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A Proposed Management Plan for the New World Archaeology Department's Photographic Archive at the Royal Ontario Museum

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*A Proposed Management Plan for the New World Archaeology Department's
Photographic Archive at the Royal Ontario Museum*

By

Tracy Mallon-Jensen

BA., Art History and Arts Administration, University of Toronto, 1989

A Thesis project presented to Ryerson University and the Art Gallery of Ontario

In partial fulfillment of degree requirements for the degree of

Master of Arts

In the program of Photographic Preservation and Collections Management

Toronto, Ontario, Canada 2011

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A Proposed Management Plan for the New World Archaeology Department's Photographic Archive at the Royal Ontario Museum

Master of Arts, 2011

Tracy Mallon-Jensen

Photographic Preservation and Collections Management

Ryerson University / Art Gallery of Ontario

Abstract

This practical thesis project addresses the dilemma faced by many museums of deteriorating archival photographs that are related to objects in their permanent collections. Collection managers often have little time, expertise or financial means to preserve these important resources. The first part of the thesis provides a guide to assessing and devising a management plan using a collection of 25,000 images in the New World Archaeology department of the Royal Ontario Museum as a case study. The guide addresses the physical issues of object identification, condition assessment, materials and methods of rehousing a diverse collection, and creating a proper storage environment. It also examines issues of improving intellectual access through cataloguing and digitizing as well as budgeting. A report summarizing the condition of the New World Archaeology collection accompanied by recommendations for implementation of a management plan is the focus of the second part of the thesis. This project highlights the need for institutions to recognize the value of these deteriorating materials and devote the necessary resources to their preservation.

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Tracy Mallon-Jensen
August 2011

- Dedication -

I would like to dedicate this thesis project to the most important people in my life: my husband, James and my two very special daughters, Tessa and Jamie. Even though your constant queries of “Are you done yet?” were reminiscent of the long car ride, “Are we there yet?” I have appreciated your patience with my harried (and occasionally irrational) behavior and for your unequivocal and endless support, without which I would not have been able to rise to this challenge.

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A Proposed Management Plan for the New World Archaeology Department's Photographic Archive at the Royal Ontario Museum

Introduction:

This practical thesis project is an expansion of a 2010 summer internship at the Royal Ontario Museum (ROM), undertaken at the request of the New World Archaeology (NWA) collection technician, Adrienne Desjardine. The initial project involved inventorying and assessing the condition of 10% of the New World Archaeology department's image archive. The thesis examines the entire collection of 25,000 objects and highlights a growing, multifaceted problem faced by many museums, regardless of their size. Photographic archival material, which supports institutional artifact collections, is deteriorating. Further complicating the issue of preservation of supporting photographic material is the lack of expertise by collection managers and, often archivists, in devising a collection management plan for photographic and audio-visual material specifically and in many cases, by the lack of sufficient funds to implement the necessary preservation measures.

As early as 1907, the American Association of Museums recognized the need for trained professionals to manage records¹. The issue of arts institutions ignoring their own histories over the years is exemplified in an article by Vid Ingelevics examining the lack of acknowledgement by the administration of the Metropolitan Museum in their annual report of the 1951 exhibition *Up at the Photographer's: Fifty Years of Museum Photography* by Edward Milla organized by

¹ Alan L. Bain, "The Muses' Memory," *Museum News*, (November/December 1991), 36.

the museum's own chief photographer². While archivists and museum professionals in charge of records have long lamented the deplorable state of record keeping in museums³ and administrations' engagement in "institutional amnesia,"⁴ it is widely recognized that the museums archive 'movement' gained momentum as a result of a 1979 conference organized by the Archives of American Art⁵. Archivists and librarians from the United States and Canada⁶ created *The Draft Guidelines for Museum Archives* as a result. The preamble to the guidelines states: "While the significance of museum records is widely acknowledged, they have been and still are sadly neglected...Careless storage procedures, [and] indifference...have resulted in the loss of much valuable documentation."⁷ Despite these efforts, if we use the ROM as an example, it is clear that the problem has not been addressed in any consistent way since 1979. The ROM does currently employ an archivist, but this is a new position, a role previously filled by the librarian with inadequate staff or time to properly establish and maintain an institutional archive. As a result, the current ROM archivist faces the daunting task of organizing a largely ignored institutional history, with little time for other projects. Because of these circumstances, departmental documentation in all its forms has generally been under the purview of the curator or collection technician and has not been a priority. That being said, the material in the New World Archaeology department and similar accumulations in other departments throughout the ROM, not only contextualize the permanent collections, but also provide historical evidence of each department's activities, and thus, the institutional history as a whole.

2 Vid Ingelevics, "The Metropolitan Museum of Edward Milla," *Image and Inscription: An Anthology of Contemporary Canadian Photography*, edited by Robert Bean, (Toronto: YYY Books and Gallery 44 Centre for Contemporary Photography, 2005), 36.

3 Michael Steven Shapiro, ed., *The Museum: A Reference Guide*, (New York, Greenwood Press, 1990), 367-368.

4 Ingelevics, "The Metropolitan Museum of Edward Milla", 36.

5 Bain, "The Muses' Memory," 38.

6 Ann Marie Przybyla, "The Museum Archives Movement," *Museum Archives: An Introduction*, edited by Deborah Wythe, (Chicago: The Society of American Archivists, 2004), 4.

7 The Smithsonian Institution, *Conference on Museum Archives*, (Washington, D.C., Archives of American Art Journal, Vol.19, No. 4 (1979)), 25.

Approximately 48% of the NWA photographic collection is comprised of a variety of formats, ranging from large and small glass plate negatives, cabinet cards, gelatin silver prints and acetate negatives of varying sizes, to lantern slides, chromogenic prints and 16mm film reels, that span the late nineteenth century to the present day. The remainder of the collection consists of 35 mm color slides. These photographic objects are presently housed in polyvinylchloride (PVC) sleeves and binders, spring bound binders, a poorly sized wooden cabinet, a metal filing cabinet and a metal trunk; as a consequence, they are in various states of deterioration. Their loss would create a significant gap in the understanding of the department's artifact collections and its history of archaeological activities. Further, this visual material is neither catalogued nor digitized, severely limiting access to this collection by staff and researchers. The NWA photographic material is currently housed in the department's office space, as well as related textual documentation; however, as material continues to accumulate, this multipurpose space becomes more overburdened, further restricting access to the archival collection. In addition, the area is not environmentally controlled, which increases the risk of further deterioration of the photographic archive.

The goal of the thesis project is to provide a methodology to assess a photographic collection and the subsequent steps required to devise a management plan. It will function as a practical guide for institutions dealing with similar collections, using the work done in the New World Archaeology department as a case study. Part I of the thesis will consider issues of identification, proper storage materials and methods, environmentally controlled storage facilities and measures to improve intellectual and physical access for all user groups. It is a summary of the research

undertaken while investigating the preservation issues of the NWA department's photographic collection. The thesis will also include a report to the Royal Ontario Museum and collection technician based on the analysis from Part I, summarizing the present condition of the New World Archaeology collection, with a set of specific recommendations and proposals for implementation of a management program. The report, identified as Part II of the thesis, will be accompanied by a title page and table of contents upon delivery to the technician. It will include an inventory of the New World Archaeology's collection and recommendations for appropriate rehousing materials and methods as well as a general supply list to rehouse the entire collection accompanied by a budget. This section will, for obvious reasons, repeat some of the information found in Part I, where I am detailing my research. It will also include a list of descriptive terms needed for inclusion of photographs into a database for cataloguing purposes, an outline of photographic preservation issues that may be affecting the collection and suggestions for improving the environmental conditions within the office space.

Literature survey

The goals of this applied project were to provide a preservation and collections management plan for the photographic archive of the New World Archaeology department in the Royal Ontario Museum. This would establish much needed physical and intellectual order to the collection. While there are many publications related to the management of museum collections or archives separately, there is limited material that combines these two distinct practices. Consequently sources reflect the complexity of the project and address multiple issues, such as identification, preservation, cataloguing, and access.

The starting point for my research was an inventory and assessment of the collection itself and its condition, thus the sources in this section deal with identification and preservation issues. While engaged in examination, finding sources that identified the processes and mediums represented in the collection in one text was a challenge. Bertrand Lavédrine's *Photographs of the Past: Process and Preservation*, published in 2009 by the Getty Conservation Institute served as an excellent general source that covered every medium. Organized into three main sections dealing with positives, negatives and conservation, the book spanned the history of photographic processes from the daguerreotype to color chromogenic prints. It provided succinct descriptions of each process, including the active time period, the history, how it was fabricated and elements of deterioration and care. As with all books that cover a large time span however, it lacked depth, so for a more detailed analysis of any particular process, I had to look elsewhere.

The “*Conserve O Gram*” leaflets on caring for photographic materials published by the National Park Service between 1993 and present day are another excellent resource⁸. Ranging from the general to the specific, the topics covered are presented in a concise manner including “do and don’t” sections that emphasize their main points and serve as an introduction to the various processes and how to treat them. The 1986 James Reilly book, *Care and Identification of 19th Century Photographic Prints*, published by the Eastman Kodak Co. on the other hand, is a more specialized publication dealing with positive images on paper supports. It provided specific clues to identifying the earliest works in the collection. The fold out identification flowchart detailing the characteristics and timelines of major photomechanical and photographic processes, accompanied by visual examples, synthesizes the contents of the book into a clear, easily comparable format. The Image Permanence Institute (IPI) website founded by Reilly, contains a *Graphics Atlas* that is also an excellent 3D resource for comparing features of 19th c. photographs⁹.

As 50% of the NWA photographic archive is comprised of color slides, the one text that provided the most detailed information for the processes and supports of the twentieth century was the *Permanence and Care of Color Photographs: Traditional and Digital Color Prints, Color Negatives, Slides and Motion Pictures* by Henry Wilhelm and Carol Brower and printed by Preservation Publishing in 1993. Despite its title the book also included information relating to black and white negatives, especially in relation to the cold storage of acetate film. Chapters of

8 National Parks Service, Department of the Interior, Museum Management Program, *Conserve O Grams*. (http://www.nps.gov/museum/publications/consveogram/cons_toc.html).

9 James M. Reilly, *Image Permanence Institute*. (<https://www.imagepermanenceinstitute.org/>)

the book can be downloaded from the Wilhelm website¹⁰. As James Reilly has also done a great deal of research on the deterioration and preservation of acetate film, the IPI website also contains a number of printed resources available to purchase, including the *IPI Storage Guide for Acetate Film*¹¹.

All of the general publications above include information on identifying photographic processes as well as the physical and environmental factors of deterioration that affect preservation, recommendations for proper housing and storage methods, and finally, factors to consider for exhibition including lighting levels. The project for the NWA department required that many of these topics be considered to provide informed recommendations for their specific needs. Dee Psaila's book, *Design and Materials for Photographic Housings*¹² first published in 2006 provided a more in-depth look at housing solutions for different mediums based on the funds available within an institution, including different materials available, a source guide and instructions on how to make custom housings. This was particularly important to making my own recommendations for this collection.

Finding relevant sources for the second major section, "Cataloguing and Database Management", was problematic. Cataloguing in museums is generally organized by specific object, and in archives by fonds, series and item level descriptions. The specific needs of the New World Archaeology department do not fit neatly into either of these paradigms. The material will not be accessioned as part of the Museum's core, permanent collections or absorbed

10 Henry Wilhelm, *Wilhelm Imaging Research*. (<http://www.wilhelm-research.com/>).

11 James M. Reilly, *IPI Storage Guide for Acetate Film*. (Rochester, NY., Image Permanence Institute, Rochester Institute of Technology, 1993).

12 Dee Psaila, *Design & Materials for Photographic Housings*. (United States, Lulu Inc., 2008).

into the official archive in the very near future. In addition, the size of the collection and lack of resources prohibits item level description at this time. As a result, providing intellectual organization can be accomplished most effectively by choosing options that suit the collection's size and diversity from amongst multiple sources.

*Photographs: Archival Care and Management*¹³ by Ritzenthaler and Vogt-O'Connor proved to be the most appropriate publication for the collection in the NWA department, as it describes archival practices such as arrangement of information, the creation of container lists, description techniques, keywords, cataloguing, and digitization specifically for photographic formats. *Museum Registration Methods*¹⁴ by Buck provided a detailed look at the issues of registration for museums, and a brief overview of the purpose and major considerations for a museum archive, but was too focused on procedures for registrars to be relevant to the NWA collection. The second edition of *Museum Archives: An Introduction*¹⁵ edited by Deborah Wythe included excellent background information on the 'movement' to establish institutional archives in museums and a bibliography that aided in defining the issue of institutional memory in the introduction to the thesis¹⁶. It serves as a guide on how to establish an archive that considers some aspects specific to a museum, with a brief section on dealing with photographs, but it does not deal with archival material accumulated by departments other than the institutional archive.

13 Mary Lynn Ritzenthaler and Diane Vogt-O'Connor, *Photographs: Archival Care and Management*. (Chicago, Society of American Archivists, 2006).

14 Rebecca A. Buck, Jean Allman Gilmore, and American Association of Museums, eds., *Museum Registration Methods*. 5th ed. (Washington, DC: American Association of Museums, 2010).

15 Deborah Wythe, ed., *Museum Archives: An Introduction*, 2nd ed. (Chicago, Society of American Archivists, 2004).

16 Przybyla, "The Museum Archives Movement", 3-8.

While several texts include practical information on digitizing collections, such as *Digital Imaging: A Practical Handbook* by Stuart Lee¹⁷ or *Digitizing Collections* by Lorna Hughes¹⁸ and on digital asset management systems, such as Chapter 4 on “Records Management” in *Museum Registration Methods*¹⁹, the publications by the National Parks Service, Ritzenthaler, and Hughes also discuss methods of prioritization, a key element for any cash strapped organization that must manage its resources intelligently. The Ritzenthaler text also includes tips for estimating the number of personnel hours necessary to complete a given project, a crucial element for budgeting²⁰.

Archival texts seem to be more appropriate than museum registration publications, but customization must still take place to provide the best solutions for the NWA department. Continuing discussions with the collection technician reveal the fragile nature of this process. As this department is without a curator, any decisions made at this juncture may be reversed in the future with respect to priorities. Until a museum wide policy is in place for these departmental collections, they will remain vulnerable to deterioration.

17 Stuart Lee, *Digital Imaging: A Practical Handbook*. (New York, Neal Schuman Publishers, Inc., 2001.)

18 Lorna Hughes, *Digitizing Collections: Strategic Issues for the Information Manager*. (London, Facet, 2004).

19 Buck, Gilmore and American Association of Museums, eds., *Museum Registration Methods*, 184-192.

20 Ritzenthaler and Vogt-O'Connor, *Photographs: Archival Care and Management*, 162.

Methodology

When I began the project, the collection technician, Adrienne Desjardins and I discussed the importance of this archival material to the NWA department. The material provides critical context to the permanent collection under her care. Field notes, detailed excavation maps and photographs of archaeological sites and the excavation process support objects in the permanent collection. Without this information, the objects would have little meaning. Further, requests for visual imagery related to archaeological sites were frequent, but the material was not catalogued in any way, thus severely limiting access. As well, the loss of the curator in this department meant the loss of a complete knowledge of the contents and accurate locations of the photographic objects previously gained through working experience. In light of this, Adrienne sought aid in organizing the photographic documentation and assessing its condition in order to facilitate its preservation. By inventorying the contents, a beginning could be made towards creating a permanent, searchable database for present and future staff and researchers. It would also be instrumental in making decisions regarding which material to keep, which to discard and how to preserve the material.

I began the project by examining the contents of a wooden cabinet. The material housed within it was in physical danger every time a drawer was opened because the contents did not fit properly into the cabinet. I created a detailed inventory sheet in Excel and included as much information as possible to eliminate the need to examine the collection a second time. The sheet needed to include data fields specific to identifying photographic material, such as process and format as well as information relevant to archaeology, such as site name or archaeologist. The photographic material was housed throughout the space in various non-archival ways, with

differing levels of detail, each posing its own housing problems. As the inventory was undertaken for each storage area, fields were added to the original database to incorporate the unique characteristics of the photographic formats. The photographic objects in the wooden cabinet were recorded at a much more detailed level than most of the other formats in the department because they were part of an initial summer internship project. It became apparent when examining the remainder of the departmental collection that an item level analysis was impractical considering the increased volume of objects. Regardless, a description of the different photographic formats, their locations, the general contents, condition, recommendations for rehousing and possible avenues for itemized description in the future, especially in relation to digitizing will be a valuable tool for the department.

Completing the inventory was the most time consuming aspect of the project because of the variety of processes and quantities included in the collection. Each format required a great deal of research to ascertain correct process and deterioration identification (if any), both critical factors in making rehousing suggestions and determining rehousing priorities. Condition ratings were kept simple (poor, fair and good) and notes were added indicating the exact form of deterioration, for example: "Poor – large silver mirror spot in center." From this information, I was able to recommend rehousing solutions for the most vulnerable photographic materials in the NWA department, taking into consideration archival materials already available and a very limited, and uncertain budget. Fortunately, the collection technician has access to an empty refrigerator situated in the NWA collections vault. To take advantage of this asset, I researched cold storage options for storing acetate material. This would not be frozen storage, which would

be more advantageous, but reducing the temperature for film even by ten degrees adds significantly to its life span²¹.

Using the inventory sheets, I then examined the Access database previously constructed for departmental documents to see if the fields would be sufficient to include the photographic material. This required research into archival description and cataloguing fields to understand how the two systems are similar so that information included in the departmental database could be incorporated into the archive at a future date. Meetings with the museum archivist and the departmental database technician facilitated the decisions made regarding the addition or redefining of fields. Transferring the Excel inventory spreadsheet into the Access database will significantly increase intellectual access to the material, just as rehousing the collection will dramatically increase the safety of the material, as well as physical accessibility. The last component of improving access is digitization. The condition reporting and decisions made regarding rehousing priorities, as well as research into prioritization factors to consider, facilitated the development of priorities for digitization specifically for the NWA department that will hopefully be implemented sometime in the future.

The physical environment for storage of the material was the last thing to consider. Humidity and temperature readings were taken over a three month span for the department office space by the museum. From this information and by measuring the area of the space, I made recommendations regarding the purchase of a commercial dehumidifier to produce a more

21 Bertrand Lavédrine, *Photographs of the Past: Process and Preservation*. (Los Angeles, Getty Conservation Institute, 2009), 278.

controllable microclimate. While the collection technician has researched replacing her current shelving with compact shelving, this is a very expensive venture and unlikely to happen soon, if at all. Nevertheless, once the housing materials were decided on, I was able to determine the amount of space the newly rehoused material would occupy in linear feet by considering how the material could be stacked on the shelves and the measurements of the storage containers (Please see Section 6 for further details). This would allow the collection technician to plan for storage of the material.

Part I: How to Develop a Management Plan

History

The history of the Royal Ontario Museum has played a major role in the development of the New World Archaeology department. The *Toronto Normal School* (a teacher's college) was established in 1847. Ten years later, the *Natural Museum of History and Fine Art*, the first publicly funded museum in Canada, opened under the auspices of the Normal School. Its collections were developed with purchases made by Egerton Ryerson on trips to Europe²². In 1896, these collections were amalgamated with the archaeological and ethnological collections of the *Canadian Institute* (now the *Royal Canadian Institute*) to form the *Ontario Provincial Museum*²³. David Boyle, who was appointed by the Institute as Canada's first full-time archaeologist in 1888, acted as curator and superintendent for the new museum from 1896 until his death in 1911²⁴. The collections from the *Natural Museum of History* and the *Canadian Institute* were the cornerstones of the new provincial institution, the Royal Ontario Museum, which was officially established in 1912 with funding from both the provincial government and the University of Toronto. The Royal Ontario Museum actually housed five separate museums under its roof in association with the University: the Royal Ontario Museums of Archaeology, Paleontology, Mineralogy, Zoology, and Geology²⁵. Each of these museums operated under

22 Claude W. Doucet, "Egerton Ryerson, 1803-1882," *Ryerson University*, 2002, <http://www.ryerson.ca/archives/egerton.html>

23 Gerald Killan, "Boyle, David," *Dictionary of Canadian Biography Online*, 2000, http://www.biographi.ca/009004-119.01-e.php?id_nbr=7235&&PHPSESSID=yhzfzfkqvape

24 "David Boyle (1842-1911)," *Brief History of Anthropology at the University of Toronto*, accessed June 20, 2011, <http://anthropology.utoronto.ca/about/history>

25 "Our History," *Royal Ontario Museum*, accessed June 20, 2011, <http://www.rom.on.ca/about/history/index.php>

separate administration until reorganized in 1955 creating a culture of isolation that has not been totally dispelled today²⁶.

The archival material in the New World Archaeology department began to accumulate in the late 19th century as a result of David Boyle's activities that included site inventories, systematic field explorations and excavations, and the work of amateur archaeologists²⁷. There have been many archaeologists who have contributed to the body of archival material accumulated in the NWA department since its inception. Particularly prolific since the 1950's were Kenneth Kidd, Walter Kenyon, Peter Storck and Mima Kapches. Photography became a useful tool to document the archaeological dig site, detailing landscape features, the surroundings, the excavation process and the discovery of objects in situ. Much of the material in the NWA department represents these activities that relate to objects within the permanent collection, as well as material used for teaching purposes. Unfortunately, while photographic material, textual documentation, maps, etc., continued to accumulate, they were not properly archived and detailed knowledge of this supporting material was stored in the memories of department curators who took this knowledge with them when they left the museum. Connections between the supporting material and the physical collections have been weakened as a result. A lack of proper storage and maintenance of the photographic material, in particular, has further exacerbated the problem. If the archival material is not preserved and organized to maintain and re-establish connections with the permanent collection, then objects in the collection may become irrelevant without an understanding of their origins. Further, without the archival information available in a searchable

26 "Our History," *Royal Ontario Museum*, accessed June 20, 2011, <http://www.rom.on.ca/about/history/index.php>

27 Gerald Killan, "Boyle, David," *Dictionary of Canadian Biography Online*, 2000, http://www.biographi.ca/009004-119.01-e.php?&id_nbr=7235&&PHPSESSID=yhzfzqkvzape

database, access to this supporting material by staff and external researchers will continue to be extremely limited.

Current Storage Units and Environmental Conditions

The photographic collection is stored in the office space of the New World Archaeology department, using a variety of non-archival materials and storage units. The space is not environmentally controlled and sudden shifts in humidity are common. High rates of humidity (RH), as well as extreme shifts in humidity are prime factors in photographic deterioration²⁸. An image on a support, be it paper, glass or film, is composed of chemicals. Heat and humidity can cause further reactions in those chemicals, which deteriorate the image, the support or both.

The photographic materials are not stored centrally, but spread around the room, making access more complicated than necessary. A wooden cabinet, that was not purpose built for storing photographs or negatives is causing physical damage to the objects such as breakage, bends and tears (Figs. 1&2).



Fig. 1 – Closed Wooden Cabinet in NWA Office Space. Photograph by author. Courtesy of the Royal Ontario Museum.



Fig. 2 – Open Wooden Cabinet in NWA Office Space. Photograph by author. Courtesy of the Royal Ontario Museum.

28 Lavédrine, *Photographs of the Past*, 280-281.

Wooden furniture is also treated with chemicals when manufactured, and could be causing chemical reactions in the photographic material through off-gassing²⁹. The cabinet itself is damaged from the weight of the glass negatives and needs to be eliminated. Shelves that house PVC binders line the exterior wall of the space (Fig. 3), which becomes warm in the summer, contributing to photographic deterioration. A metal equipment trunk housing film reels is unvented and stored against the same exterior wall (Fig.4). Finally, a metal filing cabinet currently stores a mixture of 10x13cm negatives, prints and color transparencies, as well as, 35mm and 120mm filmstrip negatives (Fig. 5).



Fig. 3 – Exterior Wall Shelves in NWA office space. Photograph by author. Courtesy of the Royal Ontario Museum.



Fig. 4 – Metal Trunk in NWA office space. Photograph by author. Courtesy of the Royal Ontario Museum.



Fig. 5 – Metal Filing Cabinet in NWA office space. Photograph by author. Courtesy of the Royal Ontario Museum.

Despite these deficiencies, the collection as a whole has not suffered extreme deterioration thus far. However, some materials, such as acetate film, are more susceptible to sudden deterioration. The first step towards long-term preservation of a collection is recognizing its value and vulnerability, and taking stock of the contents to begin the process of devising a management plan.

²⁹ Lavédrine, *Photographs of the Past*, 294.

1) Identification, Housing, Condition

The project began in the spring of 2010 as one of my internship projects at the ROM. I was asked to complete an inventory and condition assessment of the contents of the wooden cabinet located just inside the entrance to the department office space, next to a heat producing office printer. A numbering system was used haphazardly, but not explained in any department documents. Creating an inventory sheet to record the contents of the material was the first step towards organization. The inventory sheet for the cabinet noted the original assigned numbers, the drawer number or location, quantities, any text or title on envelopes, the archaeologist or site, the subject or type of content (object, site, illustration), the process and format (ie. Gelatin silver glass negative), dimensions, date if known, whether they were black & white or color, the current housing and the condition (see Appendix 1). For the cabinet only, the sheet also included a column for department, as not all of the material was related to archaeology. Some teaching material was ethnological and noted for later removal. Condition ratings were kept simple: poor, fair and good, and reflected the ratings being used in an access database previously devised for tracking other departmental documents. Notes were added indicating the exact form of deterioration. This system would allow anyone searching the database to more easily understand the rating scale and the exact form of deterioration regardless of their knowledge of photographic formats. When the project expanded to include the whole photographic archive, it became apparent that an item-by-item description for the rest of the collection was impossible given the time constraints. As a result, not all of these fields were needed for the remainder of the inventory. In the following sections, I will identify and discuss the specific materials found in the collection.

Glass Plate Negatives

The cabinet contained most of the older photographic formats found in the collection, including cabinet cards, gelatin silver glass negatives, gelatin silver prints and postcards, and acetate film negatives in varying sizes. The larger glass negatives were encountered first. They were easily identified as gelatin silver because of their telltale neutral grey to black tones, versus collodion glass plate negatives that have warmer beige tones³⁰. Ranging in size from 11x15 cm to 20x25.5 cm, they are stacked horizontally in non-archival envelopes, where the weight of each negative bears down on the other (Fig. 6). Approximately 50% of these negatives are exhibiting some degree of silver mirroring, discernable by a silvery blue haze, visible in raking light that can spread across the picture plane and obscure the image (Fig. 7).



Fig. 6 – Drawer with Horizontally Stacked Glass Negatives in Wooden Cabinet. Photograph by author. Courtesy of the Royal Ontario Museum.



Fig. 7 – Silver Mirroring on Glass Negative. Photograph by author. Courtesy of the Royal Ontario Museum. Reproduction is strictly prohibited without written consent of institution.

30 Lavédrine, *Photographs of the Past*, 266-267.

While silver mirroring typically begins at the edges of a negative and progresses inward, it can also appear as dots or blooms anywhere on the emulsion surface (Fig. 8). Particularly degraded areas can appear violet, green or bronze in color³¹ (Fig. 9).



Fig. 8 – Silver mirroring speckles and blue metallic sheen on glass negative. Photograph by author. Courtesy of the Royal Ontario Museum.

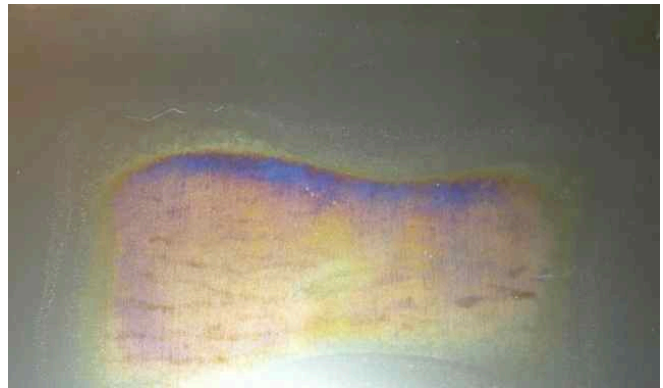


Fig. 9 – Violet, bronze and gold effect from silver mirroring on glass negative. Photograph by author. Courtesy of the Royal Ontario Museum.

This rather exotic coloring is not normally noted in photographic identification texts such as Bertrand Lavédrine's *Photographs of the Past: Process and Preservation* and was very unexpected. Usually, only the silvery blue metallic haze is emphasized. To identify this effect, I had to search for a source that looked at glass negative deterioration in much more depth, and in so doing found Giovanna Di Pietro's dissertation, *Silver Mirroring in Silver Gelatin Glass Negatives*, 2002. Approximately 20% of the large glass plates are suffering from this advanced form of silver mirroring that begins as metallic speckles and enlarges to encompass the image.

³¹ Giovanna Di Pietro, "Silver Mirroring on Silver Gelatin Glass Negatives," (Phd. Dissertation, University of Basel, 2002), 9-10, edoc.unibas.ch/34/1/DissB_6232.pdf

Of the smaller glass plate negatives, many are housed vertically in non-archival envelopes that catch whenever the drawers are opened or closed (Fig. 10). The majority of the smaller glass negatives are stacked in the drawers against each other with no separation or protection (Fig. 11).



Fig. 10 – Glass and film negatives stored vertically. Photograph by author. Courtesy of the Royal Ontario Museum.



Fig. 11 – Unprotected glass negatives stored vertically. Photograph by author. Courtesy of the Royal Ontario Museum.

Under these conditions they are not only subject to breakage and abrasion from rubbing against each other, but from off-gassing chemicals from the wooden cabinet itself, as well as dirt, dust and air pollution. Approximately 1200 glass plate negatives measuring 8x10cm duplicated pages of books and were ethnological in nature, not archaeological. It was assumed that they were used for teaching purposes as the subjects do not relate to objects in the permanent collections. As they no longer serve any purpose to the department, they will be disposed of after being offered to other departments that may have an interest. Only 200 to 300 small format glass plate negatives remain to be rehoused, significantly reducing costs. The metal filing cabinet also contains some small format gelatin silver glass plate negatives, but the numbers are negligible compared to the wooden cabinet.

Lantern Slides

Also housed in the cabinet are 195 black-and-white glass transparencies measuring 8.25 cm x 8.25 cm. More commonly known as lantern slides they are essentially an early version of a film slide (Fig. 12). Like the glass negatives, they are subject to breakage, but in the NWA collection they are generally in good shape. Stored leaning against each other like the glass negatives, they are at less risk of damage from opening and closing of the drawers because of their smaller size (Fig. 13). An additional 75 lantern slides were located in the collections' vault housed in a period box. They will be added to the inventory and a revised supply list will be created as a result.



Fig. 12 – Glass Lantern Slide. Photograph by author. Courtesy of the Royal Ontario Museum. Reproduction is strictly prohibited without written consent of institution.



Fig. 13 – Glass Lantern Slides vertically stacked in drawer. Photograph by author. Courtesy of the Royal Ontario Museum.

Acetate Film

The NWA archive contains a substantial amount of cellulose acetate film or 'Safety Film'.

Cellulose acetate film was created to replace the highly flammable, cellulose nitrate film, the first

plastic film base developed in the late 19th century³². Acetate film went through several stages of development, from cellulose diacetate, to cellulose acetate propionate and finally cellulose triacetate, each one more stable than the last³³. Unfortunately, even cellulose triacetate continued to exhibit instability, especially under conditions of high temperature and high humidity, and developed ‘vinegar syndrome’ as it deteriorated. ‘Vinegar syndrome’ occurs as the deteriorating film releases acetic acid, which smells like vinegar. This reaction is autocatalytic, causing nearby photographic material to also react and begin to deteriorate³⁴. Being more familiar with pre-20th century material, I was surprised by the number of formats that used acetate as a film base when I began researching the NWA collection. Equally surprising was the length of time acetate continued to be used despite its known instability. Identifying the support as acetate of all of the various formats in the collection was also a challenge that required searching through many sources.

Acetate Film – under 10x13cm- cabinet

The acetate film in the NWA collection is present in multiple formats and locations. The wooden cabinet contains gelatin silver sheet film negatives ranging in size from 4 cm squared to 10x13cm housed in non-archival envelopes. They are frequently housed with a b&w gelatin silver print of the negative (Fig.14).

³² Lavédrine, *Photographs of the Past*, 254.

³³ David Horvath, *The Acetate Negative Survey: Final Report*, (Louisville, KY, University of Louisville, 1987), 7.

³⁴ Lavédrine, *Photographs of the Past*, 256.



Fig. 14 – Acetate sheet film negative with gelatin silver print. Photograph by author. Courtesy of the Royal Ontario Museum. Reproduction is strictly prohibited without written consent of institution.

The b&w sheet film negatives were identifiable as acetate by notch codes present on the upper corner, as well as, the phrase ‘safety film’ printed on the top edge (Fig.15; See David Horvath’s *Acetate Negative Survey* for further illustrations of acetate notch codes)³⁵. Although it is possible for a copy negative to have been made on polyester film that also copied the ‘safety film’ edging, it is unlikely that the trouble was taken for these negatives and the original notch codes would not have been present. I did not detect any vinegar syndrome among these negatives.



Fig. 15 – Acetate sheet film negative with notch codes. Photograph by author. Courtesy of the Royal Ontario Museum.



Fig. 16 – 35mm B&W Acetate roll film. Photograph by author. Courtesy of the Royal Ontario Museum.

35 Horvath, *The Acetate Negative Survey: Final Report*, 52-59.

Acetate Film – 35mm roll film - cabinet

The cabinet also contains rolls of gelatin silver 35mm b&w acetate film in small canisters, or in cardboard boxes that originally held the canisters (Fig. 16). Those housed in the canisters themselves are suffering from vinegar syndrome and will have to be rehoused and separated from the other film to avoid any further contamination.

Identifying the film base is extremely important in regards to preservation and housing. Roll film formats are more difficult to identify visually as acetate if they do not happen to be suffering from vinegar syndrome. They do not always have safety film printed on the edges, nor is the type of film always identified. Dating can be helpful, but is far from conclusive as acetate continued to be used well into the 1990's simultaneously with polyester³⁶. The majority of the roll films in the NWA collection have 'Safety Film' printed along the edges indicating they are acetate and I have made recommendations accordingly.

Acetate Film – 10x13cm; stripfilm – metal cabinet

The metal filing cabinet also contains gelatin silver acetate sheet film as well as color transparency sheet film (3,500 altogether) and significant quantities of 35mm and 120mm acetate stripfilm negatives (Figs.17 & 18).

³⁶ Lavédrine, *Photographs of the Past*, 255.



Fig. 17 – Sheet film transparency. Photograph by author. Courtesy of the Royal Ontario Museum.



Fig. 18 - 35mm and 120mm strip film negatives. Photograph by author. Courtesy of the Royal Ontario Museum.

While a faint odor of vinegar can be detected when the drawers are opened, pinpointing which negatives are affected at this stage is impractical considering the numbers involved. Currently, the sheet films are housed in individual, mostly non-archival sleeves. Replacing them with buffered sleeves will help to absorb any acids currently being released until such time that they can be digitized and put into cold storage (if possible). The filmstrips are currently housed in glassine sleeves, not an ideal material³⁷, but there appears to be little if any deterioration thus far (Fig. 19).



Fig. 19 – 35 mm acetate film in glassine sleeves. Photograph by author. Courtesy of the Royal Ontario Museum.

³⁷ Henry Wilhelm, *The Permanence and Care of Color Photographs*, (Grinnell, Iowa, Preservation Publishing Company, 1993), 502-503.

Acetate Film – motion pictures – metal trunk

Of more significant concern are the 16mm acetate motion picture films currently being stored in a metal trunk. Neither the trunk itself, nor the metal canisters they are packaged in are ventilated (Fig.20). Some of the films are also wrapped in plastic inside the canisters (Fig.21). The trunk is situated against the outside wall of the office space, which becomes warm in the summer. This lack of ventilation and extra heat encourages film base deterioration and vinegar syndrome is very evident in this material³⁸. As well, at least one of the color films has suffered a color shift indicating deterioration of image making dyes in the film (Fig.22). These materials require immediate attention to at least maintain their present condition and avoid further degradation.



Fig. 20 - Metal trunk with poorly ventilated acetate reel film suffering from vinegar syndrome. Photograph by author. Courtesy of the Royal Ontario Museum.



Fig. 21 – Acetate reel film wrapped in plastic. Photograph by author. Courtesy of the Royal Ontario Museum.

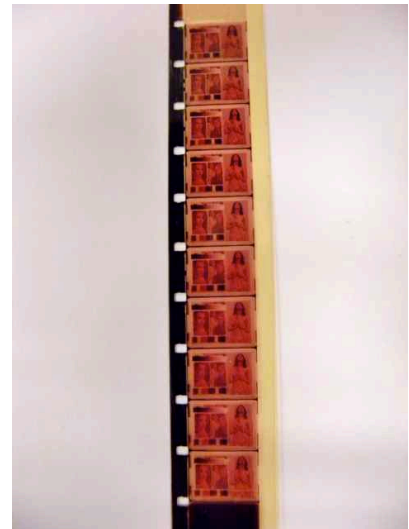


Fig. 22 – 16mm color acetate reel film that has color shifted. Photograph by author. Courtesy of the Royal Ontario Museum. Reproduction is prohibited without written consent of institution.

38 Lavédrine, *Photographs of the Past*, 256.

Acetate Film - Chromogenic (color) 35mm slides

Over 50% of the collection is composed of 35mm chromogenic (color) acetate slides. There are approximately 550 slides stored in the wooden cabinet in plastic and cardboard cases, or leaning loosely against each other in a drawer. Of that number, there are some 70 gelatin silver, b&w slides. Approximately half of the slides (in the cabinet) are mounted in standard cardboard or plastic, while the rest are encased in glass. Glass mounts can be problematic due to mold growth in the gelatin. This leaves over 12,000 color slides housed in PVC binders, packed very closely together on the exterior wall of the office space. The majority of the slide pages in the binders are also composed of PVC (Figs. 23 & 24). As PVC deteriorates, it produces a sticky residue of plasticizer that covers the film and blurs the image. When the slide is removed from the plastic and left to dry, a visible ring is left on the film.

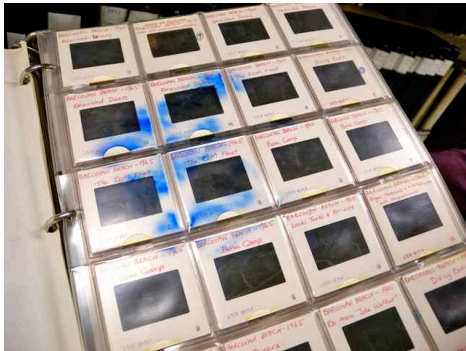


Fig. 23 – PVC slide pages with ink imprint on plastic. Photograph by author. Courtesy of the Royal Ontario Museum.



Fig. 24 – Deteriorating PVC slide pages. Photograph by author. Courtesy of the Royal Ontario Museum.

Chromogenic acetate film slides (and larger color transparencies) are at risk of more than just film base deterioration. Additionally, they are vulnerable to light and dark fading. Exposure to

light significantly increases the incidence of color fading, but even in dark storage, some color films will continue to fade albeit at a slower rate³⁹. Limiting exposure to light, which includes light boxes and projection equipment, can slow color fading. The type of film also plays a role in its stability. Kodachrome film, for example, has excellent dark fading resistance, but performs very poorly when exposed to light, such as a slide projector; whereas, Ektachrome film has very poor dark storage performance, developing extensive yellow staining⁴⁰. There are no exact numbers of the proportions of either film type in the NWA collection at this time however, proper storage boxes will provide a dark storage environment as well as protection against physical damage and other environmental factors as a first line of defense. To halt color fading and film deterioration, transparencies should be digitized (to limit physical contact and increase access), housed in archival slide boxes, and placed into cool (refrigerated) or cold (frozen) storage⁴¹. As the slides are rehoused and digitized the exact type of film can be assessed to watch for inherent deterioration problems. If reduced temperature storage is unavailable, then housing the slides in as stable an environment as possible will still increase their longevity over current housing methods.

Gelatin Silver Prints – Wooden and Metal Cabinets, Shelves

There are over 5,700, gelatin silver, black-and-white prints of varying sizes in the collection. In the wooden cabinet there are approximately 240 individual contact prints made from 35mm and 120mm film. They are often pasted onto board in twos and housed with the corresponding two negatives (Fig.25).

39 Wilhelm, *Permanence and Care of Color Photographs*, 2.

40 Ibid., 176.

41 Ibid., 658.



Fig. 25 – Gelatin Silver prints and acetate negatives. Photograph by author. Courtesy of the Royal Ontario Museum. Reproduction is strictly prohibited without written consent from institution.

Additionally, there are 400 10x13cm prints, and 42 prints ranging in size from 10x15cm to 20x25.5cm. Included in this group are 5 cabinet cards dating from the late 19th century. They represent some of the earliest gelatin silver prints ever produced. The prints were mounted on heavy card that had an elaborate studio stamp on the verso (Fig.26). They were a common format in the late 1800's, and named after the wooden cabinets that were made to house them. There are also some prints mounted on board, from early in the 20th century that are suffering from minor silver mirroring. Additionally, there are 16 gelatin silver postcards included in the cabinet. This format replaced the cabinet card in popularity at the turn of the century⁴².

42 Mary Warner Marien, *Photography: A Cultural History*, (London, Laurence King Publishing Ltd., 2010), 169-170.



Fig. 26 – Verso of cabinet card with studio stamp dated 1878. Photograph by author. Courtesy of the Royal Ontario Museum. Reproduction is strictly prohibited without written consent from institution.

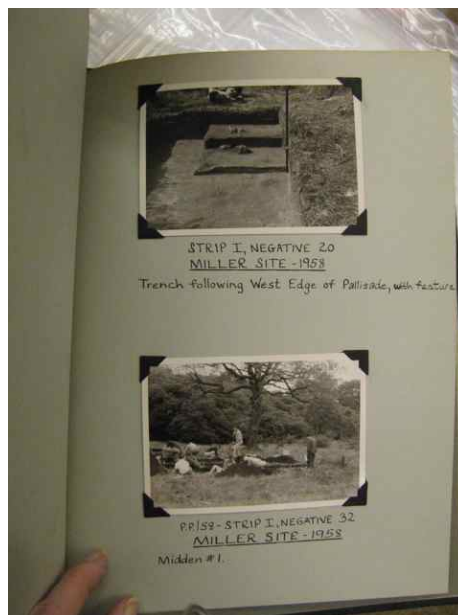


Fig. 27 – Gelatin silver prints mounted on spring bound album page. Photograph by author. Courtesy of the Royal Ontario Museum. Reproduction is strictly prohibited without written consent from institution.

The most significant number of prints included in the NWA collection, over 4800 in total and measuring 10x13cm, are housed in PVC binders and spring bound binders on the shelves of the exterior wall of the office space. Except for some fingerprints, these prints are in excellent condition. They are mounted two to a page with photo corners on non-archival board (Fig.27). Also included in PVC binders and a few commercial albums are 10x15cm prints and 20x25.5cm prints and contact sheets. As many of these are from the 1990's, it is likely that the accompanying filmstrips are polyester instead of acetate. In addition there are five bound, archaeological site books comprised of very thin paper. In these books, the prints are mounted to the pages. As a result of the adhesive and the lack of density in the paper, the prints have curled and caused severe warping of the pages in some of the books (Fig. 28). There is little that can be

done with these prints as they are firmly attached to the pages, except to rehouse the books and attempt to maintain a steady rate of humidity in the office space.

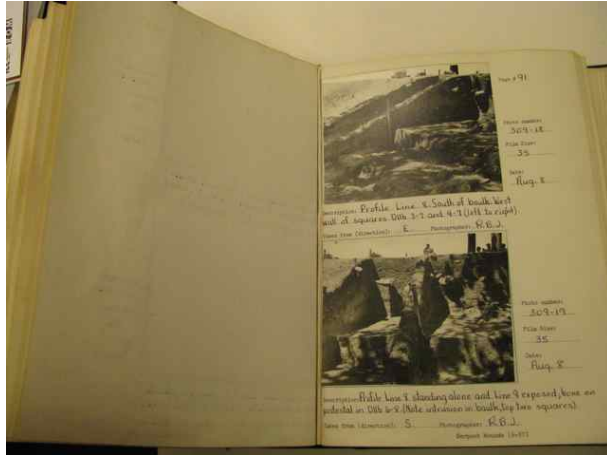


Fig. 28 – Gelatin silver prints permanently mounted onto thin page of archaeological site book. Photograph by author. Courtesy of the Royal Ontario Museum. Reproduction is strictly prohibited without written consent from institution.

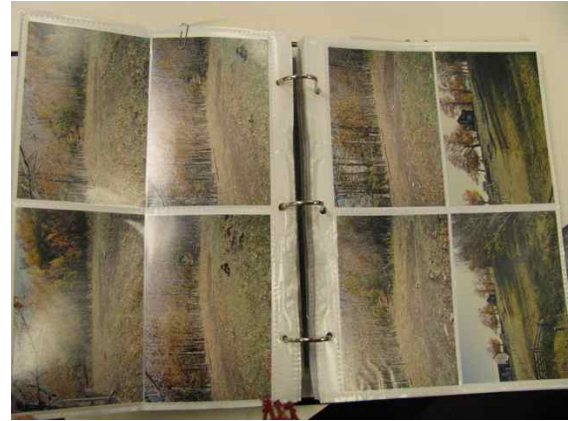


Fig. 29 – Chromogenic prints. Photograph by author. Courtesy of the Royal Ontario Museum. Reproduction is strictly prohibited without written consent from institution.

Chromogenic Prints and Negatives

There are three contemporary photo albums occupying the shelf space along the wall with a variety of materials in them including chromogenic slides, gelatin silver prints and negatives and chromogenic prints and negatives (Fig. 29). The quantities are small in comparison to the gelatin silver, but must still be mentioned, as color prints and film base are as susceptible to color fading as the slides⁴³.

43 Wilhelm, *Permanence and Care of Color Photographs*, 2.

While there are many Internet resources available to aid in identification of photographic processes, ultimately the best general resource to have on hand, at the time of this writing, is Lavédrine's book, *Photographs of the Past*, noted above. It covers the entire history of photography, includes images of positive and negative processes, deterioration, identification tests, conservation and housing suggestions. After having identified the types of photographic materials found in the NWA collection and assessed their condition, it was important to consider what improvements could be made to their storage conditions. This is the subject of the next section.

2) Rehousing

General Principles and Materials

Proper housing of photographs can significantly inhibit, slow or stop deterioration. Halting or avoiding physical or chemical deterioration is accomplished initially by using individual storage materials for every photographic object⁴⁴. Poor quality storage materials can contribute to deterioration by releasing oxidants, sulfur, peroxides and acids even in a perfect temperature/humidity environment⁴⁵. Envelopes and boxes are effective means of protecting photographs from dust and abrasion, and also limit contact with air pollutants. Proper storage methods also decrease the likelihood of physical damage such as tears, scratches, or broken glass. Storage should be a layered process, where envelopes or sleeves are primary and the boxes that contain the sleeves are secondary measures of defense⁴⁶. Further, powder coated shelving that will not rust offers a third level of protection. Finally, to avoid contamination of photographs and negatives from body oils, dirt and perspiration, cotton or latex gloves should be worn during handling.

Paper Envelopes and Sleeves

Paper envelopes and sleeves should be acid free, have a neutral pH and be made from paper that is not acidic and will not become acidic as it ages. Buffered envelopes contain an alkaline material, such as calcium carbonate, which acts to neutralize acids as they form, preserving both the paper enclosure and the photograph housed in it⁴⁷. Products must pass the Photographic

44 Lavédrine, *Photographs of the Past*, 285.

45 Reilly, *Care and Identification of 19th-Century Photographic Prints*, 92.

46 Psaila, *Design and Materials for Photographic Housings*, 20.

47 Gary Albright, *Storage Enclosures for Photographic Prints and Negatives*, (Washington, D.C.: National Park Service, Conserve O Gram 14(2), 1993),1.

Activity Test (PAT) to ensure storage material will not harm the photograph⁴⁸. Suitable paper must be chemically stable, and made from 100% cotton fibers. They must not contain lignin, dyes, waxes, metallic particles, or any materials that could cause damage to the photograph⁴⁹.

Plastic Envelopes and Sleeves

The most highly recommended plastics are polyester and polyethylene. PET (polyethylene terephthalate) is sold under trade names such as Mylar and Melinex⁵⁰. It is physically and chemically stable, but it does accumulate electrostatic charges that can contribute to delamination of glass plates. PE or polyethylene is cheaper than PET, but less transparent, less rigid, and ultimately less durable. Polyester is a good choice for photos that are frequently accessed, as they are easy to view and prevent deterioration from fingerprints⁵¹. However, paper is generally preferred as it does not seal the photograph and trap moisture. Nitrate and cellulose acetate negatives benefit from buffered paper sleeves as they help neutralize the formation of acids and avoid accumulation of damaging gases inside a sealed airspace⁵². Regardless of the material, the goal is to find an enclosure that will not adversely affect or react with what is being stored.

The New World Archaeology Collection

Once the inventory was completed and I felt confident I had identified the contents correctly, I investigated appropriate methods of archival re-housing of each format. In an ideal situation,

48 Reilly, *Care and Identification of 19th-Century Photographic Prints*, 92.

49 Ibid., 93.

50 Albright, *Storage Enclosures for Photographic Prints and Negatives*, 2.

51 Lavédrine, *Photographs of the Past*, 289.

52 Albright, *Storage Enclosures for Photographic Prints and Negatives*, 1.

where money was of no concern, a layered approach using envelopes, boxes and powder coated shelving would be the best rehousing solution for the collection. However, in the case of the NWA department (and likely, many other publicly funded institutions) where obtaining funds for materials is uncertain, compromises were made in the recommendations. It is also important to note that even had there been sufficient funds to purchase all the necessary supplies at once, it did not necessarily follow that there would also be a staff person available or trained to perform the rehousing. As a result, prioritization played a large roll in an initial request for rehousing materials.

Short-Term Priorities

The short-term priorities for the NWA department are threefold. The following will consider each short-term goal and discuss the necessary actions to accomplish it.

1) Remove all material from the wooden cabinet and rehouse:

Large Glass Plates and Lantern Slides

Removal of the material from the wooden cabinet immediately eliminates ‘controllable’ damage, meaning damage that causes physical harm such as breakage, bending or tears. The material is also removed from a potentially chemically reactive enclosure, solving two issues at once. The glass negatives are the most complicated medium to be rehoused. The initial request for acid free materials (Appendix 2) included glass negative boxes for those measuring over 10x15cm (rigid board boxes with a cushioned bottom, rigid spacers and metal strip edges to handle the weight) to accommodate vertical storage. An 80lb buffered text paper in large sheets will serve to make four flap enclosures for those glass negatives, as well as the lantern slides stored in the cabinet. Four flaps that wrap around the negative

are preferable to envelopes that require sliding the negative in and out to view, potentially causing abrasion to the sides of the negative or breakage if dropped⁵³. Purchasing ready-made four flap enclosures is more expensive and assumes that the negatives are all a uniform size, which the materials in the NWA collection are not. Purchasing the paper alone allows for customization and saves money. Boxes suited to the small size of the lantern slides were also ordered. The NWA department already has on hand acid free, corrugated blue board that can be used to create sink mats for the broken glass negatives⁵⁴. Large, horizontal boxes with reinforced corners on both the tops and the bottoms will house the sink mats and allow for stacking.

Small Format Glass Plates, Gelatin Silver prints, Sheet Film and Roll Film Negatives

While removing the smaller glass negatives, prints and film negatives from the cabinet and rehousing them in archival envelopes and boxes would be ideal it would also be too expensive at this time. The solution for the NWA department lies in shifting the material in the wooden cabinet to the metal filing cabinet already in the space. The metal cabinet is not powder coated, but is in excellent condition. Removing outdated bibliography index cards will create sufficient space for the photographs and negatives, which can remain in their present envelopes until there is sufficient money to purchase archival envelopes for all and employ staff to begin cataloguing the material. For those glass negatives that are not currently housed in envelopes, non-buffered sleeves have been ordered to provide protection while in the metal cabinet. Non-buffered envelopes are less

53 Diane Vogt-O'Connor, *Caring for Photographs: Special Formats*, (Washington, D.C.: National Park Service, Conserve O Gram 14(5), June 1997), 3.

54 Vogt-O'Connor, *Caring for Photographs: Special Format*, 3.

expensive than buffered, and glass negatives do not emit chemical byproducts that need to be absorbed like acetate. Any remaining envelopes can be used to house color transparencies currently housed in the metal drawers. Traditional housing of color materials advocates the use of non-buffered materials to avoid a reaction with the dyes that may cause a color shift⁵⁵. Additionally, the rolls of 35mm black & white, acetate film can be cut into strips and housed in custom made, buffered L sleeves (using the same buffered text paper used to make four flaps noted above) to absorb the acetic acids that are emanating from them. Test strips or ‘A-D Strips’ from the Image Permanence Institute can be purchased to determine the extent of deterioration and the appropriate course of action to ensure their preservation⁵⁶. The negative strips can then be housed in an archival box and put into refrigerated or frozen storage, depending on the results of the test strips⁵⁷.

Large Gelatin Silver Prints

The large format gelatin silver prints currently stored in the wooden cabinet will be rehoused in one of the three horizontal archival quality boxes on order. They can be layered on top of each other with acid free tissue in between each object or simple Mylar L sleeves can be constructed for each photograph. This solution would allow for easy viewing without the possibility of contamination from fingerprints⁵⁸. The department also has an ample, pre-existing supply of Mylar that can be used for this purpose.

⁵⁵ Albright, *Storage Enclosures for Photographic Prints and Negatives*, 1.

⁵⁶ “A-D Strips,” *Image Permanence Institute*. Accessed August 31, 2011. <https://www.imagepermanenceinstitute.org/imaging/ad-strips>

⁵⁷ Theresa A. Voellinger and Sarah S. Wagner. *Cold Storage for Photograph Collections - An Overview*, (Washington, D.C.: National Park Service, Conserve O Gram 14(10), August 2009), 1-2.

⁵⁸ Lavédrine, *Photographs of the Past*, 289.

2) Rehouse all cellulose acetate transparencies (slides):

To rehouse the slides is a relatively simple procedure. Individual width archival slide boxes have been ordered to replace the deteriorating PVC binders and slide pages. These boxes measure 28cm in length and accommodate up to 220 slides per box⁵⁹. The boxes include dividers to write any required identifying text for organization. Larger boxes can also be purchased to house 6 of these smaller boxes, but available blue board will be used instead to make custom boxes and save on expenses. The slides in the wooden cabinet will also be rehoused in these boxes, ensuring that all similar material is housed together, improving access. While housing the slides in slide boxes invites more handling rather than less, it is the least expensive option in terms of physical rehousing supplies, and also requires the least amount of shelf space. It is important, in this case, to keep in mind the number of slides to be rehoused (over 12,000) and that the ultimate goal is digitization, which would reduce the necessity of handling over the long-term. *Safe-T-Stor* polypropylene slide sheets are another method of housing that allows for easier viewing, but the sheets are much more expensive⁶⁰ and would require larger, archival file boxes to store them in. Listed below is the difference in price between these two systems at the time of this writing: slide boxes (60 boxes - \$261 total); slide pages (24 pkgs. of 25 - \$1,411 total).

3) Remove all acetate film reels from trunk, rehouse, and place in cold storage:

The 16mm acetate film reels are in the worst condition with respect to current housing and state of deterioration. The vinegar syndrome evident when opening the trunk is a definite problem. Their size is also an issue as they take up a considerable amount of space. The film reels are

⁵⁹ Hollinger Metal Edge, *Slide Storage Boxes*:

<http://www.hollingermetalede.com/modules/store/index.html?dept=22&cat=81&cart=130876656364769>

⁶⁰ Hollinger Metal Edge, *Safe T Stor pages*:

<http://www.hollingermetalede.com/modules/store/index.html?dept=22&cat=86&cart=130876656364769>

stored in two ways. Some are wound around plastic cores and the remainder on metal reels. The plastic core films could be housed in vented polypropylene film cans, but the cans are not for use with metal film reels. The metal film reels would require rewinding onto plastic cores, an unlikely possibility at this time. My initial request to rehouse these materials called for vented film cans for those already on plastic cores and archival boxes made for film reels for the remainder of the reels in the trunk. Again to save money, it was decided that boxes could be custom made using the blue board already available for all of the film reels indiscriminate of their current housing. Further, because these materials are in such an evident state of deterioration, they will be placed into a refrigerator to significantly reduce this rate⁶¹. The NWA storage vault currently contains an unused unit. The boxes will be wrapped in polyethylene with freezer tape to prevent moisture condensation if the films need to be removed for viewing⁶². The ideal solution to vinegar syndrome is cold/frozen storage (0°C) that halts vinegar syndrome, as well as, light and dark fading of color film; however neither the ROM in general nor the NWA department in particular have a cold storage vault and there is insufficient space in the freezer compartment of the refrigerator to accommodate the film reels. A commercial freezer would be an acceptable alternative to a cold storage vault, but too expensive for the department at this time. As Conserve O Gram 14/10 suggests, “the selection of cold housing conditions is based on what is achievable,” and any reduction in temperature aids in preservation⁶³. The 35mm film rolls also suffering from vinegar syndrome currently stored in the wooden cabinet can also be housed in the refrigerator. Until the film reels can be rehoused in custom boxes, removing them

61 Lavédrine, *Photographs of the Past*, 282.

62 Wilhelm, *The Permanence and Care of Color Photographs*, 655.

63 Voellinger and Wagner. *Cold Storage for Photograph Collections - An Overview*, 1.

from the trunk and increasing ventilation away from the rest of the collection will be a prudent first step that will dissipate some of the built up acetic acid.

Remaining Photographic Material

There are still groups of material to be dealt with of lower priority and supplies were not requested at this time to rehouse them. They include: the 10x13cm gelatin silver prints in binders, the 35mm and 120mm negative stripfilms, the bound archaeology site books, the chromogenic prints and negative strips and the majority of the material in the metal filing cabinet. While housing recommendations have been made for this material, the acetate film reels and contents of the wooden cabinet are first priorities because of the ongoing risk of physical damage and chemical deterioration in progress.

As the 10x13cm gelatin silver prints in binders are generally in very good condition and there is text written below each print on the mount board, it is not advisable to remove and rehouse the 4800 prints, but rather add a layer of protection between the sheets to prevent abrasion. In this way the original order and the textual information are not compromised. Mylar can be used to make a cover sheet for each of the album pages, thus providing protection, but also allowing for easy visibility⁶⁴. As buying polyethylene or polyester sleeves is extremely prohibitive⁶⁵, attaching a cut to measure sheet of Mylar over the prints with two-sided tape is a much more economical solution. Acid free tissue could also be used for this purpose, but would be more cumbersome as the sheets would dislodge when pages were turned. When the department budget

⁶⁴ Reilly, *Care and Identification of 19th Century Photographic Prints*, 95.

⁶⁵ Hollinger Metal Edge, *Polypropylene Photo/Print Envelopes*:

<http://www.hollingermetalede.com/modules/store/index.html?dept=21&cat=1356&cart=130876656364769>

allows, 3-ring archival boxes can replace the PVC binders and the pages can then be stored flat instead of upright.

The negative stripfilms are currently stored in the metal cabinet in glassine sheets. While this material is not ideal, as the glassine sticks to deteriorating film bases⁶⁶, the negatives do not appear to be deteriorating at this time. Eventually these materials can be rehoused in clear, high-density polyethylene enclosures⁶⁷ that allow easy viewing and prevent unnecessary handling. The sheets can be housed in 3-ring binder boxes like the gelatin silver prints and stored horizontally. The photographs in the bound site books cannot be removed, and aside from the bowing of many of the photographs, the images are not faded. They can be stored in archival boxes horizontally when funds permit. This will protect them from dirt and dust, sudden changes in humidity⁶⁸ and possibly allow some of the prints to relax and flatten when they are no longer vertical.

The chromogenic prints and corresponding negatives are from the 1990's⁶⁹ and are already housed in archival plastic, so other than rehousing the sheets in archival boxes at some point in the future with the other album material, no other measures are necessary at this time. Finally, the acetate negatives and gelatin silver prints in the metal filing cabinet need to be rehoused in archival sleeves. A more detailed inventory needs to be done to determine the quantities of each material housed within it at present. This will allow for a more accurate estimate of the number of buffered envelopes to purchase for the acetate sheet film negatives. The gelatin silver prints

66 Wilhelm, *The Permanence and Care of Color Photographs*, 502-504.

67 Ibid., 496.

68 Reilly, *Care and Identification of 19th Century Photographic Prints*, 92.

69 Lavédrine, *Photographs of the Past*, 262.

can be housed in non-buffered envelopes or Mylar L sleeves, if sufficient supplies remain to accomplish the task.

Potential Problems

Unfortunately, financial support is the key to solving many problems. While the rehousing supplies for priority items have been purchased there is insufficient staff to actually rehouse the collection. The only recourse for the collection technician will be reliance on student volunteers to slowly make the transition. While some tasks are relatively straightforward, like rehousing the slides, the making of custom boxes, sink mats for glass negatives and four flap enclosures will be much more of a challenge. Unfortunately, the institution seems unwilling to allot the necessary resources for the hiring of a knowledgeable individual to carry out these pressing tasks.

As material is rehoused and moved it will be important to remember to update location changes to maintain physical control of the material. While rehousing the collection will provide some physical organization, the development of a numbering and cataloguing system will provide much needed intellectual organization to the material, discussed in the following section.

3) Develop an Effective Cataloguing System to Improve Intellectual and Physical Accessibility

It is difficult to ascertain the true value of archival material if you are uncertain of what is contained in the collection. Without even a rudimentary list of the contents, connections between materials cannot be made, and those wishing to learn more about a subject may not know that needed information exists in your collection. Even a general knowledge of what is present in the collection will not necessarily help you to physically find the material if locations and contents are not coordinated.

The photographic material in the NWA collection was not recorded on a computerized system, nor did a list of general contents exist. That information could be partially gleaned from examination of the spines of binders, and very generally from the captions on drawers, but this was a far cry from having an itemized list of contents and locations. The detailed Excel inventory sheet described in section one was the first step to gathering information that could be transferred to an Access database. The Royal Ontario Museum currently uses Microsoft Access (a relational database management system) to manage its collections while attempts are made to find a system that can handle the complex needs of so many different types of collections.

An Access database was created in 2008 to begin documentation of supporting material in the NWA collection. Prior to this, a Word document was developed to assist in the organization of the archival material based on general rules for archival description. It included sixteen field names, definitions, examples, data type designations (ie. Text) and type of field designations (ie. Descriptive) that related to the document or resource. When I compared the fields suggested in

the Word document to the actual database that was developed in 2008, there seemed to be a disconnect between the primary document and the database. The database contained a total of thirty fields compared to sixteen in the document. This may have been a result of trying unsuccessfully to match the archival fields and functions to the Access database field and mnemonics. A meeting with the database technician revealed that the Access database in use was not developed in co-operation with the technician and many of the fields were being used incorrectly. A new database would have to be designed to accommodate the required information for the NWA collection.

Up to this point, meetings had taken place with the archivist, Judith Pudden, the collection technician, and myself to discuss making the Access database as archive friendly as possible in the event of a new database system that would allow for transferal of the department database to the institutional archive database. As well, there was a meeting between the database technician, Angela Raljac and myself with the same goal in mind. However, the archivist and database technician had very different views on how the database should be developed. My first meeting with the database technician was slightly contentious as I attempted to explain how the archival description system organized information. In her view the Access database could not be set up to accommodate archival descriptive methods, so we examined the information that needed to be included in the database and searched through the Access fields to find those that best fit our requirements and would allow inclusion of the many types of information in the archive including the photographic material. Where an appropriate field did not exist, we used a 'Local Use' field to tailor the database. At a following meeting that included the database technician and the archivist together, it was decided to use the Access database fields in a more archival way,

coming full circle to my original concept. From this point on, the archivist will be matching Access fields to archival description herself and consulting with the collection technician directly. I will provide a list in my recommendations of keywords for photographic material from the *Thesaurus of Graphic Materials II: Genre and Physical Characteristics Terms*⁷⁰ that will act as archival access points for future users as well as examples of the archival method of describing the different photographic mediums in the NWA collection. The newly constructed Access database will provide a searchable database that fully incorporates the photographic material. It will allow for expansion of information as more research is done and standardization will make it accessible beyond a departmental level.

An accession numbering system must also be developed to work in conjunction with the database as a means of identifying material at broad collection and item levels. The numbering system must be unique to the NWA department, so as not to confuse it with the museum's object collection accession numbers⁷¹. In the case of the New World Archaeology department, the collection technician may decide that the archaeologists whose activities created the documents should be assigned specific numbers that can then be broken down further into series and subseries. For instance, the archaeologist Peter Storck could be given the number NWA0001. If Mr. Storck participated in four separate digs, they would be numbered NWA0001.1 -.4 and each of those could be further broken down to represent field notes, maps, photographs, etc. A series of photographs could be numbered NWA.0001.2.PH1 – PH36⁷². Numbering in this way would be significantly more work than assigning a sequential number to each separate document

70 Library of Congress, *Thesaurus of Graphic Materials II: Genre and Physical Characteristic Terms*, <http://www.loc.gov/rr/print/tgm2/>

69 Ritzenthaler and Vogt-O'Connor, *Photographs: Archival Care and Management*, 136.

72 Ibid.

regardless of creator. It would require a comprehensive knowledge of the individuals involved and their activities to know which materials are associated with a particular event. This level of organization at the outset would provide substantially better intellectual access than currently available. The creation of a numbering system fulfills many roles and will be particularly useful when digitization of the collection takes place. The database and numbering systems must be able to function at an item level, so when a photograph is digitized it can be identified and easily associated with the new digital image, the next subject to be discussed in this paper.

4) Digitization of the Collection to Facilitate Easier Institutional and Research Access

While the Access database allows for a textual search, it does not supply visual records of the images in the NWA collection. Digitization of visual material serves many functions. First and foremost, it reduces handling of the original objects that could contribute to deterioration, and thus promotes preservation⁷³. Digitization can also capture the image content before ongoing deterioration destroys the image (ie. glass negatives with severe silver mirroring), and computer programs such as Photoshop can be used to create unblemished digital copies for the archaeological researcher more interested in the content than the photographic object. Digitizing collections makes them accessible through the internet, not only to researchers, but to the public which can increase interest in the institution's collections as a whole, potentially increasing the number of museum visitors and revenue. Further to this, a project done well, that raises the profile of the institution can be used to accelerate a digitization project through additional funding opportunities⁷⁴.

One of the primary detriments to proceeding with a digitization project are the costs which include: equipment, software, cataloguing system, staff time and training, and potentially having to update or integrate a digital asset management system with sufficient memory⁷⁵. More importantly, it should be understood that digital copies should not replace original photographic material. Just as a digital image of an object in the permanent collections does not replace that object, so a digital image of a photographic object should not replace that photograph. Joanna

⁷³ Hughes, *Digitizing Collections: Strategic Issues for the Information Manager*, 11.

⁷⁴ Ibid., 13.

⁷⁵ Lee, *Digital Imaging: A Practical Handbook*, 7.

Sassoon argues that there is a materiality to photographs that is not translated to its digital referent⁷⁶. There is a great deal of information that can be gleaned from the physicality of a photograph from information that may be on the back, to the camera used to take the photo, the process used to produce it, possible captions and more, all of which may be lost when a photograph is transformed into a digital image⁷⁷. As well, from a technological point of view, systems are constantly being upgraded, and digital information is transferred from one system to another with potential losses every time. A digital copy is not a permanent solution⁷⁸.

Prioritizing which materials should be digitized first, or at all, should be based on pre-determined selection criteria that may be set by the institution or the department. The National Parks Service Conserve-O-Gram 19/10 provides three criteria to assess collections for digitizing priority: value, risk and use⁷⁹. Each criteria is divided further for clarification and each object or collection is assigned point values based on whether they scored high, moderate or low in any or more than one criteria. Value, for example, includes informational, administrative, associational, evidential and artifactual (e.g. is it a rare photographic process?). The material in the NWA collection would score in informational and associational most often and possibly artifactual. Risk refers to the physical risk the object is in or may represent. For instance, cellulose nitrate film collections present a high risk to the rest of the collection because of their chemical instability⁸⁰. Use refers to the frequency that a collection or material within it is requested⁸¹. While the selection criteria

76 Joanna Sassoon, "Photographic Materiality in the Age of Digital Reproduction" in *Photographs Objects Histories*, Edited by Elizabeth Edwards and Janice Hart, (New York: Routledge, 2004), 186.

77 Sassoon, "Photographic Materiality in the Age of Digital Reproduction," 189–190.

78 Lee, *Digital Imaging: A Practical Handbook*, 6.

79 Diane Vogt-O'Connor, *Reformatting for Preservation and Access: Prioritizing Materials for Duplication*, (Washington, D.C.: National Park Service, Conserve O Gram 19/10, July 1995), 1-2.

80 Ibid., 2.

81 Ibid., 3.

will be different for every institution, I found the above criteria helpful in recommending the NWA materials for digitization from a preservation (risk) point of view. Decisions about value and use will be left to the collection technician.

Other considerations to make include availability of equipment and format. The scanning equipment in the NWA department is not of high enough quality for scanning photographic material. There are other scanners in the museum that would perform better, but they are on different floors in different departments. Cooperation will have to take place to manage digitizing of the material. As well, decisions will have to be made regarding the quality of the scan. For instance, will it be a high quality scan that creates a master (TIFF) from which smaller files (JPEGs) can be copied for use on the internet or internally? Or is the material in this collection not likely to be used for exhibition or publication and a jpeg might be sufficient? Where will this information be stored? On a central system or can an external drive be used? Any digital asset management system already in place may dictate requirements and procedures used. While I can make recommendations about what to digitize first, and the advantages of producing a high quality digital copy, ultimately there are many decisions to be made that will likely not be resolved in the near future. Physical rehousing and cataloguing may be the best that can be expected for the NWA department at this time. With that in mind, it will be even more important for the office space to be an environmentally friendly place to store the photographic material as outlined in the following section.

5) Measures to Improve the Environmental Conditions Within the Office Space

While the office space is temperature controlled at an average of 22°C, the humidity levels fluctuate significantly. When relative humidity is over 65%, the rate of chemical and biological deterioration processes is increased significantly. High rates of RH result in a dramatic increase in fading (image oxidation) and yellowing and the softening gelatin emulsion becomes a breeding ground for mold growth⁸². Relative humidity of 30 - 50% is the most desirable for storage of most photographic objects. It is dry enough to slow or prevent chemical or biological deterioration, but moist enough to keep materials flexible so they can be safely handled without breakage or delamination (separation of the emulsion from the support)⁸³. Ideally, a range of 30 - 40% RH is optimal, but this range is somewhat impractical within the office space where other material is stored and where staff work⁸⁴. While the optimal temperature for the majority of photographic collections is 18°C or 65°F⁸⁵, that will also not be achievable or comfortable within the office space. The current average temperature is well within acceptable levels for most photographic material, except for nitrate and acetate, which should be kept in cold storage if possible. Even stored at normal temperatures, the deterioration of these materials can be limited in a stable environment.

In the NWA department, the instability of the relative humidity is a problem. Wide swings of temperature or relative humidity, even within apparently safe ranges can be detrimental. Stability is a crucial component in creating effective environmental control. Fluctuations should be kept to

82 Reilly, *Care and Identification of 19th Century Photographic Prints*, 84-85.

83 Ibid., 83.

84 Ibid.

85 Lavédrine, *Photographs of the Past*, 283.

+/- 2 or 3% of the goal RH level⁸⁶. Readings of relative humidity taken by the ROM over a period of three months, from March to June, 2011, illustrate wide fluctuations from one week to the next (Appendix 3). For example, within one week alone, the RH was measured as low as 17% swinging up to 37% by week's end. Overall, the lowest RH was measured at 15.4% (in February) to the highest at 58.7% (in June), with humidity generally rising closer to the summer. This fluctuation level is considered of moderate to high risk of damage to photographs⁸⁷ and should be addressed, especially if the cellulose acetate material in the collection cannot all be put into cold or frozen storage. Relative humidity can be tracked using an electronic hygrometer, but must be regularly calibrated⁸⁸. As the office space measures approximately 450 square feet, and the smallest capacity dehumidifier can theoretically service up to 500 square feet, a simple solution to controlling high levels of humidity would be the installation of a commercial dehumidifier⁸⁹. More surprising than the fluctuations in RH or the high levels of RH in the summer, were the average low levels of RH, lower than 30%, in the colder months. Potential problems of low relative humidity were noted above, but this may explain why the film sheet negatives are in relatively stable condition, as they generally prefer levels in the 20-40% range⁹⁰. Given this information, consultation with building services may be warranted to see if a more comprehensive solution to regulating RH is possible. Establishing a proper storage environment is not limited to RH and temperature, but includes the physical storage units that support the material housings discussed below.

86 Wilhelm, *The Permanence and Care of Color Photographs*, 544.

87 Lavédrine, *Photographs of the Past*, 281.

88 Ibid.

89 Wilhelm, *The Permanence and Care of Color Photographs*, 544.

90 Diane Vogt-O'Connor, *Caring for Photographs: General Guidelines*, (Washington, D.C.: National Park Service, Conserve O Gram 14(4), June 1997), 1.

6) *Replacing Existing Storage Units with Compact Storage*

Current storage units in the New World Archaeology space consist of metal filing cabinets of various sizes, map drawers, wall shelves, and a wooden cabinet. This does not include the stacks of banker boxes that occupy the floor space near the wall shelves (Fig. 30).

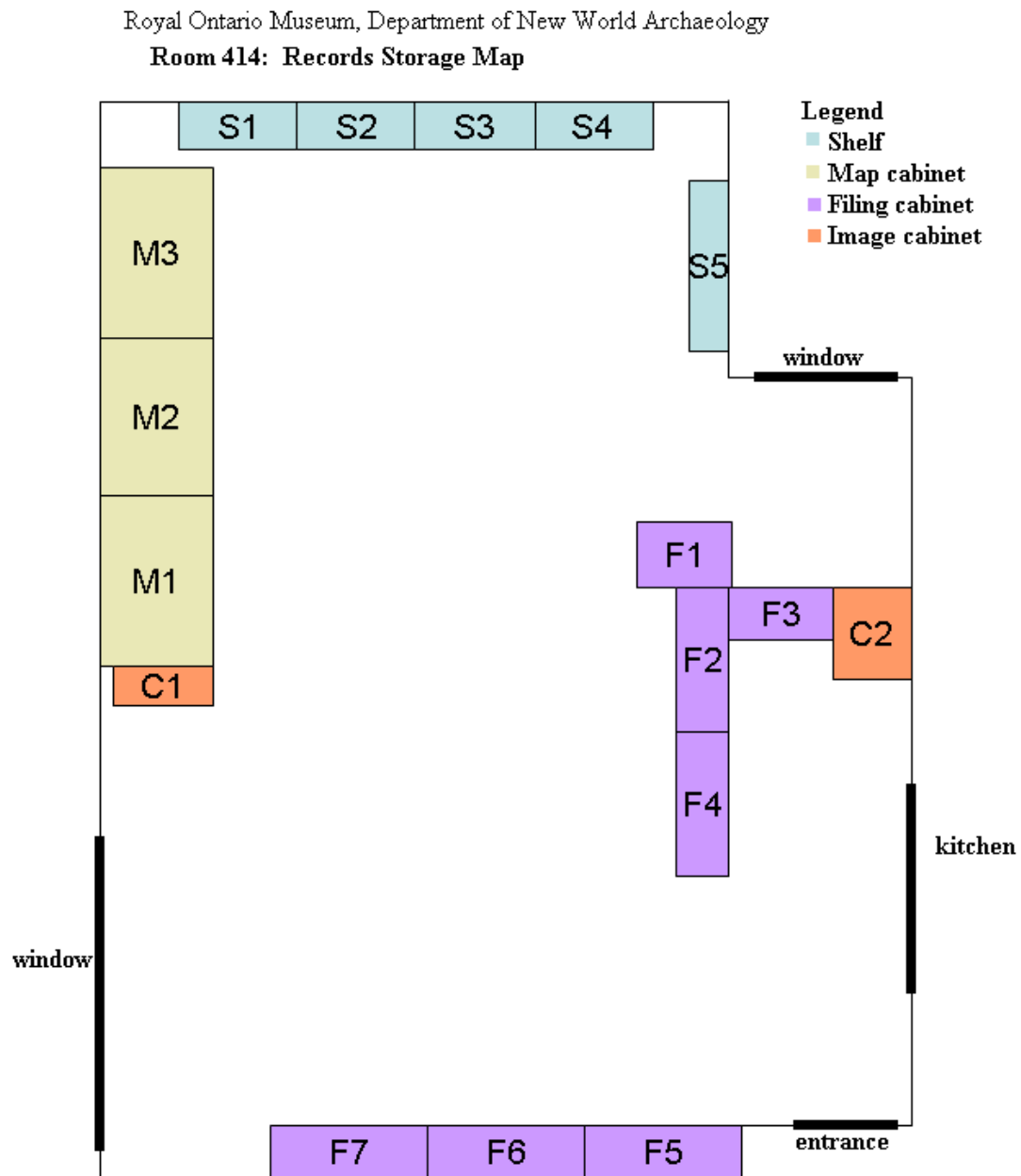


Fig. 30 – New World Archaeology office space.

Ideally, powder coated shelving that will not rust and contribute to oxidation of images should be used to house the archival material⁹¹. Current office layout has all storage units lining the walls (Fig. 31).

⁹¹ Lavédrine, *Photographs of the Past*, 294.

Fig. 31: Room 414 - Records Storage Map (Courtesy of Royal Ontario Museum)



The collection technician took the initiative to have a shelving company submit a proposal for replacing the haphazard shelving in the space with moveable compact shelving (Fig. 32). This would allow for much greater organization of all the supporting material including the photographs. Unfortunately, without a curator in this department to lobby for funding, the likelihood of replacing the shelving is very slim, especially with a price tag of approximately \$25,0000.



Fig. 32: Example of compact shelving units.

Horizontal archival boxes with metal strips on the corners are designed to carry the weight of other boxes stacked on top, but one must be careful not to overload the boxes or the shelves. If too many boxes are stacked on top of one another, they are difficult to access and the middle of the box may bend threatening the items stored within. Caution must be used when storing glass negatives in particular, because of their accumulated weight on shelves.

When storing the material ordered for the NWA department, the vertical, 8"x10" (20x25.5cm) glass negative box, as well as two horizontal boxes with the sink-matted broken negatives can be stored side by side on a shelf. The two horizontal boxes would be stacked on top of each other. The five 5"x7" (13x18cm) boxes of glass negatives would fit side by side on a single shelf. A third shelf could house the four boxes of lantern slides, as well as, twelve of the slide boxes

(6 stacks of 2). The fourth and fifth shelves would house the remainder of the slides double stacked. If the slides were put into master boxes, there would be ten boxes altogether.

The narrowest unit of the proposed compact shelving measures 30" in width. The arrangement above would fit that unit precisely. The units are also quite deep, so it may be possible to have material housed behind those lining the front of the shelf, but this makes access more difficult. For the slides it may also be possible to stack them 3 or 4 high, saving shelf space if the weight proved acceptable. At maximum then, the material that can be rehoused with the first order of supplies would take up 11.5 linear feet. This was determined simply by adding together the length of the storage boxes facing the front of the shelf. For instance, the glass negative box measures 6" deep and the horizontal boxes measure 14.5" in length. These sides will be lining the shelf, so the total number of linear inches for the first shelf is 20.5". The remaining photographic material, once budget allowed for purchasing the additional supplies, would be an additional 12 linear feet. The proposed compact shelving would supply approximately 557 linear feet of storage space, of which the photographic material would take up only 4%. As this compact shelving is not likely to be in place any time soon because of the cost (an estimated \$25,000), the material will likely be housed on the shelving that currently lines the back wall of the space (S3 & S4) or over top of the map cabinets (M2). As the slides are rehoused into boxes, and PVC binders are disposed of, space will be opened up for the newly rehoused material. According to the collection technician, it is likely that a vertical, metal shelving unit will be purchased to replace the wooden cabinet (C2) until some future date when the compact shelving can become a reality. The dimensions would be very similar to the compact unit in terms of

width, so the shelving plan noted above would still apply. The final and overriding element to the success of any management plan is financial planning.

7) Developing a Budget

There are many costs to be considered to implement a project such as the one that has been described here, including: rehousing materials, shelving, digitization equipment (if necessary), staff, environmental monitoring and management equipment (humidifier/dehumidifier). There is also the cost of hiring someone to assess the collection initially and devise a management plan if there is no staff person with such expertise. In the case of the NWA department, that was accomplished through an internship and thesis project (free of charge). As museum budgets continue to be stretched, resources must be used in the most efficient ways possible and departmental projects such as this one will not likely be funded by the museum management. Devising a step-by-step approach that can be accomplished over time is the most logical solution. The NWA department does not have a budget for this project. Once the collection rehousing needs were assessed, prioritization decisions were made and supplies requested accordingly. Once the materials are in hand, implementing the rest of the management plan will be a problem that is only likely to be resolved with the help of volunteers and interns. As this project was begun independently, without pre-approved budgetary support from management, it is highly unlikely that it will garner monetary support now, and as a result, may take a considerable amount of time to finish.

Conclusion

This practical project was complicated and will continue to be so as other volunteers tackle the component parts of the management plan. I assume that it will be volunteers attempting to complete the project because of a lack of funds to actually hire a qualified staff person. With such a complex collection, an individual trained in handling, housing, cataloguing and digitizing photographic material specifically would be of benefit to the NWA department and the museum as a whole, especially as there are similar collections in many departments throughout the ROM. What the project lacks is support. If the project is achievable and a plan has already been devised to accomplish the department's goals, and improving records management has been identified by management as an area that needs improvement, then why is there no financial support?

An editorial comment following Alan Bain's article "Muses' Memory" sums up the sentiments of many professionals working in the area of museum archives: "How strange that museums, being institutions dedicated to the preservation and study of human and natural phenomena, should overlook their own duty to organize, preserve, and support financially their own institutional behavior and history."⁹² Unfortunately, given the present financial restraints of most public museums, attending to 'housekeeping' is not seen as immediately worthwhile in terms of increasing revenue. However, having this material available and maintained safely, improves opportunities for public education and interest. As well, this material does not have to be destined for storage in a dark room, but can be exhibited as historical evidence of archaeological activities and practices, or even as a history of photography and its incredible versatility.

⁹² Bain, "Muses' Memory", 39.

Ignoring the existence and importance of these vital resources invites disaster considering the instability of many photographic processes and the potential for rapid deterioration. It is my hope that this thesis and the recommendations for the New World Archaeology department will begin a groundswell of action for all similar material that provides such important context to the objects within the permanent collections.

Part II - Report for the New World Archaeology Department of the Royal Ontario Museum

Introduction

The New World Archaeology department in the Royal Ontario Museum currently possesses a photographic archive of over 25,000 images depicting archaeological fieldwork and artifacts. Many of these images are associated with the objects from permanent material collections in the department and provide critical context to understanding those objects. In addition requests for viewing the material are frequent. The department's collection is currently housed in several areas of the office space and in various non-archival storage units. Due to the fragmented nature of current storage and lack of a detailed database of its contents, access to this non-catalogued material is limited both physically and intellectually. More importantly, the storage conditions are contributing to physical damage and deterioration of these supporting visual documents.

The purpose of this thesis project was to create an inventory, assess the condition of the contents of the collection relative to deterioration and create a report that includes recommendations regarding proper housing and storage (including preservation issues and costs). The ultimate goal of proper housing is to avoid controllable damage in the form of breakage, abrasion, wear and tear, or dirt. Even in an unregulated storage environment, using proper storage materials can help slow down inherent deterioration and prevent controllable damage. This will be particularly true for the NWA department as creating a climate controlled storage environment (vault) will not be possible at this time. Prevention of damage is much more cost effective in the long run than conservation efforts after damage has occurred.

Further, the inventory spreadsheet can be used to incorporate the photographic material into a searchable MS Access database to track departmental archival documents, thereby increasing accessibility. Recommendations will also be made regarding the creation of a numbering system that should be incorporated into the cataloguing process, priorities for digitization and measures to improve the environmental conditions. A comprehensive approach to the preservation of photographic objects requires the effective combination of environmental controls and the use of proper storage materials and methods. My assessment of the NWA documentation collection has led me to recommend that taking action now to begin to stabilize and preserve these important institutional documents is imperative in order to ensure their future existence. The following sections of this report outline my reasons for making this overall recommendation and the nature of the necessary materials and methods to do so.

The New World Archaeology Collection

Inventory

The collection of photographic material that supports the permanent collections of the NWA department is comprised of a variety of processes and formats ranging from the late 19th century to present day. The production of these photographs involved chemistry. As a result they are inherently unstable and in danger of further chemical reaction leading to deterioration from poor storage materials, methods and variable environmental conditions. In order to begin the process of preservation and collections management a complete inventory was taken and recorded in an Excel spreadsheet that can be found at (list location path). A condition assessment of all materials is incorporated into the inventory. Table 1 below, is a summarization of inventory

totals listing the process, format and locations in the office space. Please see Appendix 1 for a sample of inventory entries.

Table 1: Inventory Summary

Process/Format	Cabinet	Shelves	Trunk	Metal File Cabinet	Totals
8x10 Gelatin Silver glass negatives	16				16
5x7 Gelatin Silver glass negatives	68				68
4x5 Gelatin Silver glass negatives	200				200
4x6 and larger Gelatin Silver prints	42	219		72	333
4x5 and smaller Gelatin Silver prints	649	4,800			5,449
4x6 Chromogenic (color) prints		80			80
Lantern slides	200				200
35mm color slides	470	12,300			12,770
35mm Gelatin Silver slides	70				70
4x5 and smaller film negatives & transparencies	439			3500	3,939
35mm color film strip sets		5			5
35mm Gelatin Silver film strip sets		75		340	415
120mm Gelatin Silver film strip sets		2		98	100
35mm roll films	26				26
16mm reel film			25		25
35mm reel film			1		1
Gelatin Silver prints in bound books		1,148			1,148
Approximate Total					24,845

Overview of Current Storage Conditions

The photographs and negatives in the NWA collection are currently stored in a variety of units within the office space of the department. A wooden cabinet across from the office door is causing physical (controllable) damage to the contents because it was not designed to house photographs and the material is too large to fit properly. Further, the chemically treated wood can cause the photographic contents to react and many of the objects are not stored in acid free enclosures or an enclosure of any kind, increasing their risk of becoming damaged from abrasion and exposed to pollution, dust, and dirt. The thousands of color slides in the collection are

housed along the exterior wall of the office space in PVC binders and PVC slide pages, which are showing evidence of deteriorating plasticizer. A narrow metal filing cabinet with small drawers houses sheet film, transparencies and roll film in strips. Most seriously, 16mm acetate motion picture films are stored in an unventilated equipment trunk and are suffering from vinegar syndrome. Table 2 below, provides a snapshot of processes included in the collection and current housing and deterioration problems associated with them. A more detailed analysis follows the table. Please see Appendix 2 for a rehousing supply list and costs.

Table 2: Overview of Processes, Current Housing and Deterioration

Photographic Processes present in the collection:	Housing and Deterioration Problems
Gelatin silver glass negatives ranging in size from 3"x4" to 8"x10"	Non-archival envelopes; breakage; silver mirroring
Gelatin silver cellulose acetate negatives (safety film) from 35mm to 4"x 5"	Non-archival envelopes; Vinegar Syndrome
Gelatin silver and Chromogenic 35mm film slides (transparencies)	Deteriorating PVC binders and slide pages
Chromogenic 4x6 prints & 35mm negatives	Exposure to dust; Watch for possible fading
Gelatin silver Cabinet cards	Silver Mirroring
Gelatin silver glass lantern slides (positives) – 3.25"x3.25"	Breakage
Gelatin silver prints ranging in size from 35mm contact prints to 8"x10"	Silver mirroring, scratches, bends, dirt
35 mm and 120mm acetate film negatives	Glassine negative strip holders
16 mm acetate reel film; 35 mm reel film	Significant Vinegar Syndrome; color shifting

Detailed Condition Assessments and Rehousing Recommendations

Gelatin Silver Glass Negatives & Lantern Slides

The larger format glass plate negatives from the Montgomery collection stored in the wooden cabinet show significant oxidative damage manifesting as extensive silver mirroring on approximately 50% of the material. These chemical reactions will eventually obscure the images

on the negatives. The pressure of being stored one on top of the other has exacerbated any prior chemical deterioration and in some cases, resulted in breakage. The smaller glass negatives are too large to stand completely upright in the wooden drawers resulting in breakage when the drawers are opened and closed. As well, these negatives are not stored in archival envelopes and chemical reactions to the acidic storage materials and the adhesives are occurring. Many of the smaller format glass negatives are stored leaning against each other with no separation of any kind and as a result the majority are in various stages of deterioration. Aside from breakage and overall dust and dirt, the glass lantern slides are in relatively good condition. Some of the tape around the edges is losing its adhesiveness and should be replaced. The lantern slides are not currently protected in individual enclosures.

Recommendations:

7 of the 84 large glass plates are in pieces or have a corner broken off. To best preserve these negatives they should be sink mounted using archival board with spacers between the glass pieces to hold them firmly in place, then stored in a horizontal clamshell box and interleaved with acid free tissue. The remaining glass negatives should be housed individually in acid-free, four-flap enclosures designed to fit their specific dimensions and stored upright in archival boxes with rigid spacers to stall any further deterioration to the 50% of the larger glass plates suffering from silver mirroring. Four-flaps eliminate friction caused by sliding glass negatives in and out of traditional envelopes, reducing the risk of delamination of the emulsion along the edges. Spacers prevent the glass plates from abrasion, and the risk of further damage. 80lb buffered text paper was ordered to make the custom four-flaps. Specially sized and reinforced archival boxes were also ordered for these larger glass negatives. Archival enclosure materials should be acid

free, have a neutral pH and be made from paper or board that is not acidic and will not become acidic as it ages. Buffered supplies contain an alkaline material, such as calcium carbonate, which acts to neutralize acids as they form, preserving both the enclosure and the photograph housed in it.

The smaller 4"x5" gelatin silver glass negatives can be housed using archival paper sleeves rather than four flaps. All photographic objects should be stored in an individual housing with the emulsion side (the dull side) facing away from any seams to avoid any reaction to adhesive. An archival 'shoe box' with frequent rigid spacers would be sufficient for these smaller and less fragile negatives, but to save on expenses, the metal filing cabinet can accommodate the negatives from the wooden cabinet once outdated bibliographic index cards are removed. The lantern slides can also be housed in custom made four-flap enclosures and stored in specially sized archival boxes to protect them from abrasion, breakage and adverse chemical reactions.

Gelatin Silver Cellulose Acetate Roll, Sheet and Strip Film Negatives

Many of the sheet film negatives stored in the wooden and metal cabinets are identified with edge printing as 'safety film' meaning the support is made of cellulose acetate, developed to replace volatile cellulose nitrate film. Many others have no printing, but manufacturers' notch codes also identify them as cellulose acetate. Although some of these negatives are physically damaged from being housed in the wooden cabinet, and some are suffering from silver mirroring caused by non-archival envelopes, they do not appear to be suffering from vinegar syndrome as of yet. The negatives in the metal cabinet, placed on their sides are not suffering from controllable damage, but they are not currently stored in archival envelopes. There is some

indication of vinegar syndrome, but the sheer quantity of negatives in this cabinet prohibits a thorough investigation at this time. The use of A-D Strips from the Image Permanence Institute will enable a determination of the degree of deterioration for all of the acetate material in the collection and aid in the decision making regarding the most appropriate housing. The 35mm and 120mm stripfilms are currently housed in glassine negative holders in the metal filing cabinet. With the exception of a few housed in bound glassine negative folders, there appears to be little deterioration thus far. Conversely, the 35mm cellulose acetate roll films stored in canisters in the wooden cabinet are suffering from vinegar syndrome. Some of these negatives have been matched to contact prints housed in other drawers, but the majority have not.

Recommendations:

Proper housing in buffered, archival paper envelopes will help to stop additional physical damage of the negatives in the cabinet and slow further chemical deterioration. The buffered envelopes will help in the absorption of any acidic gasses being produced. The negatives in the metal cabinet should be rehoused in archival envelopes when finances allow. The deterioration of the cellulose acetate negatives will continue over time if they are not put into cold storage, but facilities do not allow for these non-priority negatives to be put into an empty refrigerator in the NWA's collection vault. The 35mm negatives should be removed from their canisters, cut into strips, and placed in buffered, archival paper sleeves and a custom made box. Once the negatives have been given time to relax and flatten out, testing with A-D Strips will indicate if they should be placed in cold storage. Reducing the temperature even by ten degrees can lengthen the life span of film by significantly slowing deterioration. The negative strips in the metal cabinet can be rehoused in high density polypropylene negative sheets (not Print File low density sheets) that

allow for easy viewing and prohibit damage from fingerprints. The sheets can be placed in three-ring binder, clam shell boxes when sufficient funds are available.

Gelatin Silver and Chromogenic (Color) Slides

Of the 540 slides in the wooden cabinet, approximately 70 are black and white. The remaining color slides, including those stored in the PVC binders (over 12,000) are vulnerable to light and dark fading and staining. Exposure to light significantly increases the incidence of color fading, but even in dark storage, color slides will continue to fade albeit at a slower rate. Kodachrome slides possess excellent dark fading stability, but fade dramatically when exposed to light. Ektachrome slides perform badly in both light and dark storage. The NWA collection possesses significant quantities of both. The plastic support also poses a problem as they are produced on acetate film, which can develop vinegar syndrome. The most immediate deterioration factor for these slides is the exposure to the PVC plastic in the binders and slide pages. Deteriorating plasticizer has already resulted in the temporary emergency rehousing of some slides.

Recommendations:

Limiting exposure to light, especially light boxes and projection equipment can slow color fading. Slides being viewed should never be left exposed on a light box for more than a few minutes. Proper storage boxes will provide a dark storage environment, as well as protection against physical damage, and other environmental factors. To halt color fading and film deterioration, transparencies should be digitized (to limit physical contact and increase access), housed in archival slide boxes, and then placed into cold storage. If sufficient refrigerated storage

is unavailable, then housing the slides in as stable an environment as possible will help to increase longevity over current housing methods.

Gelatin Silver Prints, including Cabinet Cards and Post Cards

Some of the older gelatin silver prints mounted on card are exhibiting silver mirroring and fading. The smaller format prints in the wooden cabinet that are standing upright have bent corners, tears and scratches from handling and being caught when the drawers were opened and closed. None are in archival housings. Large contact print sheets in PVC binders are also scratched and bent from handling. The large number of prints mounted into the PVC binders and spring bound albums make up the majority of prints and are in excellent condition, although the plasticizer in some of the binders is beginning to deteriorate and may leave spots on the prints on the front pages. Prints in the metal cabinet are also housed in non-archival envelopes.

Recommendations:

The gelatin silver prints are the most stable photographic format in the collection. The larger prints can be housed in Mylar sleeves, a commodity in large abundance in the department, and filed horizontally in a clamshell box or simply interleaved with acid-free tissue, taking care not to overload the box. The smaller, loose prints can be housed in acid-free envelopes with the emulsion facing away from any seams and filed on their sides in the metal cabinet. Housing the large number of mounted prints in the albums in Mylar sleeves would be a very expensive option (although preferred). To maintain the mounts with inscriptions and keep costs low, a piece of Mylar can be cut to measure and attached with small pieces of two sided tape to cover the page. In this way the prints are easily viewable and protected from plasticizer, fingerprints and

abrasion from the previous page. Interleaving with tissue is an alternative but while the albums remain in their bindings, tissue would fall out and add too much bulk. When funds permit, three ring clamshell boxes can be purchased to rehouse the pages. Polypropylene 8x10 print sleeves can be purchased for the few contact sheets in binders to protect them from abuse. As well, the smaller contact prints currently mounted in twos and housed with their negatives can be stored in top loading high density polypropylene negative sheets for easy viewing and containment.

16 mm and 35 mm Acetate Motion Picture Films

The film reels are all made from cellulose acetate and are suffering from vinegar syndrome. Unfortunately, the trunk they are stored in is unventilated, as are the metal film cans. Some are even wrapped in plastic within the cans exacerbating the problem. The build up of acetic acid speeds up the process of deterioration and at least one film has suffered a color shift indicating deterioration. There are both color and black-and-white films, as well as silent and audio films in the collection. Again, the use of test strips will indicate the degree of deterioration.

Recommendations:

The films clearly have the most pressing deterioration issues. As a result, I recommend they take precedence over the other acetate material. They should be housed in custom made archival board boxes (the board is already on hand), wrapped in polypropylene, sealed with freezer tape and placed in the department refrigerator. They will take up the bulk of the room in the fridge, denying the other acetate materials space. However, until these materials can be thoroughly viewed, and decisions made on whether they should be kept, the simplest solution is to preserve them in the most secure (and available) way.

Chromogenic Prints and 35mm Negative Strips – Recommendations:

The negatives were produced within the last twenty years on polyester which is a much more stable support. Both the prints and the negatives are housed in archival plastic sleeves. They are however susceptible to fading and should be monitored on a regular basis, as should the entire collection. The above recommendations pertain to the physical rehousing of individual materials. Consideration must also be made for the overall storage environment.

Shelving and Storage Environment: Overview and Recommendations

Once the individual items are rehoused there remains the question of where to store the material. The installation of powder-coated metal shelving that will not rust is advised. The wooden cabinet needs to be eliminated and replaced with a metal shelving unit. The newly rehoused material could then occupy the new shelf. It is important to remember to assign and update any location changes in the database to aid in intellectual control when rehousing is done. Boxes can be stacked somewhat, but in no more than two or three layers to avoid undue pressure from one box to the next. This will also allow for easier access to materials. Although the metal filing cabinet would still be in use, as well as the refrigerator (in the vault), the photographic material in general would be stored more centrally and more safely. The wall shelves can be used for other material, possibly allowing for more floor space to be cleared and the metal trunk can be eliminated as well. Compact storage would be the ideal situation, allowing for the proper storage of all supporting material, but this is an expensive venture.

The environmental conditions of the office space are another important consideration. Relative humidity of 30 - 50% is the most desirable for storage of most photographic objects. It is dry

enough to inhibit chemical or biological deterioration, but moist enough to keep materials flexible so they can be safely handled without breakage or delamination (separation of the emulsion from the support). Ideally, a range of 30 - 40% RH is optimal to inhibit the oxidation of silver images, as long as mechanical systems can support such a range. High temperatures coupled with high relative humidity are a lethal combination for photographic objects. The chemical and biological problems associated with high RH, such as dramatic increases in fading (image oxidation) and yellowing and softening gelatin emulsion that becomes a breeding ground for mold growth, are exacerbated with the addition of a warmer climate. The optimal environment for the majority of photographic collections is 18C or 65F with the exception of plastic film supports, such as cellulose nitrate and cellulose acetate, and color chromogenic negatives, transparencies, and prints. These items should be kept at much lower temperatures if possible because of their extreme vulnerability. Stability is also a crucial component in creating effective environmental control. Wide swings of temperature or relative humidity, even within apparently safe ranges can be detrimental. Fluctuations should be kept to +/- 2 or 3 degrees.

Currently, the temperature in the NWA office space fluctuates between 19.5C and 24.5C (see Appendix 3). While it is not as low as desired (18C), it is within acceptable limits for photographic material. Relative humidity on the other hand, fluctuates widely over the course of a week by as much as 20 points, with quite low levels of RH in the colder months (15%) and quite high RH in the warmer months (58%). A commercial dehumidifier would help equalize the humidity in the warmer months for relatively little cost. The new shelving that would replace the wooden cabinet would be close to the kitchen making it convenient to have the dehumidifier close by and also near a sink for drainage. Adding humidity in the cooler months will be more

problematic but individual storage enclosures and boxes will help mitigate environmental fluctuations. As well, acetate material prefers 20% to 40% levels of RH and as the vast majority of the film negatives and slides are acetate, this may be a fortuitous ‘problem’. Once the physical aspects of preservation are addressed, there are intellectual issues to be considered in relation to cataloguing and digitization.

Cataloguing Overview and Recommendations

The inventory created in Excel can be used to transfer information into MS Access to create a searchable database. This will greatly increase the ability of outside researchers and internal staff to search for and find information. The exact fields to be used and the methods of entering data will be slightly different than normal Access usage in order to present the material in an acceptably archival format based on recommendations from the archivist. In this way, the information will be adaptable to any new database system that is adopted museum wide in the future. Table 3 below provides examples and terminology appropriate for the “Extent and Physical Description” field for photographic material at a collection and item level, as well as “Work Type” access points based on the Graphic Materials Thesaurus II from the Library of Congress (<http://www.loc.gov/pictures/collection/tgm/>).

Table 3: Archival Description for Photographic Materials

Extent and Physical Description		Work Type Access Points	
Collection Level	Item Level	Collection Level	Item Level
5 photographic prints	1 gelatin silver photographic print on cabinet card mount; 11 x 16.5 cm.	Photographic Prints	Gelatin Silver, Black-and-White, Chromogenic, Colour, Contact
284 glass negatives; gelatin silver; 7.5x10cm to 20x25.5 cm	1 gelatin silver, dry plate glass negative; 13x18 cm.	Photographic Postcards	Gelatin Silver photographic postcard
c. 350 photographic prints; gelatin silver; 10x15 cm and larger	1 gelatin silver, studio mounted photographic print; 20 x 25.5 cm	Expedition Photographs	Expedition photograph
c. 5500 photographic prints; gelatin silver; 10x13 cm and smaller	2 gelatin silver, contact prints on board mount; 5 x 5 cm each.	Portraits	Portrait Photograph
c. 200 lantern slides	1 gelatin silver, glass lantern slide; 9 x 9 cm.	Card Photographs	Cabinet; Carte-de-visite
c. 13000 film slides; 35mm	1 acetate, chromogenic, 35mm film transparency or 1 acetate, black-and-white, 35 mm film transparency.	Negatives	Film, Glass
c. 26 chromogenic (color) and black-and-white, reel films	1 acetate, chromogenic (color), 16 mm reel film or 1 acetate, black-and-white, 16 mm reel film.	Film Negatives	Acetate or Safety Film, Nitrate, Polyester, 35mm, 120mm
c. 4000 film negatives and transparencies; 10 x 13 cm and smaller	1 acetate, black-and-white, film negative; 10 x 13 cm.	Glass Negatives	Gelatin Silver, Dry Plate
c. 500 film strip negative sets (set of film strips may contain between 20 and 36 negatives).	1 acetate, black-and-white, 35 mm (or 120mm) film negative or 1 polyester, chromogenic, 35mm film negative.	Slides	Lantern, Film, Transparencies
80 photographic prints; chromogenic (color); 10 x 15 cm.	1 chromogenic (color) photographic print; 10 x 15 cm.	Motion Pictures	Educational Film, Motion Picture film, sound recording,
26 film reels; chromogenic and black-and-white; 16mm; 35mm	1 reel of 2; acetate 16mm; sound recording and 1 reel of 2; acetate 16mm; color		

The ‘Extent and Physical Description’ examples above are appropriate for the material currently in the NWA archival collection. A complete collection level description for a series of photographs will likely include more than one format, for example:

80 photographic prints; chromogenic (color); 10 x 15cm
80 35mm polyester film negatives (4 sets of 20 negatives); chromogenic (color)

Multiple “work type” access points can be used for a collection or item level description. For example, a group of photographs related to a particular expedition may include the following work type access points:

Photographic Prints
Gelatin Silver Photographs
Expedition Photographs
Glass Negatives

The same terms can be used for either collection level or item level descriptions, but item level should include specific as well as general terms. An entry for a single photograph from the same type of series listed above might list work type access points as follows:

Photographic Print
Gelatin Silver Cabinet Card
Gelatin Silver Glass negative
Dry Plate Glass Negative

Appropriate terminology will aid in presenting information in a standardized way that makes searching easier for users.

Catalogue records must also incorporate a numbering system to track series of records within the collection and individual items within a series. In the case of the New World Archaeology department a series could be material related to a particular site or a particular archaeologist. In either scenario, a number would be assigned to represent each site or archaeologist represented in

the department (or a combination thereof) that could be divided into parts to indicate subseries and individual items. The number should also be preceded by a combination of letters that clearly identify them as having originated in the department. For example:

NWA.0005.02.1952.PH108

NWA=New World Archaeology

0005=Site (number assigned to a particular site)

02=Archaeologist (number assigned to a particular archaeologist)

1952=Year of Activity

PH108=108th photograph/negative in the series

(where both print and corresponding negative are present, the number can be further segmented as follows: NWA.0005.02.1952.PH108.1 and NWA.0005.02.1952.PH108.2).

A list of archaeological sites and archaeologists should be devised by the collections manager with numbers assigned to each to be used as a reference for creating unique identification numbers for the photographic material. When a photographic object has little information associated with it, codes can be used to indicate this in place of a site number, archaeologist or date. For instance, NWA.unkS.unkA.unkD.PH1 would mean that three fields are unknown. In all cases where this is true, the object numbers would proceed sequentially (assuming that these photographic objects were not deemed irrelevant if they cannot be associated with a site or archaeologist). As a further example, the number NWA.0004.unkA.1948.PH1 would indicate that the site and date are known, but the archaeologist is not. The establishment of a numbering system is crucial for identification and access. It will play an equally vital role when the process of digitization takes place as this is done at an item level requiring precise identification.

Digitization Recommendations

Digitization has taken on an increasingly important role in collections management for a number of reasons. First and foremost digitization aids in preservation of material by lessening the need for physical access. It provides the researcher with precise representations of subject content that may be less defined in a written description. A good quality scanner or copy stand is necessary to digitize photographic collections. This may necessitate using the equipment from another department and decisions will have to be made regarding the quality of the image to be saved. Ideally an uncompressed Tagged Image File Format (TIFF) scanned at full resolution would be created to become the master file. Lower resolution JPEGs would be made from the TIFFs for other purposes including web applications and providing thumbnails to researchers. This presents a problem for storage. An external hard drive purchased specifically to house the digital images is advisable and represents a minimal cost. The staff person responsible for digitizing needs to be trained in the use of a scanner or photographic equipment as well as Photoshop software to produce the desired results. It should be remembered that digitizing a photograph is not a means of replacement unless the material is unstable, such as cellulose nitrate, or undergoing significant deterioration that will severely affect the ability to see the image, as constantly upgraded systems result in deterioration of computer generated images. Digitization is complicated and time consuming but can be well worth the effort in terms of preservation, improved access and potential new sources of revenue. The NWA department should apply to Government and non-profit organizations that are providing resources specifically for digitization projects to cover the expenses involved in such a project. It should be noted that if a curator were appointed for this department, an Ontario archaeologist, any future research would likely be conducted using digital photographic equipment, thus creating digital born images that would require cataloging

and preservation. A digital repository would be created regardless of whether the current analog material is digitized.

There are a number of resources that provide suggestions on how to prioritize material to be digitized and it is often suggested that rehousing take place simultaneously with digitization. However, without a department curator to make crucial decisions on which material to keep or eliminate, preservation becomes the overriding consideration and digitization will have to wait until time and financial resources allow. The NWA department should focus its rehousing efforts on the acetate films, the glass negatives suffering from silver mirroring, and on the color slides. Digitization should follow suit, with the exception of the films. It may be decided in the future to copy the films or dispose of them based on their content, but that will have to wait for a curator's attention. The final component to a collections management plan is budgeting.

Budgeting Recommendations

The costs associated with devising a management plan and implementing it are numerous. Easily identified items include rehousing supplies (circa \$2500), dehumidifier (\$200), external hard drive (\$150) and a new shelving unit or compact storage (\$25,000). As the Royal Ontario Museum already possesses a number of resources, certain expenses for scanning or photographic equipment will not have to be incurred. What is more difficult to estimate is the cost of actually carrying out the management plan. A sample of work could be rehoused, catalogued and digitized to ascertain the time necessary to complete the entire project. This will provide a much more realistic estimate of the costs involved in implementing the management plan. Ideally, a trained photo preservationist should be hired to carry out the recommendations most effectively

rather than relying on less knowledgeable volunteers from other fields. Obtaining the funds for the project will require a convincing presentation to management and/or the pursuit of public funds through project grants such as the federal Canadian Heritage Museum Assistance Program (MAP) under the category of Collections Management or The Getty Foundation under their Access to Collections category.

Concluding Remarks

The photographic material in the New World Archaeology department provides critical context to the permanent collections. It is just as irreplaceable as the objects themselves. It is logical and necessary to preserve these resources with the same care and attention given to the other historical objects within the ROM's custodianship before they have deteriorated beyond usefulness. Of particular concern are the motion picture films which are of a delicate nature to begin with. Vinegar syndrome will begin to make the films brittle, and separate the emulsion from the support, destroying the ability to see the images. This is also an autocatalytic reaction that will cause other photographic material to begin to deteriorate or accelerate ongoing deterioration if they are not rehoused and separated. It is also crucial to keep in mind that well over 75% of the collection has an acetate film support, and over 75% of that is also color film with its own inherent instabilities. While sheet film is generally more stable than masses of film on reels, it still requires proper archival housing and regular examination to note any changes in condition.

The Royal Ontario Museum must recognize the value of these supporting archival collections that make sense of the irreplaceable objects housed within its vaults. Not only do they provide

crucial context to those objects, but they vividly illustrate the history of collecting by staff archaeologists, and by association, the museum itself. The material in the New World Archaeology department represents other collections throughout the ROM, thus the problem of preservation is not an isolated one. If the preservation of this archival material is not supported by management in a demonstrable way (ie. funding), then they do a disservice to the institution as well as the public that they serve.

Appendix 1: Sample Inventory for New World Archaeology

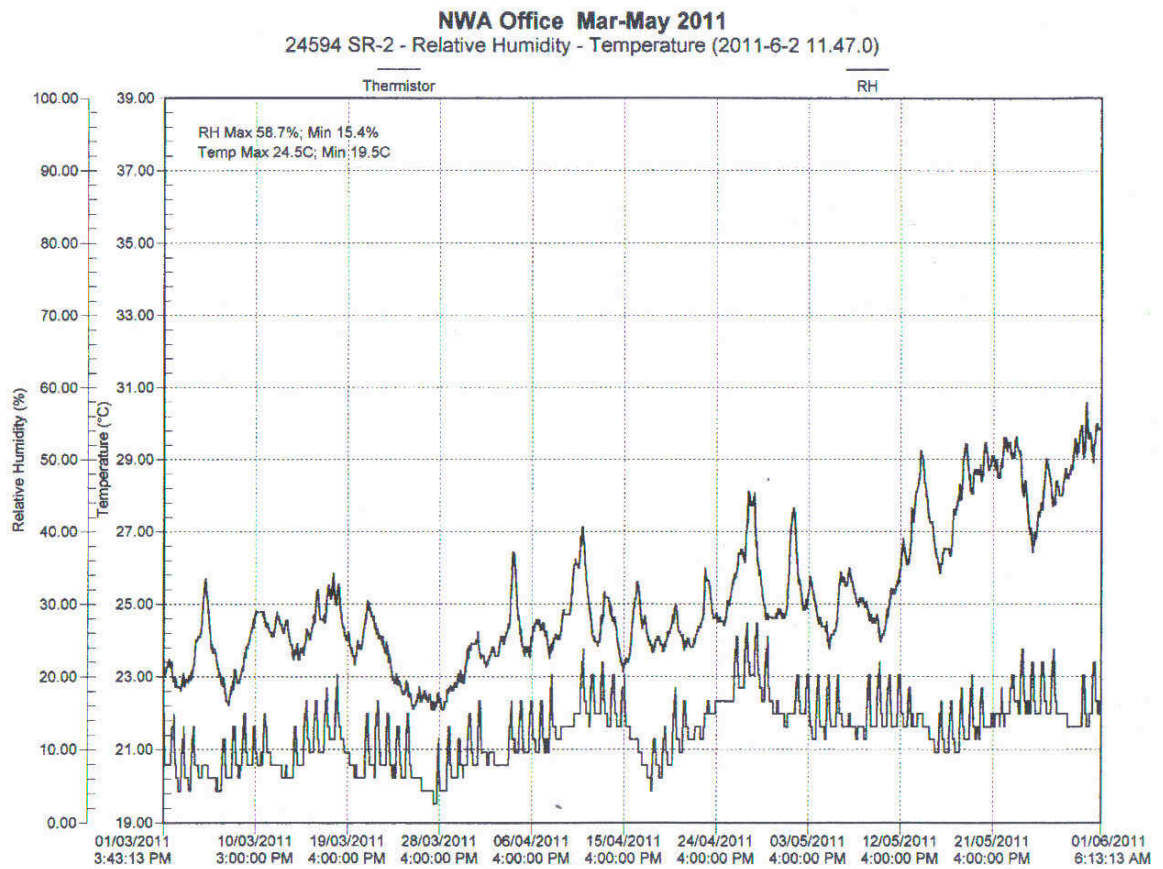
Location	Qty	ID #	Text/Title	Subject	Site	Material & Process	Clr or BW	Date	Size (Inches)	Housing	Condition
C2-Dr1	1		Curved bone	Object		Gelatin Silver Glass Negative	BW		8x10	Regular Envelope	Good
C2-Dr1	1		Cranium	HR		Gelatin Silver Glass Negative	BW		6.5x8.5	Regular Envelope	Fair – slight silver mirroring – edges
C2-Dr1	1		Axe	Object		Gelatin Silver Glass Negative	BW		8x10	Regular Envelope	Fair – Slight Silver Mirroring – edges & fingerprints
C2-Dr1	1		Small vessel	Object		Gelatin Silver Glass Negative	BW		6.5x8.5	Regular Envelope	Poor – large silver mirror spot in center
C2-Dr1	1		Bone flesher	Object		Gelatin Silver Glass Negative	BW		6.5x8.5	Regular Envelope	Fair – Slight Silver Mirroring – edges & fingerprints
C2-Dr3	5	A.1.146 – 150	Ash Bed	Site	Pound	Gelatin Silver Film & Prints	BW		1.5x1.5	Tan Envelope	Good – prints glued to mount; some loose
C2-Dr3	13	A.1.151 - 163		Objects	Pound	Gelatin Silver Film & Prints	BW		1.5x1.5	Tan Envelope	Good – prints glued to mount; some loose
S31	59		Sugluk 1978	Site	Sugluk	Gelatin Silver Prints	Clr	1978	9x13	PVC Binder	Good
S33	c.100		Serpent Mound Excavation Photographic Record 1960	Site	Serpent Mound	Gelatin Silver Prints	BW	1960	10x13	Bound Excavation Site Book – Black	Fair – warping of photo's mounted on thin paper
Trunk	1		Senneville 16mm Sil. Ans. Print; 16 mm Master Mix	Site	Senneville	16mm acetate film	BW		Yellow plastic core; 7.75"	Rusty silver canister; film wrapped in plastic	Poor – Vinegar Syndrome
Trunk	1		A Chateau of New France – Excavations at Fort Senneville	Site	Senneville	16mm acetate film; Ektachrome	Clr		Metal reel; 9.25"	Brown metal canister	Poor – color shift & vinegar syndrome

Appendix 2: Rehousing Materials Supply List

Priority	Ordered	Item/s Housed	Code #	Supplier	Material	Size	Qty	Price	Total
✓	✓	Broken Glass negatives; Large prints & cabinet cards	1411	Hollinger	Full Telescope Box	14.5x11.5x3	3	\$12.35	\$37.05
✓	✓	Glass negatives; Lantern slides	PTP2335	Hollinger	80LB Buffered Text Paper	23x35	1	\$116.00	\$116.00
✓	✓	Glass Negatives (8x10)	TAS0530 03	Talas	Glass negative box	11.5x6x8.75	1	\$21.80	\$21.80
✓	✓	Glass Negatives (5x7)	TAS0530 02	Talas	Glass negative box	8.5x6x5.75	5	\$15.75	\$31.50
✓	✓	Lantern Slides	LSB34	Hollinger	Lantern Slide Boxes	10.5x3¾x4.5	6	\$8.60	\$53.40
✓	✓	Small Glass Negatives; 4x5 film negatives, prints & transparencies	UNE45 (11421)	Hollinger	Unbuffered, acid/lignin free envelopes (100/pkg)	4x5	5	\$16.35	\$81.75
✓		16 mm Acetate Reel Film	FC22504	Hollinger	Vented Film Cans	7.5"	3	\$4.95	\$14.85
✓		16 mm Acetate Reel Film	FC22508	Hollinger	Vented Film Cans	10"	6	\$6.45	\$38.70
✓		16 mm Acetate Reel Film	FC22513	Hollinger	Vented Film Cans	12 ¾"	1	\$7.75	\$7.75
✓		35mm Acetate Reel Film	FC23510	Hollinger	Vented Film Cans	10.25"	1	\$9.95	\$9.95
✓		16 mm Acetate Reel Film	RB10	Hollinger	Film Reel Storage Boxes	10¼x10¼x1½	5	\$11.70	\$58.50
✓		16 mm Acetate Reel Film	RB14	Hollinger	Film Reel Storage Boxes	14¼x14¼x1½	5	\$13.50	\$67.50
✓	✓	35mm Slides	SSC13	Hollinger	Individual width slide boxes	11x2½x2¾	60	\$4.35	\$261.00
		35mm Slides	SS315	Hollinger	Master storage box	15x11½x3	10	\$10.95	\$109.50
		2x2 negatives & contact prints	V12012	Hollinger	120mm Negative preservers	50/pkg	1	\$21.15	\$21.15
		4x5 Film negatives & prints	BNE45 (11420)	Hollinger	Buffered, acid/lignin free envelopes (100/pkg)	4¼ x 5¼	28	\$18.40	\$515.20
		35mm strip negatives	V353OLD	Hollinger	35mm Negative Preservers	6 neg/strip; pkg of 50	8	\$17.60	\$140.80
		120mm strip negatives	V12012	Hollinger	120mm Negative preservers	4 strips/3 negs; pkg of 50	2	\$21.80	\$43.60
		Stripfilm negative sheets; 4x5 Photo sheets from Albums	BA13123	Hollinger	3 Ring Clamshell Box	13x12x3¾	14	\$15.15	\$212.10
✓	✓	PVA for Four Flap Enclosures	PVA32	Hollinger	Neutral pH Adhesive	Quart Container	1	\$29.40	\$29.40
✓	✓	3M Double Sided Tape for creating mylar sleeves	DT14	Hollinger	Double Sided Tape	1/4 x 36 yards	1	\$8.25	\$8.25

Note: 16mm Acetate films are marked as a priority to rehouse. It was decided that custom boxes would be made for all films from available supplies, rather than purchasing the two types of archival containers that would be needed.

Appendix 3: Temperature and Humidity Readings in the NWA Department



Note: Top Line = RH; Bottom Line = Temperature

BIBLIOGRAPHY

Identification and Preservation

Albright, Gary. *Storage Enclosures for Photographic Prints and Negatives*, Conserve O Gram 14(2), Washington, D.C.: National Park Service, 1993.

Bigourdan, Jean-Louis. "Vinegar Syndrome: An Action Plan," *The Vinegar Syndrome: A Handbook, Prevention, Remedies and the Use of New Technologies*. Bologna: The GAMMA Group, 2000. https://www.imagepermanenceinstitute.org/webfm_send/308

Bigourdan, Jean-Louis and James M. Reilly. "Effectiveness of Storage Conditions in Controlling the Vinegar Syndrome: Preservation Strategies for Acetate Base Motion-Picture Film Collections," *Image and Sound Archiving and Access: the Challenges of the 3rd Millenium*, proceedings of the Joint Technical Symposium Paris 2000, M. Aubert and R. Billeaud, eds., Paris: CNC, May 2000.

Di Pietro, Giovanna. *Silver Mirroring in Silver Gelatin Glass Negatives*. Diss. University of Basel, 2002.

Horvath, David G. *The Acetate Negative Survey: Final Report*. Louisville, KY: University of Louisville, 1987.

Lavédrine, Bertrand. *Photographs of the Past: Process and Preservation*. Los Angeles: Getty Conservation Institute, 2009.

Lavédrine, Bertrand. *A Guide to the Preventive Conservation of Photograph Collections*. Edited by Jean-Paul Gandolfo, Sibylle Monod and Getty Conservation Institute. Los Angeles: Getty Conservation Institute, 2003.

Psaila, Dee. *Design and Materials for Photographic Housings*. United States: Lulu Inc., 2008.

Reilly, James M. *Care and Identification of 19th-Century Photographic Prints*. Edited by Eastman Kodak Company. Rochester, N.Y.: Eastman Kodak Co., 1986.

Reilly, James M., Peter Z. Adelstein and Douglas W. Nishimura. *Preservation of Safety Film: Final Report to the Office of Preservation, National Endowment For the Humanities*. Rochester, NY. Image Permanence Institute, 1991.

Reilly, James M. *IPI Storage Guide for Acetate Film*. Rochester, NY.: Image Permanence Institute, Rochester Institute of Technology, 1993.

Vogt-O'Connor, Diane. *Caring for Photographs: General Guidelines*. Washington, D.C.: National Park Service, Conserve O Gram 14(4), June 1997.

Vogt-O'Connor, Diane. *Caring for Photographs: Special Formats*. Washington, D.C.: National Park Service, Conserve O Gram 14(5), June 1997.

Voellinger, Theresa A. and Sarah S. Wagner. *Cold Storage for Photograph Collections - An Overview*. Washington, D.C.: National Park Service, Conserve O Gram 14(10), August 2009.

Wilhelm, Henry Gilmer. *The Permanence and Care of Color Photographs : Traditional and Digital Color Prints, Color Negatives, Slides, and Motion Pictures*. Edited by Carol Brower. Grinnell, Iowa: Preservation Pub., 1993.

Cataloguing and Digitizing

Buck, Rebecca A., Jean Allman Gilmore and American Association of Museums, eds. *Museum Registration Methods*. 5th ed. Washington, DC: American Association of Museums, 2010.

Hughes, Lorna M. *Digitizing Collections: Strategic Issues for the Information Manager*. London: Facet, 2004.

Lee, Stuart D. *Digital Imaging: A Practical Handbook*. New York, NY.: Neal -Schuman Publishers, Inc., 2001.

Reibel, Daniel B, ed. *Registration Methods for the Small Museum*. 3rd ed. Walnut Creek, Calif.: AltaMira Press, 1997.

Ritzenthaler, Mary Lynn and Diane Vogt-O'Connor. *Photographs: Archival Care and Management*. Edited by Diane Vogt-O'Connor and Mary Lynn Ritzenthaler. Chicago: Society of American Archivists, 2006.

Wythe, Deborah.ed. *Museum Archives: An Introduction*. Chicago: The Society of American Archivists, 2004.

General

Bain, Alan L. "The Muses' Memory." *Museum News*, (November/December 1991), pp. 36 - 39.

Benedetti, Joan M. ed. *Art Museum Libraries and Librarianship*. Lanham, Maryland: Scarecrow Press, Inc., 2007.

Doucet, Claude W. "Egerton Ryerson, 1803-1882," *Ryerson University*, 2002, <http://www.ryerson.ca/archives/egerton.html>.

Davis, George M. "Unlocking Nature's Story," *Museum News*, (November/December 1991), pp. 43-45.

Gorman, G.E. and Sydney J. Shep, eds. *Preservation Management: for libraries, archives and museums*. London: Facet Publishing, 2006.

- Hartt, Kathleen. "A Manifold Resource," *Museum News*, (November/December 1991), pp. 40-42.
- Ingelevics, Vid. "The Metropolitan Museum of Edward Milla." In *Image and Inscription: An Anthology of Contemporary Canadian Photography*, edited by Robert Bean. Toronto: YYY Books and Gallery 44 Centre for Contemporary Photography, 2005.
- Killan, Gerald. "Boyle, David," In *Dictionary of Canadian Biography Online*, 2000, http://www.biographi.ca/009004-119.01-e.php?&id_nbr=7235&&PHPSESSID=yhzfqkvzape.
- Marien, Mary Warner. *Photography: A Cultural History*. London: Laurence King Publishing Ltd., 2010.
- McKellar, Shelley. "The Role of the Museum Archivist in the Information Age," *Archivaria* 35: Proceedings of the ACA Seventeenth Annual Conference, Montreal, 12-15 September, 1992, pp.347-352.
- Przybyla, Ann Marie. "The Museum Archives Movement," In *Museum Archives: An Introduction*, edited by Deborah Wythe. Chicago: The Society of American Archivists, 2004, pp.3-8.
- Royal Ontario Museum. "Our History." <http://www.rom.on.ca/about/history/index.php>.
- Sassoon, Joanna. "Photographic Materiality in the Age of Digital Reproduction" in *Photographs Objects Histories*, Edited by Elizabeth Edwards and Janice Hart. New York: Routledge, 2004), pp. 186-202.
- Shapiro, Michael Steven ed., *The Museum: A Reference Guide*. New York, Greenwood Press, 1990.
- The Smithsonian Institution, Conference on Museum Archives. Washington, D.C.: *Archives of American Art Journal*, Vol.19, No. 4 (1979).
- University of Toronto. "David Boyle (1842-1911)," in *Brief History of Anthropology at the University of Toronto*. <http://anthropology.utoronto.ca/about/history>.

Web References

- Canadian Conservation Institute (<http://www.chin.gc.ca>)
- Hollinger Metal Edge. <http://www.hollingermetaledge.com/>
- Image Permanence Institute. (<https://www.imagepermanenceinstitute.org/>)

National Parks Service, Department of the Interior, Museum Management Program, *Conserve O Grams*. (http://www.nps.gov/museum/publications/conservation/cons_toc.html).

Wilhelm Imaging Research. (<http://www.wilhelm-research.com/>)