

Terminology and the *Ten Agents of Deterioration*¹

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Introduction

This text discusses some of the terminology we use in collection care and introduces the *Ten Agents of Deterioration*², a list developed by the Canadian Conservation Institute (CCI) which identifies the main issues that need to be recognised and addressed in order to ensure the long term preservation of archives.

Terminology

Before we begin to manage the preservation of our archive collections, we need to be sure that we understand the key terminology. This will help us both in understanding what we are trying to do, but it is also crucial in articulating our concerns and requirements to others, such as managers, colleagues, volunteers and researchers. Our objective is to maintain these collections into the future and for as long as possible. We have absolutely no guarantees that we can do this, but by establishing a better understanding of why we are doing it, we can start to identify the key factors that will undermine our objective of providing access to information. We keep archives – preserve them for as long as possible – to provide evidence of the story of individuals, communities and society for current and future generations. To preserve them we need to argue for their importance and secure the resources required. In addition, we need to understand the risks and the threats to them, and how to protect them from those risks and threats.

Preservation

1. A basic archival function of storing and protecting records
2. The totality of processes and operations involved in the physical protection of records/archives against damage or deterioration and in the repair or conservation of damaged or deteriorated documents.³

Let's look first at the term "Preservation" and how the profession defines this activity. According to Paul Eden, "Preservation is the art of 'keeping safe', 'maintaining', 'retaining', and 'keeping alive'. Preservation, as it applies to library and archive collections, can be defined as 'all managerial, technical and financial considerations applied to retard deterioration and

¹ This text is adapted from Section 2 of ICA's online Collection Care course

² See: <https://www.canada.ca/en/conservation-institute/services/agents-deterioration.html>

³ International Council on Archives, 'Dictionary of Archival Terminology', KG Sauer 1988

extend the useful life of (collection) materials to ensure their continued availability”⁴
Preservation sits at the centre of all archive functions: it impacts on and is impacted by all the other things we do to manage and make them available to researchers.

Collection Care

The archival function of caring for the collection or collections in a holistic and strategic way not only to ensure their physical preservation but also to avoid and mitigate risks of damage at any time or location.

The term “Preservation” often gets used inter-changeably with “Collection Care”. This has come from museum colleagues as they face significant challenges addressing the needs of a vast range of formats, and consequently better defines the aim of “keeping safe”. The definition of this term includes the word “risk”, and this is a constant theme in caring for and preserving archive collections. The term “archival management”, is used for the totality of archive management functions and activities, covering the way that we manage and care for the collections throughout their life cycle, beyond the specific preservation objective.

Conservation

All measures and actions aimed at safeguarding tangible cultural heritage while ensuring its accessibility to present and future generations. Conservation embraces preventive conservation, remedial conservation and restoration. All measures and actions should respect the significance and the physical properties of the cultural heritage item.⁵

There are two other terms that have been associated with preservation planning and thinking. The first is the most common and refers to the actual activity and specialised skill of conserving – carrying out a range of carefully chosen procedures on specific items that are damaged. The conservator will need to assess each item and liaise with the archivist to enable a priority to be identified. In both cases this relies upon, very strongly, their combined professional judgement.

Restoration

Reconstruction of an archival record without regard to the possibility of reversing the procedure.⁶

⁴ Eden, P. et al., ‘A model for assessing preservation needs in libraries, London’, British Library Research and Innovation Centre 1998

⁵ From the International Council of Museums’ Committee for Conservation Resolution adopted at the 15th Triennial Conference, New Delhi, 22-26 September 2008, see: <https://journals.openedition.org/ceroart/2794?file=1>

⁶ The Archive-Skills Consultancy ‘Basic Archive Skills Training Day Handbook’ 2023

The second term, “restoration”, is associated with the other title for a conservator, a “restorer”. This is what a conservator is called outside of the United Kingdom and the USA, often joined together as “conservator-restorer”. But restoration itself is not conservation and so it is only via this title that they are connected. Restoration is usually associated with the art world and commerce. Conservation can be utilised in the art world, and can be commercial, but for archives conservation we are concentrating on the carrier of the information, and not the information itself, its value, or the value of the object. Restoration implies carrying out procedures that will return the item to how it may have looked originally. For archives this is not important. We wish to stabilise the carrier to ensure access to the information it contains. All conservation treatments need to be visible.

The *Ten Agents of Deterioration*

As mentioned before, the *Ten Agents of Deterioration* provides a useful framework for identifying and managing the factors that threaten the preservation of our archive materials.

The Canadian Conservation Institute (CCI)⁷ and other associated Canadian heritage institutions have had a very real impact on the way that professionals think about and define collection needs. Whilst their focus is not solely on archives, the principles that CCI have identified provide an especially useful framework for considering both the needs of, and the risks to, archive collections. The inclusion of “conservation science” is significant. No progress on the ways that conservators treat objects can be effective without the appropriate science to back up the decision-making process. The CCI covers a wide range of activity and responsibility and this demonstrates how many strands of activity and decision-making are needed when enacting a national collection care programme and/or policy.

The *Ten Agents of Deterioration* is one of the most useful tools developed by the CCI. It is a list of ten factors that contribute to the damage, deterioration or destruction of heritage materials, including archives. They are:

- Physical Forces
- Thieves and Vandals
- Dissociation (sometimes also called custodial neglect)
- Fire
- Water
- Pests
- Pollutants
- Light and Ultraviolet and infrared radiation
- Incorrect Temperature
- Incorrect Relative Humidity

Understanding these terms and what they mean in relation to collection care for archives is the first step in being able to manage the issues and challenges they represent. We are now going to look at and analyse each one in turn, to start building this understanding. This will not give any

⁷ <https://www.canada.ca/en/conservation-institute.html>

answers, but it will begin to highlight how many challenges there are to our preservation objective.

Physical forces

Physical Forces: example of the process to identify priority and effects

Catastrophic forces (Low Incidence, High Intensity)

e.g. Earthquake, war and vandalism or a building collapse

Working forces (High Incidence, Moderate-to-High Intensity)

e.g. Handling or transit (in-house)

Cumulative Forces (High Incidence, Low Intensity)

e.g. Handling or shipping

Low-level Forces (Variable Incidence, Low Intensity)

e.g. Building or construction vibration

In considering Physical Forces, we must firstly think about the external risks to the archive building. Worst-case scenario would be some intense force of nature. Another one might be the impact of localised building work, utilising drills, causing damaging vibration to adjacent buildings. However, we also put our archives at risk through their direct use not only by researchers for consultation but also by archive staff for processing and other management activities. This is especially true when we transfer material within the building, or if we must transfer between buildings with the combined risk of human error and weather events. The CCI model uses a risk management matrix approach to assess each risk issue via the simple questions: “how likely is this to happen?”; and “what will be the likely impact on the service and/or collections?”. In this way the risk is analysed, and a meaningful assessment can be logged, to provide useful advice to the collection holders. Additionally, the process provides the evidence to those we need to influence.

Thieves and vandals

For those of us working in archives, the idea of “thieves and vandals” seems very far-fetched. It is difficult to imagine anyone wanting to steal archives. But it seems that every archive has probably had one instance of theft. This may be a pre-meditated act or a scenario where a researcher convinces themselves that this information is so much better in their care, at their house, for their important research. It is not unknown for people in power, or those who believe their study is paramount, to help themselves to this vital resource. Why are people stealing though? One can understand the need to take something of value, but how do we define value? Most archives have a significant historical value, but probably not a monetary value – unless it is an iconic object. Again, this will be a matter of addressing and establishing the risk. In very rare cases, the item itself has been vandalised because of its intrinsic cultural value or status as an object of national importance.



In this image the National Library of Bosnia and Herzegovina in Sarajevo still has boarded up windows and a damaged façade but it is possible to see the beauty of this remarkable building. It was built in the Austro-Hungarian period to house the rich library of books and manuscripts which included oriental texts of great cultural significance. The library is a distinctive landmark clearly visible from the mountainsides around Sarajevo which were occupied by the Serbian forces during the war and thus proved an easy target to hit in 1992. The library had no military significance but almost two million books - including many rare manuscripts - were destroyed in what was most likely a deliberate attack on Bosnian cultural heritage and identity.

If we accept that security is an issue we need to put in place ways to address, mitigate and/or manage this threat. There are many technological ways that activities can be monitored, noting this also brings up the wider issues of citizen's rights. The approach needs to ensure that the building itself is secure – is there a protecting perimeter wall? Are the gates locked? Is there a security guard? Can any vegetation near to the building conceal someone? How might the organisation detect and record any thieves or vandals? It is always very difficult to establish the balance between how much we raise awareness of the potential “value” of the collections and in so doing attract the attention of thieves.

Dissociation

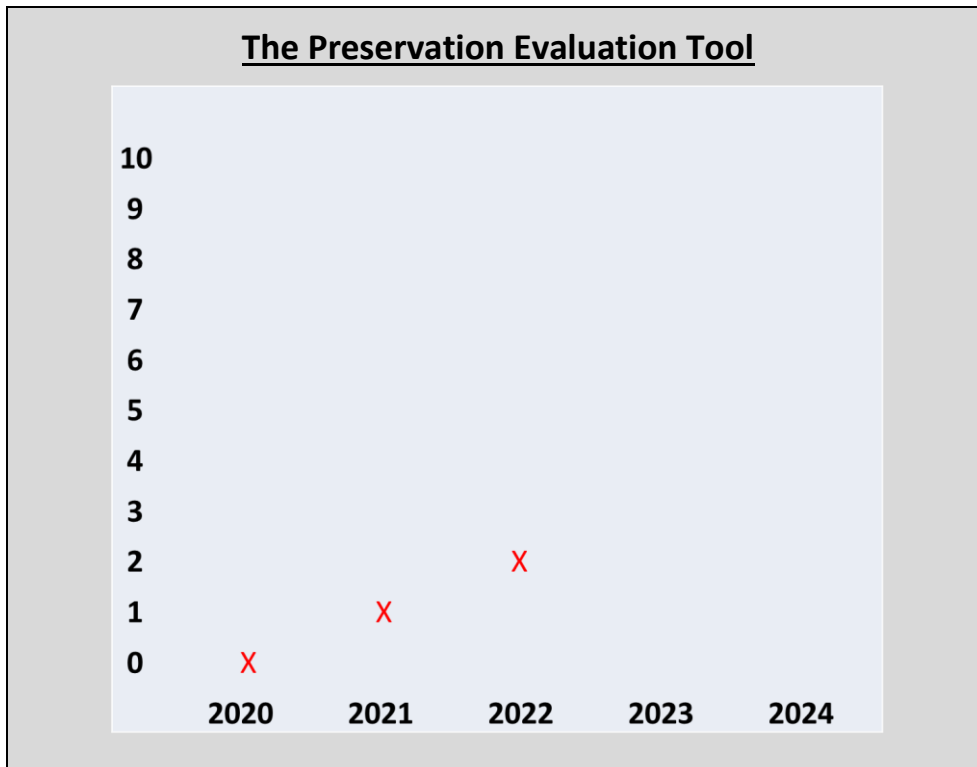
Dissociation

A situation in which the archives repository has lost track of all of its holdings and/or the collection management data. It also refers to situations where the archives staff is discouraged or discontented with the poor environment for and the low status of the collections in general to such an extent, that they are unable to address the risks.

The concept of Dissociation as risk is quite difficult to fully understand. We might even ask if it really is a risk. Clearly the loss of any object, either by external uncontrollable effects or by theft, would be a big issue for any organisation with responsibility for irreplaceable and unique materials. This factor has been sub-titled “curatorial neglect” – in other words the situation in which an archivist is so discontented with the poor environment for and the low status of the collections in general, and is demoralised by this to such an extent, that they do nothing to address the risks. It is important to remember that sometimes “familiarity breeds contempt”, whether due to the pressures of working in low resource and low status environments or the pressures of the modern workplace. We all need to make sure that we are always trying to improve the care of our collections – every step forward is progress. Putting boxes on a pile of bricks to get them off the floor is a progressive step.

When considering how to measure progress you need to bear in mind that the range of elements covered by a preservation policy and strategy are daunting. Each institution or organisation will have its own priorities and will have to decide where preservation fits into the repository’s overall mission. It is important to remember that **any** improvement, no matter how small or seemingly insignificant, represents progress. The important point is that you look creatively at how to improve your preservation standards.

The graphic overleaf helps to visualise the concept of progression. We are not looking for huge leaps, but gradual progression. There may be a year when little changes but we now have a plan and we know what we are aiming for. We will not accept going backwards. Imagine the task of managing preservation on a scale of 1 to 10. Reaching stage 1, if you begin at 0, is an improvement, and should be viewed as such. Maybe next year you can progress to 2, or at least maintain your position.



Fire

The threat of fire is obvious to us all. Its destructive nature is one of life's early understandings. When controlled and harnessed, fire is of course vital to life, but when it is an unplanned event its capacity to destroy is devastating. It is really important to know what percentages of highly flammable material is in the collections. Photographic negatives will burn very quickly, as will a pile of documents, but a tightly closed book will take much longer to burn through. It is also important to assess the local or adjacent risks from other buildings or services – is there a petrol station next door? How well protected are your collections? Do you have a fire detection system, a suppression system or staff trained in deploying fire extinguishers? Remember that the risk of fire is not only from combustion and fire lighting - it may be from faulty electrical equipment.

Water

Water

- Causes:
 1. Natural (e.g. rainwater, snow or flash flood)
 2. Mechanical (e.g. sewer back-up or leak)
 3. Accidents
- Identify control strategies and a prevention programme:
 1. Monitor
 2. Detect
 3. Respond
 4. Recover and Treat

Whilst water can put out a fire, on its own, and as part of an unplanned event, water can be equally catastrophic. This risk may be weather related, or location related, but there may also be a high risk from building services – water supply tanks, pipework, toilets and kitchens. However, a water problem could be as simple as accidentally knocking a drink over at a desk and damaging a vital document or due to work by contractors who are involved in repairing another issue. As when countering fire risks, the way in which leaks are detected will be vital – this may just be regular inspections by staff (they are the preservation police) or by technological solutions such as flood detectors that send a text to your phone. Remember, that most disaster events will occur over the weekend or when the building is not occupied, and so the archive will need to have a process in place to guide an effective response at these times in the form of a Disaster Plan .

Pests

Pests

Animal life that poses a threat to the preservation of archive materials.

The impact of insects and rodents on archival collections is often under-estimated. We must accept that no matter how antiseptic our storage environment, some insects will be present. This is mainly because insects will get everywhere, and also the fact that our collections have come from many different sources, over long periods of times, with little close checking before being taken into the storage areas. Both insects and rodents will want to eat archival materials when they contain cellulose (present in paper) and proteinaceous (in records written on animal skins such as parchment), so this attracts them into the archive storage areas as well. Rodents also use archive material to make nests. The risks posed by tropical climates will have a significant impact on the numbers, density and size of the pests. An infestation of insects, or a mould

outbreak, are as damaging to an archive as a flood or fire – especially regarding reputational damage. Added to this will be the impact on the institution of the cost of conserving and protecting material damaged by potentially avoidable lack of care. Consequently, there will need to be processes to assess the risk, to address key problems like badly fitting doors or windows, and ways in which the extent of the problem can be defined and prioritised.

Pollutants

Pollutants

- Causes:
 1. Airborne pollutants
 2. Pollutants transferred by contact
- Control strategies:
 1. Filtration
 2. Cleaning
 3. Handling protocols
 4. Packaging

The effect of pollutants in archives is an under-developed part of our knowledge of the agents with deteriorating impacts on archives. This is partly because there are no easy, or affordable ways of measuring pollution levels for archives and libraries. We will all be aware of the environmental impacts of our industrial world, and these terrible changes are affecting climate, which in turn affects our capacity to protect our archives. Practically though, an archive in a busy city will be more at risk than one in the countryside (provided there is not a factory complex nearby). Interestingly, the deterioration of the organic materials that archives consist of also produce localised pollution, which can affect the deterioration timetables of other, adjacent, and more sensitive materials. A good example of this is the deterioration of poor-quality papers by acidic components within the paper. This deteriorating paper has an acidic effect on material around it. In addition, man-made products such as plastics will also degrade and affect other susceptible materials.

Light, Ultraviolet and Infrared

Light is an ever-present risk to organic materials. It causes fading of colours, bleaching, yellowing and in some cases darkening. Light is electromagnetic radiation. Visible light, seen by the human eye, exists in the middle of the light spectrum. But we must also take into account the impact on archives of the shorter (ultraviolet or UV radiation) and longer (infrared or IR radiation) waves. UV radiation is high energy and therefore particularly damaging to archive collections. UV is most strongly present in daylight but fluorescent, metal halide and mercury

vapor lights also emit UV radiation. IR raises the temperature of the surface of the archive carrier and leading to incorrect (too high) temperatures which damage the carrier itself. Two examples of deterioration due to light exposure are the acid deterioration of poor-quality papers and the silvering effect of a photograph's image. Most archives will not have windows in the storage areas – but many do – and most collections are boxed - but many are not. However, it is important to understand that we are not just talking about natural light (daylight, sunlight) but also the effects of electrical light sources. The key factor here is the intensity of the light and the period of time that an item is exposed to this light. On balance, an unregulated light will degrade or fade unprotected objects. The key to managing light levels is control and monitoring. However, we should bear in mind that– light meters are expensive and UV filters and blinds are also costly and have limited lifespans.

Incorrect Temperature

Incorrect temperature: effects

Temperature too high

Normal room temperatures are much too high for the long-term preservation of unstable materials, especially those carrying images, sound, and text

Temperature too low

Overall, low temperature is beneficial to collections as in general, this slows down the rate of deterioration

Temperature fluctuation

This is particularly problematic for more sensitive material and collections that consist of mixed media or material. Cycling of temperature can have distinct physical effects on some archive materials i.e. parchment

Temperature is one of the two most important factors affecting the preservation of archives. We are particularly interested in the higher or hotter temperatures. Temperature, especially when linked to relative humidity, plays a key part in the archive materials' deterioration process. The impact of temperature is twofold. At high temperatures organic materials dry out (desiccate) and this causes chemical degradation reactions, and at low (sub-zero) levels, organic decay is slowed right down. Whilst ideally we should keep all collections deep-frozen, this is clearly not practicable if we want to process and provide access to them. What we need to think about is how we manage our storage environments and how we document those environments. Some examples of deterioration caused by high temperatures include:

- The leather on a volume becoming dried out and affected by acid deterioration, causing the leather to weaken and become dusty
- The boards of a volume warping and causing damage to its structure

Incorrect Relative Humidity (RH)

Risk assessment: four types of incorrect RH

- RH over 75% encourages mould
- RH above or below a critical value for a particular object
- RH above a set % that will affect chemically sensitive material i.e. acidic paper
- RH fluctuations

With respect to relative humidity (RH), the more moisture that a material absorbs, the more this affects the way it functions. A dry sheet of paper is robust and easy to handle, a wet sheet of paper is floppy and has no strength. Again, in simple terms, the drier the environment, the more brittle and dustier the material becomes. On the other side, the damper the material becomes due to higher levels of water vapour in the environment, the less robust it is and, for organic material, the greater the risk of mould. If we then add temperature, the dry scenario results in the material being affected by increased chemical damage, and the wet one results in increased mould activity. As for temperature, one of the other concerns is to guard against a storage environment that consistently fluctuates, constantly moving up and down, as this puts the material at greater risk, and on some materials, increases the physical, as well as the chemical changes. Some examples of deterioration caused by incorrect humidity include:

- High and then low RH on a glass slide causing the image layer to shrink and pull away from the glass substrate
- A metal ring binder mechanism rusting as a result of high RH

Next steps

This text has outlined some of the main threats that will affect your archive collections. Once you have understood the cause of deterioration and how to identify, monitor and prevent or at least mitigate them, you will want to begin to manage them.

You could use the exercise sheet that goes with this text and list the agents of deterioration in the order that suits you – you may wish to review this order later to see whether your initial thoughts were right for your situation. Identify the challenges posed by each agent with regard to your archive collections, and your building. Finally, think about the more positive side: how well does your organisation currently address these agents and their challenges? There is also room for notes to enable you to explore your reasoning, set any contexts – for example are there things you can't address for any reason? You can use this space to log the issues, or to pose questions, that you may have, and then follow this through into other areas of your archive work and learning.

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