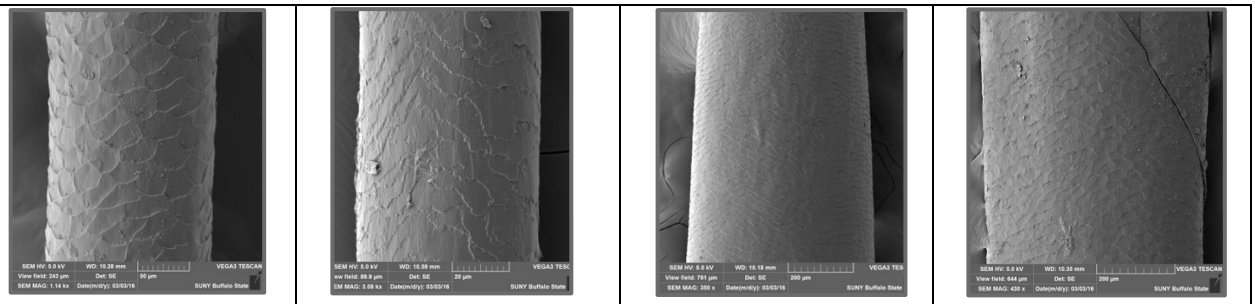


Figure 18: SEM Images comparing scale patterns (L to R) Moose, Elk, Quill, and Unknown.

Characteristics of moose hair scale patterns can be described as open polygons, with flattened imbricated scales (Kronthal 1994). The medulla does not appear as a distinct dark line, but more like large polygon-shaped cells that look like bubble wrap. The scales can also be described as stacked crowns with smooth edges (Carrlee 2009). In contrast porcupine quill scale patterns are generally irregular in form, size, and arrangement. Narrow elongated scales can be interspersed with tiny ones and there is typically the appearance of random overlapping (Kronthal 1994). The pattern can also be described as looking like fish scales or honeycomb (Carrlee 2009). Using individual scale widths (Figure 19), shape, and recognizing the flattened and degraded nature of the unknown, it was determined that the material is likely moose hair and not porcupine quill.

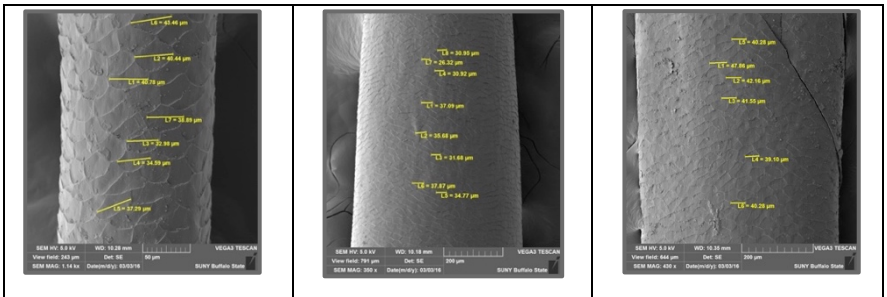


Figure 19: SEM Images comparing scale size and shape (L to R) Moose, Quill, Unknown.

4.3 Characterization of Skin Type and Processing

Iroquois moccasins are typically made of buck or a similar skin, but after close examination and the use of photo-macrographs (Figure 20) it became clear that the moccasins are likely goat or sheepskin (Figure 21). Micro-chemical tests were then performed to help characterize the tanning agents in the leather. Each test was run with the unknown moccasin sample next to a known positive and negative material for comparison. The unknown samples were first tested for the presence of vegetable tannins using one drop of 1% ferric chloride solution on samples wet with deionized water. A deep/blue- black color would have resulted in a positive test (Kite and Thomson 2006). The unknown sample was tested alongside chrome and vegetable tanned leather fragments and the result was negative.

Figure 20: Photo-macrograph of proper left (PL) moccasin sole.

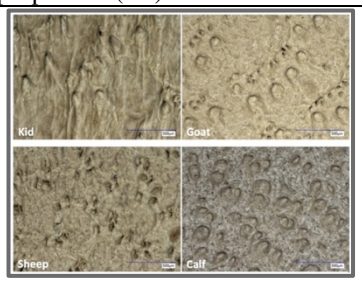


Figure 21: Reference for Kid, Goat, Sheep, and Calf Skin

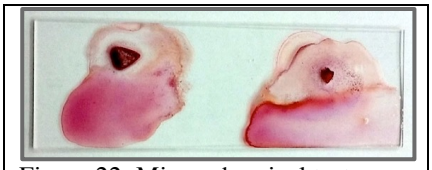


Figure 22: Micro-chemical test results for the Known Positive alum tawed goat skin (left), and Unknown Moccasin fragment (right).

Then the unknown sample was also tested for aluminum tanning agents alongside chrome tanned and alum tawed goatskin fragments. Each sample was moistened with a drop of 2M ammonium hydroxide followed by a drop of 0.1% sodium alizarin sulphonate solution in a 9:1 mix of ethanol and deionized water. After 5 minutes, excess reagent was removed with filter paper and 3-4 drops of 1M acetic acid were added (Kite and Thomson 2006). The chrome -tanned fragment remained yellow while the alum tawed skin and the moccasin sample developed a red color (Figure 22) indicating the presence of aluminum compounds. This test was performed twice with two positive results. The overall presence of aluminum was further confirmed by low energy x-radiography (Figure 23) as well as x-ray fluorescence (XRF) spectroscopy (See Appendix G). The combined analysis indicates that the skin is likely alum tawed and not brain-tanned.

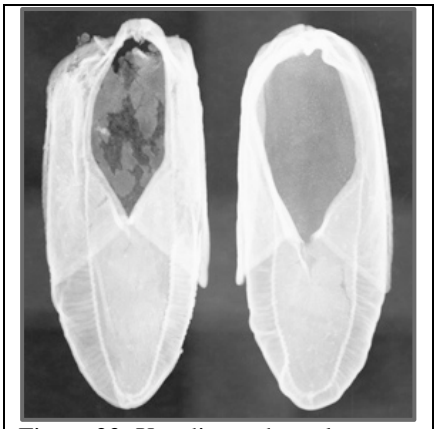


Figure 23: X-radiography at low energy showing the overall presence (white) of aluminum.

4.4 Investigation of Past Pesticides Use

Pesticides have been used on museum collections to treat active pest infestations and to prevent future attacks for many decades. This action was well intentioned, but generally when this practice was introduced little was known about the potential health hazards of many of the commonly used pesticides. The SINM does not have records regarding past pesticide use so it was prudent to test the moccasins for potential residual residues. Attempts were made to test the moccasins for the presence of both inorganic and organic residues. This information can be useful in addressing handling, storage, and health concerns.

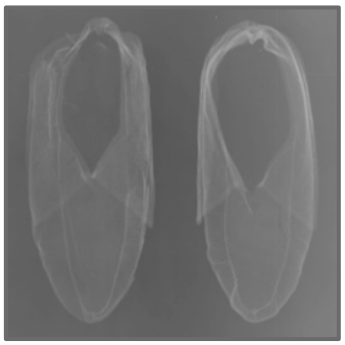


Figure 24: X-radiography at high energy shows the absence of heavy metals (white).

X-radiology at high energy (Figure 24) showed that there are no heavy metals like arsenic, lead, or mercury present on the moccasins. If these elements were present large pockets of white typically found on taxidermy animals as seen on Figure 25 would present. The absence of heavy metals was also confirmed using XRF (See Appendix G). Many attempts were made to test the moccasins for organic pesticides using a variety of py-GC-MS methods (See Appendix F), but this approach was limited by time and extraction methods. The results were inconclusive, but it is possible that the moccasins escaped past pesticide intervention.

Figure 25: Taxidermy bird showing pockets of heavy metal pesticide residue (white clumps).

4.5 The Characterization of Dyes Used

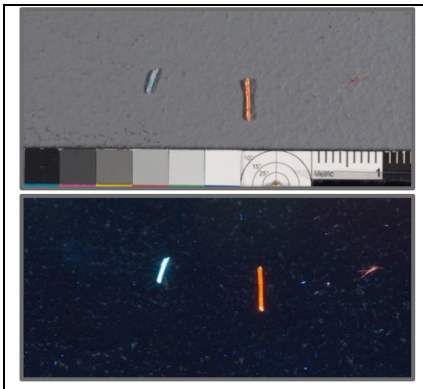


Figure 26: Blue and orange moose hair and red fiber samples in Normal Light (upper) and UVA Radiation (lower).

The fourth category of analysis was the characterization of the various colored dyes used on the moccasins. SINM dates the moccasins to around 1800. Commercially available aniline synthetic dyes were in wide use by the mid to late 1800s. The distinction between whether the dyes used on the moccasins are natural or early synthetic organic dyes could give more insight into when they were constructed. The analytical tools employed to explore this distinction were UVA radiation, GC-MS, Raman Spectroscopy, and Microfadeometry (See Appendix F). To date, the results are inconclusive and further investigation using Liquid Chromatography Mass (LC-MS) Spectrometry to analyze the dyes will be ongoing.

However, the use of micro-fadeometry did provide useful information regarding the lightfastness of the dyed materials. Although light has been known to damage materials for centuries, only recently have there been attempts to try to quantify the rate of fading. In order to test the light sensitivity using this method (See Appendix F) a small spot approximately 0.2mm that is not easily detectable by the eye is faded. A plot of the Delta E values versus Time can be compared to Blue Wool Standards (ISO 105-B01) 1 and 2 (Figure 27). Blue Wool 1 represents the highest level of sensitivity of the standards with each successive being less sensitive. According to the published ASTM standards, Blue Wool 1, 2, and 3 are considered to have poor lightfastness. If the fading rate of a sample corresponds to Blue Wool rating between 1 and 3 then the sample is considered to be fugitive and not suitable for permanent display (ASTM 2006). This data is useful for making informed storage and display decisions.

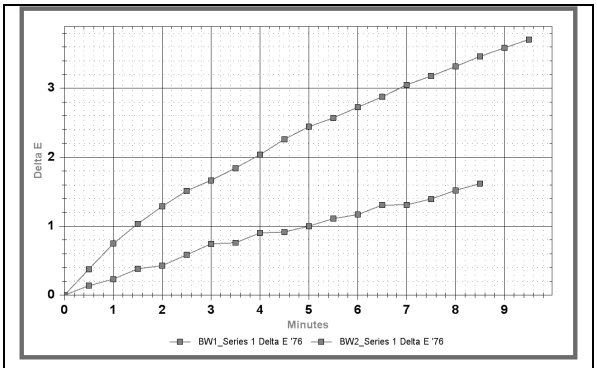


Figure 27: The graph of Delta E Values vs. Time for Blue Wood Standards 1 (upper) and 2 (lower).


Figure 28: Micro-fading Blue embroidery on the PL inner cuff.

The orange, light blue, dark blue, and light pink moose hair samples were micro-faded (Figure 28) and the rate of fading compared to the Blue Wool Standards 1 and 2 is illustrated in Figure 29. The graph of Delta E versus Time shows that each of the four embroidery colors is a relatively fast fader. The rate of change in Delta E Values for the orange moose hair is between the Blue Wool Standard 1 and 2 curve for the first minute and half and then rapidly starts to follow the Blue Wool Standard 1 curve much more closely. The light blue and light pink moose hair show a rapid fading in the first minute and then they start to fade at approximately the same rate as the Blue Wool Standard 2 around 4 minutes. The dark blue moose hair follows a similar fade rate as the orange for the first minute, but by the fourth minute the rate starts to drop below the Blue Wool Standard 2.

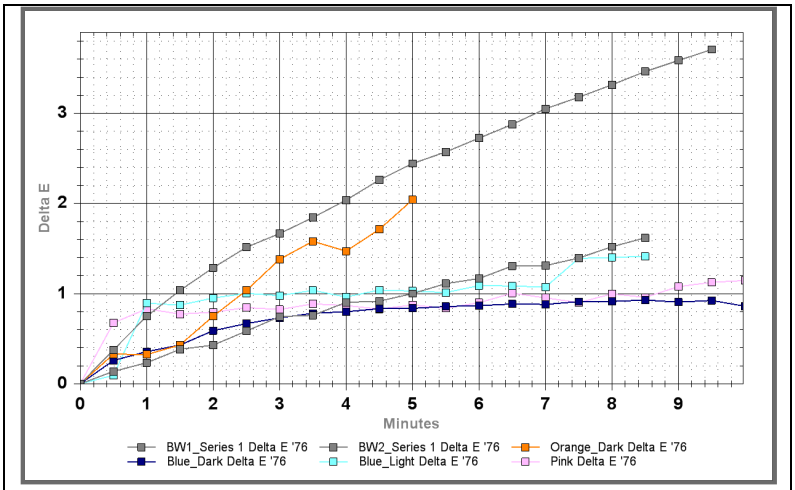


Figure 29: The graph of Delta E Values vs. Time for Embroidery color samples (orange, light blue, dark blue, and light pink) compared to the rate of fading of Blue Wool Standards 1 and 2.

Figure 30 compares the two most fugitive dyes found on the moccasins to the Blue Wool Standards 1 and 2. The rate of change in Delta E Values for the red cloth (Figure 31) found on the cuff is considerably faster than Blue Wool Standard 1 and 2 and should be considered an extremely fast fader. The rate of change in Delta E Values for the orange moose hair (Figure 32) falls between Blue Wool Standard 1 and 2 and should also be considered extremely sensitive to light.

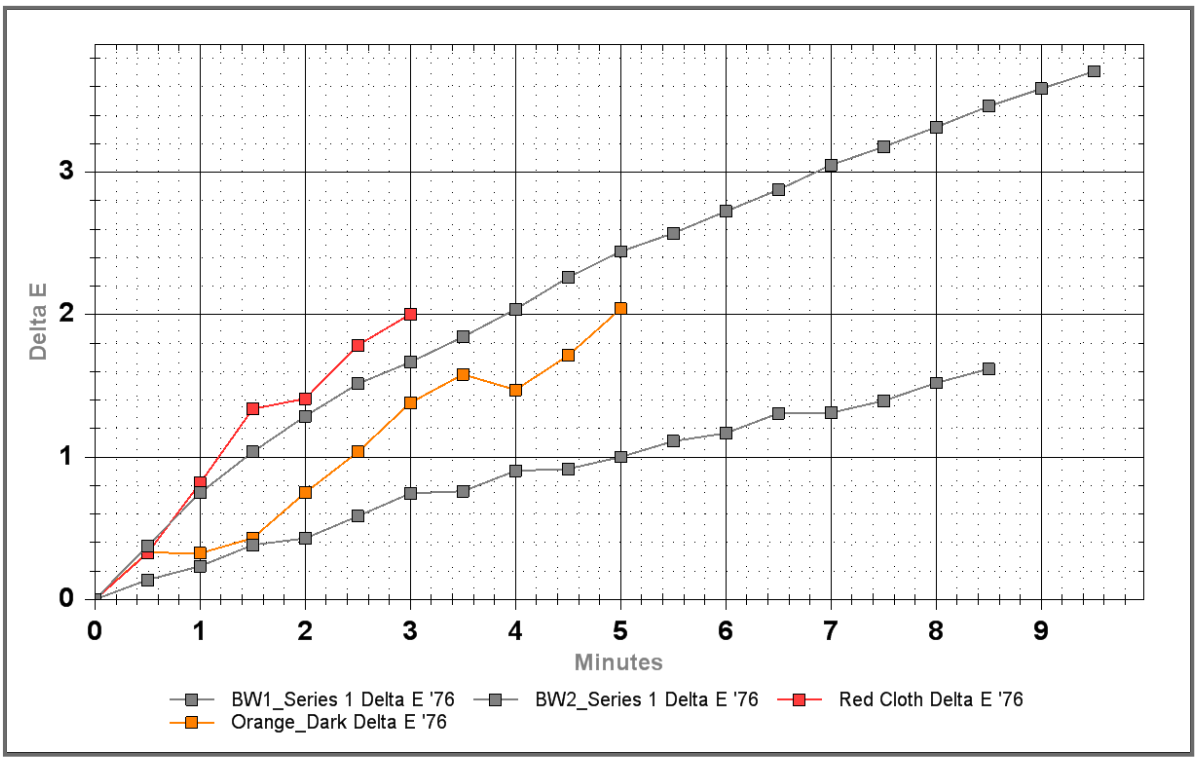


Figure 30: The graph of Delta E Values vs. Time for the red cloth found on the cuff (Fig. 31) and the orange moose hair (Fig. 32) compared to the rate of fading of Blue Wool Standards 1 and 2.

This data can inform storage and display choices for upcoming and future exhibitions. To avoid fading of these light sensitive materials it is advisable to keep the light levels below 50 lux if the moccasins are on display and covered when they are not. It is important to note that light exposure is cumulative and the damage caused by light is irreversible. Light not only fades colors it can also increase the oxidation process in the fibers, promoting additional degradation (Brooks & Eastop 2011) therefore light exposure in display and storage should be as limited as possible.

Figure 31: Sample of the red cloth found on the cuff.

Figure 32: Sample of the orange moose hair embroidery.

5. MATERIAL BACKGROUND

Figure 33: Moose, genera *Alecs*

Hair that is suitable as an embroidery medium needs to have certain characteristics including length for handling, thickness for visibility, white or lightness in color to accept dye, and the capability of being folded, flattened, or creased to obscure the thread for stitching. Hair used for embroidery generally has a thin-walled cortex and a wide, large medulla that can be easily broken down with pressure. Both the quills of the porcupine and two genera of the *Cervidae* family possess these qualities. The genera are the *Alecs*, the moose or elk, and *Rangifer*, the Eurasian and American animals known respectively as reindeer and caribou. The moose (Figure 33) is the largest living deer and inhabits northern Scandinavia to the Atlantic coast of Canada and northern New England (Turner 1955).

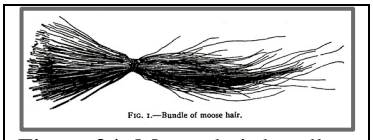


Figure 34: Moose hair bundle

The hair from the mane, cheeks and rump of the moose are used to embroider designs on both tanned skin and birch bark (Speck 1911). In addition, the hair from the areas around the neck called the dewlap or bell can also be used for embroidery (Turner 1955). Moose hair averages five inches in length and is usually kept in like-sized bundles (Figure 34) until needed for use (Lyford 1945). The discovery that the embroidery on SINM's moccasins is likely moose hair and not quillwork introduces the potential influence of the Wendat (Wyandot) also known as the Huron People. The Wendat are a confederacy of five Iroquoian-speaking nations located in Ontario, Canada (Figure 35) and are widely known for their skillful moose hair embroidery.

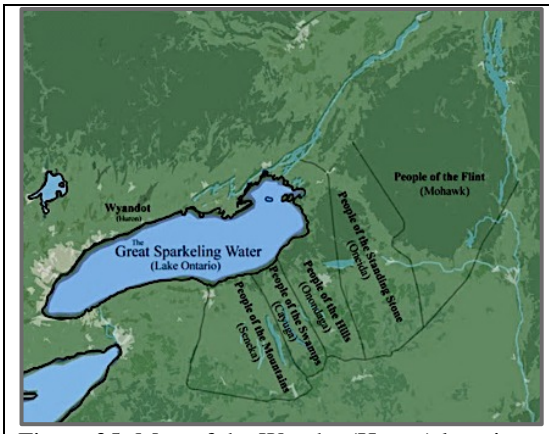


Figure 35: Map of the Wendat (Huron) location in relationship to the Seneca.

Figure 36: Brown buckskin gloves from the SINM collection.

Iroquois moccasins were traditionally made of deer hide that was converted to a soft skin through the process of tanning. This involved skinning the animal, removing the grain of the skin, and soaking the skin with the brains of the deer for several hours. Next the skin would be wrung and stretched many times to make it pliable. This process produces a white or whitish yellow, flexible, and water sensitive material. It could then be smoked over an open fire to create water resistance, producing a yellow or brown color, which is frequently referred to as buckskin (Figure 36).

Figure 37: Examples of dyed skin gloves with moose hair embroidery.

Skins were sometimes dyed black (Figure 37) using walnuts or other natural materials. In contrast to brain tanning, alum tawing typically involves treating pig, goat, or sheepskin with alum-baring salts and yields white, stiff leather that is worked over a blunt edge to soften it (Wright 2002). Treating skins with potassium aluminum sulfate (alum) was the first mineral tannage and historically this process was used for white and light- weight thin leathers meant for bookbinding, white kid gloves (Figure 38), cut-leather-lace, etc. Tawed leathers are sometimes not classified as actual tans, because they are so sensitive to wetting. When alum is combined with egg yolks, milk-fat, or other lipids the skin will be more water resistant, but the color of the skin will be less white (Thornton 2016). Non-smoked, brain tanned deerskin and alum tawed leather (pig, goat, and sheep) have similar characteristics. Both of these processes produce white, pliable, durable, but water sensitive skins that stiffen when in contact with moisture. The choice of alum tawed goat or sheepskin as noted in Section 4.3 indicates that the SINM moccasins were likely made to trade with Europeans travelers and illustrates the availability and use of non- traditional materials.

Figure 38: Spanish Goat Kid Gloves, Ca. 1800

The Iroquois typically wore two types of soft-soled buckskin moccasins (Lyford 1945). The first type is made of one piece of skin with seams at the heel and over the top of the foot, but the bottom was seamless. The top seam was gathered, beaten down and either directly decorated or covered with a narrow decorative strip. The second type of moccasin has a gathered toe in a U-shape vamp, which is often decorated. In both versions the top of the extended sides of the moccasins were turned down to form a cuff. Moccasins worn by woman typically had a cuff made of a single continuous piece whereas those worn by men had a cuff that was separated at the back seam so that there were two separate sides. Traditionally the thread used to sew them was sinew, but the SINM moccasins have a cotton thread. The tool that was traditionally used to sew them was known as the moccasin needle and was made of a small bone taken from near the ankle joint of a deer. The small size and decoration of the SINM moccasins indicates that they were meant for a woman, but the cuff split in the back is more typical of moccasins worn by men. Iroquois moccasins were decorated in scroll, floral, and zigzag patterns with porcupine quill, moose hair, beads, ash, vegetable fibers, and ribbons as different materials became available. The wide variety of design work was influenced by intertribal contact and interaction with French and English colonists. Embroidered moose hair floral design on red broadcloth on non- traditional items (figure 40) is an example of French influence that began in the early 17th century when young Iroquoian girls and women

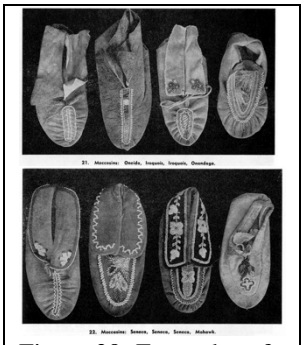


Figure 39: Examples of Iroquois Moccasins.

Figure 40: Non- traditional Evening slippers ca. 1850-1875

studied under nuns in newly established French convents (Turner 1955). Women mainly practiced the art of dyeing and it is thought that they began using commercial aniline dyes as soon as they were available in the late 1800s. Before the use of synthetic dyes natural materials such as walnut for brown, onion skin for reddish brown, hemlock bark for shades of red, sweet gale seeds for yellow, green baize for blues, and gallium root or sumac seeds for red were commonly used (Lyford 1945).

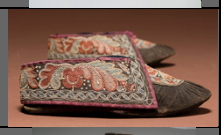
Institution	
Bata Shoe Museum Toronto, Ontario, Canada	
Canada Museum of History Gatineau, Quebec, Canada	
McCord Museum Montreal, Quebec, Canada	
National Museum of the American Indian New York, NY, USA	
Online Auction www.worthpoint.com/worthopedia/huron-embroidered-hide-moccasins	
Pitt Rivers Museum Oxford, England	
University of Pennsylvania Museum of Archeology Philadelphia, PA, USA	
V&A Museum London, England	
Seneca Iroquois National Museum Salamanca, NY, USA	

Table 5.1 Moose Hair Embroidered Moccasins found in USA, Canada, and England Museums Collections.

Although many museum collections have moose hair embroidered objects they are frequently mislabeled as fine porcupine quill as noted in section 4.2. The most common examples of moose hair embroidered moccasins (Table 5.1) found in museum collections and are typically made in dark brown, black, or gray buckskin. This makes the SINM moccasins a rare find. The white, alum tawed, moose hair embroidered moccasins noted at the bottom of Table 5.1 display two distinct surface embroidery techniques. The first (Figure 41) is a line technique where the stitches cross diagonally over the hair, which is slightly twisted beneath each stitch. When the stiches lie closely together and are drawn tight the effect can look like a row of tiny beads. The second technique (Figure 42) used on the moccasins is the flower petal. It is accomplished when a small bundle of moose hair is caught under a narrow stitch at the apex of the petal and then the hair is folded back and a single stitch secures it. The petal shape is achieved by spreading the hairs between the two stitches to create a rounded form (Turner 1955).

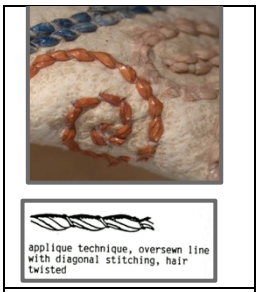


Figure 41: Applique technique photo-macrograph (upper) illustration (lower).

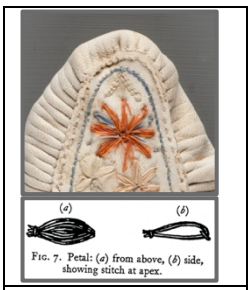


Figure 42: Petal technique photo-macrograph (upper) illustration (lower).

6. CONDITION

Figure 43: Moccasins Before Treatment Normal Illumination (upper) UVA Radiation (lower).

The moccasins (Figure 43) have dirt and dust on their surface, leather losses and tears, and broken and missing moose hair. The red cloth that wraps the edge of the cuffs has small holes. The loss of moose hair is scattered throughout both moccasins with a high concentration of missing moose hair found on the vamps where there are large floral embroidery designs. The keratin that moose hair is made of is a strong proteinaceous, substance when it is on a living animal, but once it is removed the deterioration process begins. Mechanical processes like folding or twisting while working with the hair also cause damage. Dyeing the hair can weaken the scale and surfaces (Kronthal 1994) and as noted in Section 4.5 light also causes deterioration.

The proper left moccasin is in relatively good condition in contrast to the proper right moccasin, which is missing the back heel and part of the sole (Figure 44). The loss of moose hair is scattered throughout both moccasins and large losses are on the front toes where there are several flower petal designs. The moose hair appears to have insect damage.

Figure 44: Comparing the condition of the toe vamp (top) and back heel (bottom) of the proper left (Left) and proper right (right) moccasins.

This comparison is more drastic when the two are compared from the bottom (Figure 45). A stiff crease can be found on the left upper portion of the sole of the proper right moccasin. This can be interpreted as a stiff tideline caused by water or moisture. As noted in Section 5 alum tawed skins are white, considerably durable, but are easily damaged by moisture. In addition to the missing heel the leather is separating and there are large losses on the bottom and the sides of the proper right moccasin. No previous treatment is noted in the SINM records, but a dark yellow-brown, hard substance found around the most deteriorated areas of the proper right moccasin could be the remnants of adhesive residue from a previous treatment. Small bits of a gold colored residue are also found on the bottom of the proper right moccasin. These are likely from a previous mount or display.

Figure 45: Compare the bottom condition of the proper left (Left) and proper right (Right) moccasins.

7. TREATMENT

With the moccasins slated to go on exhibition in 2017, the goal of the treatment was to create a custom support system and to fill the losses of the right moccasin to match the overall look of the left moccasin. This approach was conservative with the hope of achieving an aesthetically pleasing support that could be used for display without distracting from the fine craftsmanship of the moccasins. The moccasins will be stabilized and the appearance of the proper right moccasin will look more similar and cohesive with the proper left moccasin. The new supports will greatly improve the overall look and shape of the moccasins, although the existing damage will still be visible. First, before treatment written and photo-documentation were completed using normal illumination, ultraviolet radiation (UVA), and infrared illumination. Next the moccasins were tested for old pesticide residue and material identification of the moose hair and skin were completed.

Figure 46: Detail, Proper left front vamp flower Before (Left) and After (Right) cleaning.

After documentation and material analysis were complete the next step was to surface clean the moccasins using a soft bristle brush and a variable suction vacuum. A small attachment covered with a nylon netting insured that no small or loose parts of the moccasins were removed. Although it is difficult to see a noticeable change by the naked eye the use of photo-macrographs (Figure 46) can show the removal of dust and dirt on a smaller scale. Next a storage box was created using an acid-free, corrugated blue board to help protect the moccasins from dust, pests, and humidity fluctuations.

New custom internal supports (See Appendix E) were sewn using Tyvek™ and polyester batting to passively reshape and support the moccasins. Then the areas of loose and separating leather on the bottom and side of the proper right moccasin were consolidated using BEVA[2] gel, blotter paper, and pressure. These two steps helped to support and stabilize the moccasins. Next, alum tawed goatskin was pared down to a similar thickness of the moccasins and a new internal heel support was created for the missing heel. This was then sewn to the Tyvek™ insert using cotton thread creating additional support, shape, and visual compensation while still exposing all of the original material.

[2] BEVA gel (an ethylene vinyl acetate based adhesive)

An exterior heel was created using the same alum tawed goatskin in order to encapsulate and protect the loose pieces of the original moccasin. The exterior heel was toned with dry pigments and microcrystalline wax. Neither heel is sewn or adhered directly to the moccasin. Figure 47 shows the transformation of the heel before and after treatment.

Figure 47: Proper Right Moccasin Before Treatment (Left), Internal Heel (Center), and External Heel (Right).

The left image shows the poorly supported, ill shaped before treatment condition. The center image shows the internal heel giving support and shape to the moccasin while exposing all of the original material, which has been consolidated. The right image shows the addition of the external, toned heel encapsulating the loose pieces of the original while adding additional support and visual compensation. Figure 48 shows the improved profile of the right moccasin and the minimal exposure of the faux exterior heel.

Figure 48: Proper Right Moccasin Profile Before (Left) and After (Right) Treatment.

The last step of the treatment was to fill the level of loss found on the proper right to the level of loss on the toe of the proper left moccasin. The fills were created using cotton threads dyed with Orasol[3] dry pigments and were attached using a 1:1 Ethanol: Acetone B-72[4] solution.

Figure 49: Proper Right Moccasin Toe Before (Left) and After (Right) Treatment.

[3] Orasol Powder pigments Orange RLN, Blue GN, and Black RL1
[4] PARALOID B-72 (a copolymer of ethylmethacrylate and methyl acrylate)

8. CONCLUSIONS

The goal of this treatment was to stabilize the moccasins with adequate and appropriate support while achieving an aesthetically pleasing visual compensation that would not distract from the original and fine craftsmanship of the moccasins while on display. This process was documented and a short video is currently being produced. The draft of the video (Figure 50), edited by Greg Gheorghiu has been shared with SINM's director David Shongo. Going forward adjustments to music, text, and voice over will be made and the hope is to have the short video translated into Seneca for the 2017 opening exhibition. This video will share and promote conservation to the many visitors of the new cultural center.

Figure 50: A still from the video (draft) that will be shared as part of the exhibition at the new cultural center.

Some of the broader goals of this project are long-term and ongoing. A basic preventative care and simple protocol booklet for the museum is in the works and the newly established ties between SINM and the SUNY Buffalo State Art Conservation Department for future projects will grow stronger with time. As a member of the Seneca Bear clan, who frequently visited this museum, as a kid with my grandma Virginia Snow Passerotti working on this project has been a privilege and incredibly rewarding. After spending time with the collection and its caretakers, it's clear that they've done an amazing job of maintaining it with very few resources. I look forward to continuing to work with the Seneca–Iroquois National Museum, as they get ready for their future move and beyond.

ACKNOWLEDGEMENTS

I would like to extend my sincere gratitude to the faculty and staff in the Department of Art Conservation at SUNY Buffalo State College. In particular I would like to thank Jonathan Thornton for his guidance, indelible expertise, and good humor. I'd like to extend a special thanks to Jiuan-Jiuan Chen for always being available to answers all of my questions with great enthusiasm and knowledge. I am extremely grateful to Dr. Rebecca Ploeger for her patience, time, and expertise when I came to her with material analysis questions. Thank you to Dr. Aaron Shugar for sharing his wealth of books and assistance with the material analysis of this project. I would also like to thank the Andrew W. Mellon Foundation, Ross Kenzie Family Foundation, Saxe Family Foundation, and SUNY Buffalo State Tuition Scholarship for their generous financial support for my education. Without the help, collaboration and trust of David Shongo, Marissa Corwin, and Jonnie Crouse at the Seneca Iroquois National Museum this project would not have been possible. I am also extremely grateful for previous supervisors and old and new colleagues who provided important information during this project. Thank you: Susan Heald, Marian Kaminitz, Fran Richie, Rebecca Summerour, Meredith Montague, and Jare Cardinal. I am beyond grateful for the time I got to spend as a conservation student at Buffalo. My professors and classmates have been a constant inspiration and I could not have asked for a better group of friends and classmates to learn with and from. Thank you Class of 2017. I will always be indebted to my friends and family who have supported my conservation journey. In particular, I would not be where I am today without the infinite patience, support, and friendship from Zuke and Greg Gheroghiu.

Nya:weh!

Thank you!

IMAGE CREDITS

Photographs and images by Nicole Passerotti, except the following:

Figure 1: Map of Iroquois Territory, http://be91148.tripod.com/id2.html

Figure 2: Figure 2: Regional map of the Haudenosaunee (Iroquois) Tribal regions, http://ksuanth.wikifoundry.com/page/N.+American+(Maria+U+2%3A30

Figure 3: Regional map of the Six Nation Tribes ca. 1720, https://commons.wikimedia.org/w/index.php?curid=435663

Figure 4: Seneca Nation of Indians eight animal clans, https://www.senecamuseum.org

Figure 5: The Seneca Iroquois National Museum, https://www.senecamuseum.org

Figure 6: A sample of displays at the current Seneca Iroquois National Museum, https://www.senecamuseum.org/Default.aspx

Figure 8: Groundbreaking Ceremony September 3, 2015 for the new Seneca Cultural Center, http://news.wbfo.org

Figure 9: The location of the 74 tribes participating in the 1990 survey, Appendix E from *Keepers of the Treasures: Protecting Historic Properties and Cultural Tradition on Indian Lands*.

Figure 10: The 74 tribal institutions participating in the AASLH 2002 survey, List from *Tribal Museums in America*.

Figure 16: Scale Patterns (L to R), Moose, Elk, and Porcupine Quill, *Hair embroidery in Siberia and North America and* http://www.ncsl.org/research/state-tribal-institute/list-of-federal-and-state-recognized-tribes.aspx

Figure 21: Reference for Kid, Goat, Sheep, and Calf Skin, http://britishlibrary.typepad.co.uk

Figure 25: Taxidermy bird showing pockets of heavy metal pesticide residue, Courtesy of Dan Kuschel

Figure 33: Moose, genera *Alecs,* http://bioweb.uwlax.edu/

Figure 34: Moose hair bundle, "Huron Moose Hair Embroidery". *American Anthropologist* 13 (1):1-14.

Figure 35: Map of the Wendat (Huron) location in relationship to the Seneca, Zoesaadia.com

Figure 37: Examples of dyed skin gloves with moose hair embroidery, Canadian History Museum

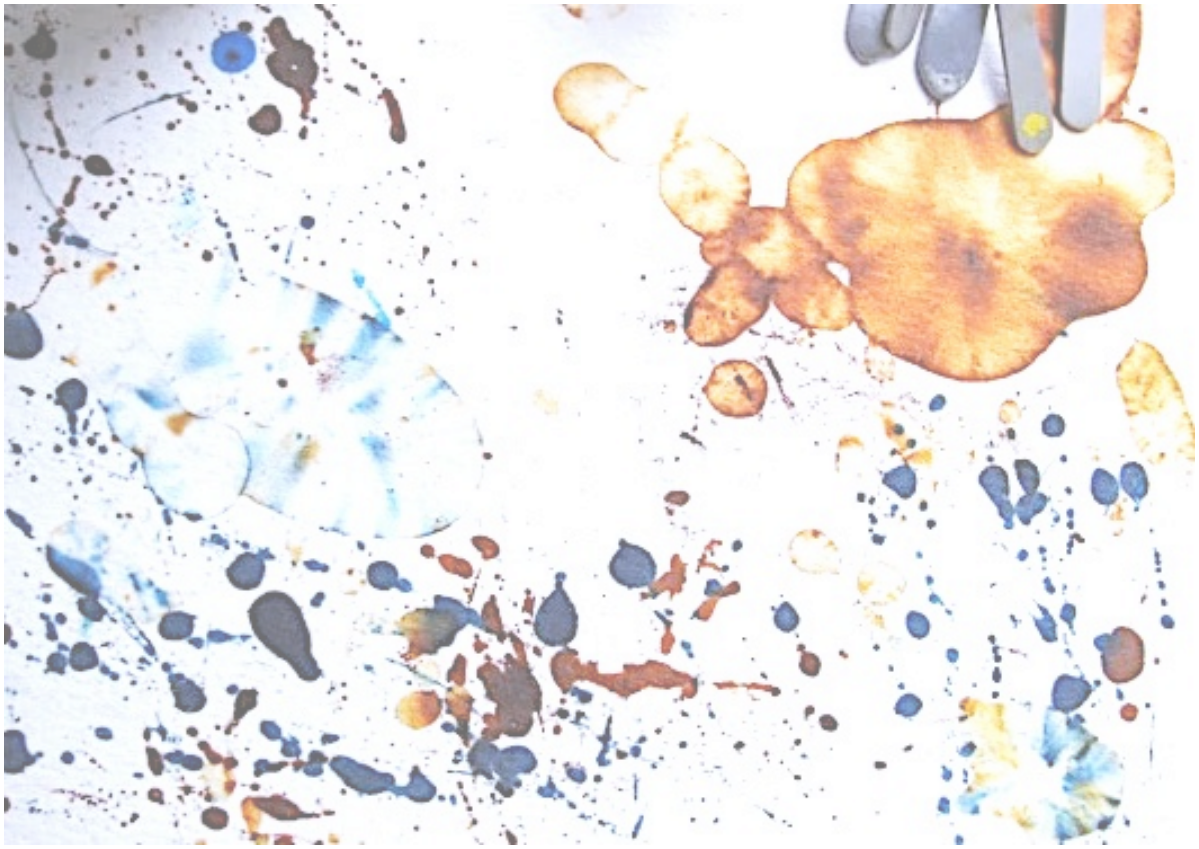
Figure 38: Spanish Goat Kid Gloves, Ca. 1800, http://www.metmuseum.org/art/collection/search/157064

Figure 39: Examples of Iroquois Moccasins, *Iroquois crafts*.

Figure 40: Non- traditional Evening slippers ca. 1850-1875 objects with red wool and moose hair embroidery, V&A Museum

Figure 41: Applique technique illustration (lower), Identification and Conservation of Quillwork and Hollow Hair Embroidery" in *Textile Conservation Group Meeting Preprints: The Treatment and Handling of Textiles with Problematic Materials*.

Figure 42: Petal technique illustration (lower), *Hair embroidery in Siberia and North America*.



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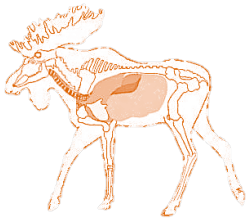

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AUTOBIOGRAPHICAL STATEMENT

Nicole Passerotti earned a B. A. in English Literature with a concentration in Modern Culture and Media from Oberlin College in Oberlin, OH in 2003. During this time she worked in the Oberlin College Library Preservation Lab as a technician. As an undergraduate she also studied in Macerata, Italy and completed bookbinding and printing apprenticeships at Quercus Press in Waltham, MA and Alembic Press in Oxford, England. She was a pre-program intern at the Textile Museum of Oaxaca in Oaxaca, Mexico as well as the deYoung Museum in San Francisco, CA, and Chrysalis Art Conservation in Half Moon Bay, CA. She also worked as an outdoor sculpture technician at the Iris & B. Gerald Cantor Center for the Visual Arts at Stanford University in Palo, Alto, CA. As a pre-program intern at the National Museum of the American Indian in Washington, DC she worked on preparing objects for the exhibition *Nation to Nation: Treaties Between the United State and American Indian Nations*. During the summer of 2015 she interned at the Kaymacki Archaeological Project (KAP) as part of the Gygaia Projects in Tekelioglu, Turkey. During the summer of 2016 she will intern at the Pitt Rivers Museum at Oxford University in England. Following this, she will begin a twelve-month internship at the Philadelphia Museum of Art in Philadelphia, PA. Nicole is a current graduate fellow and will earn a Master of Arts with a Certificate of Advanced Study in Art Conservation from SUNY Buffalo State College in September 2017.

Betty Wolfgang (Great Aunt), Nicole Passerotti, and Virginia Snow Passerotti (Grandmother)