Preventive Conservation in Historic Houses and Palace Museums: Assessment Methodologies and Applications

SilvanaEditoriale

Preventive Conservation in Historic Houses and Palace Museums: Assessment Methodologies and Applications

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and the Research Centre
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Fundamental Requirements for Historic House Preservation Risk Management

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Abstract
Risk assessment quantifies the value of expected events and processes. Applied to preventive conservation, it quantifies expected loss in value to a cultural property. The quality of risk analysis is broadly thought to depend on uncertainties in measures or estimates of risk factors. The usefulness of risk analysis is commonly thought to be most dependent on the accuracy, or even more mistakenly of the precision, of risk measures. Fundamental risk analysis understandings, as well as practical risk management experience, demonstrate that the precision of risk magnitude measures is less important than a useful underlying system model for both the assessment and management of risk. Underlying models can be constructed to clarify understanding of risks with special reference to one of the dimensions: time, space, or population. For the protection of historic houses and their contents each of these models has value. Models focused on time are best exemplified by severe weather and flood forecasts. Cultural property risk models focused on space are typified by the Risk Map of Italian Cultural Heritage but are now being developed to great benefit at the building level where they can identify locations of high risk to building, contents, or both. For building contents, and to a lesser degree for building components, a population focused model such as the Cultural Property Risk Analysis Model (CPRAM) is most appropriate and useful. In that model "population" refers to items within collections or to measures of building components. A risk assessment and management approach for the protection of historic houses must include features, hence benefits, of each of these modeling approaches. Further, it must be both comprehensive, so as not to divert resources from unidentified but serious risks, and informative in an instrumental way to all actors and systems influencing preservation.

Keywords
Preventive conservation, risk analysis, risk assessment, risk management.

To survive and retain authentic values over time, historic houses must guard against many diverse risks. Some of these are easy to compare and decide where to provide more protection. For example, guarding against visitor contact with a delicate china set will always be judged more important than guarding against visitor contact with a fixed fireplace mantel (fig. 1). Given similar levels of care

Fig. 1
Fragilities as different as delicate china and massive stone are within scope of historic house risk management.
(Source: 123rf.com)

in protecting these items from physical damage due to visitor contact (risk management) we would expect much more damage to the china than to the mantel (risk assessment).

Still, many of the risks to be assessed and managed are more difficult to compare. Light induced fading of many materials within a house may result in a visitor experience that fails to convey the sense of richness the space once had and is still meant to convey. Light damage is gradual but progressive and cumulative. In the other extreme, historic buildings can be lost completely, literally overnight in a catastrophic fire. Consider value as the positive emotion arising in visitors. Comparing the expected loss over time due to the chance occurrence of a major fire with the expected loss of value due to continued fading of interiors (risk assessment) is challenging. Yet deciding the importance and value of improving protection against each of these (risk management) requires that we know their relative importance.

When comparing more than just two different risks, in fact the hundreds of distinct risks we want to manage requires us to have a measure of each. Often these risk measures require expert judgments from many sources. These expert judgments are brought together using the language of mathematics, in the case of the Cultural Property Risk Analysis Model (CPRAM) using ratios. Control of the risks may also be in the hands of different specialists, light damage being controlled by conservators and room attendants while fire protection being contributed to by many but most controlled by estate management.

Fig. 2
Risks as diverse as total destruction by fire and fading by light need to be considered and evaluated. (Source: 1223rf.com b). Mary Perrin (1737-1815), Roxbury, Massachusetts, 1750, wool, silk and metallic thread on linen. Museum purchase with funds provided by the Henry Francis du Pont Collectors Circle 2016.66. Left: back showing vibrant colors. Right: front, faded by light, as seen on display. Courtesy Winterthur.

Fundamental Requirements

This paper focusses on the "fundamental requirements" for risk analysis and risk management methods applied to preventive conservation in historic houses. The two fundamental requirements considered most important for risk management are: first, being maximally informative, and second, being sufficiently comprehensive.

By *informative* we mean providing *useful, actionable* information as an outcome. This information can be applied to management systems, to all people who can influence preservation, and to our fundamental understanding of what we mean by preventive conservation, preservation management, risk analysis, and so on.

By *comprehensive* we mean fully inclusive of all risks, considering all significant factors, and engaging all people who influence preservation.

Informative
At this point, it is important for us to well define what is the meaning employed here for the term *system*. Each of us is comprised of many systems including skeletal, nervous, circulatory, and so on (fig. 3a). A system is simply a construct of parts, and their relations, to serve a goal. It is worth taking a few moments to reflect on the complexity, partial-independence, and inter dependencies of these systems within our own bodies before reading on.

Organizations, like each of us, also contain systems that are somewhat complex, independent, and interdependent (fig. 3b). The preventive conservation (preservation assurance or risk management) system is just one of these many systems, albeit an important one. These systems are made up of both people (hereafter called actors) as well as conventions and rules governing their actions and interactions. An effective risk management system must inform both systems and actors in ways that are instrumental in guiding decisions and actions. Effective risk communication requires us to recognize that informing systems and informing people are different challenges.

Take for example, the case of the Palace of Versailles, which is probably one of the most complex heritage institutions in France, and probably in Europe. If conservation of movable collections is the main responsibility of the Conservation Department, the preservation of the décor and of the architectural structures is the primary goal of the Architecture Department. But there are many decisions about the preservation of the Palace to be discussed together between these two Departments, and also probably with the Audience Department that is in charge of the management and organization of visits. It is essential that risk assessment addresses all these components and perspectives and also that it meaningfully informs both systems and actors in all these areas.

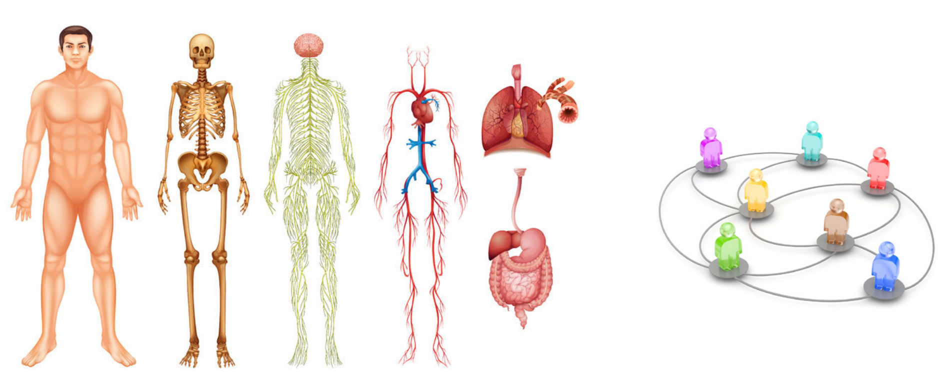


Fig. 3
a) Bodies are assemblies of many systems.
(Source: 123rf.com)
b) Organizations are also assemblies of many systems.
(Source: 123rf.com).

A heritage preservation system needs to be defined in the context of related systems [Waller, 2002, 2003]. Most closely related are the three systems that comprise heritage management (fig. 4):
– develop: accumulate, enrich, or enhance heritage value;
– preserve: maintain heritage value guided largely by risk analysis;
– use: interacting with heritage to provide benefits to society.

Fig. 4
The heritage management system includes three major sub-systems. (© Protect Heritage Corp.)

Risk assessment results have value for many other systems within the institution including, as depicted here, guiding decisions on transfer of risk through negotiated insurance coverage.

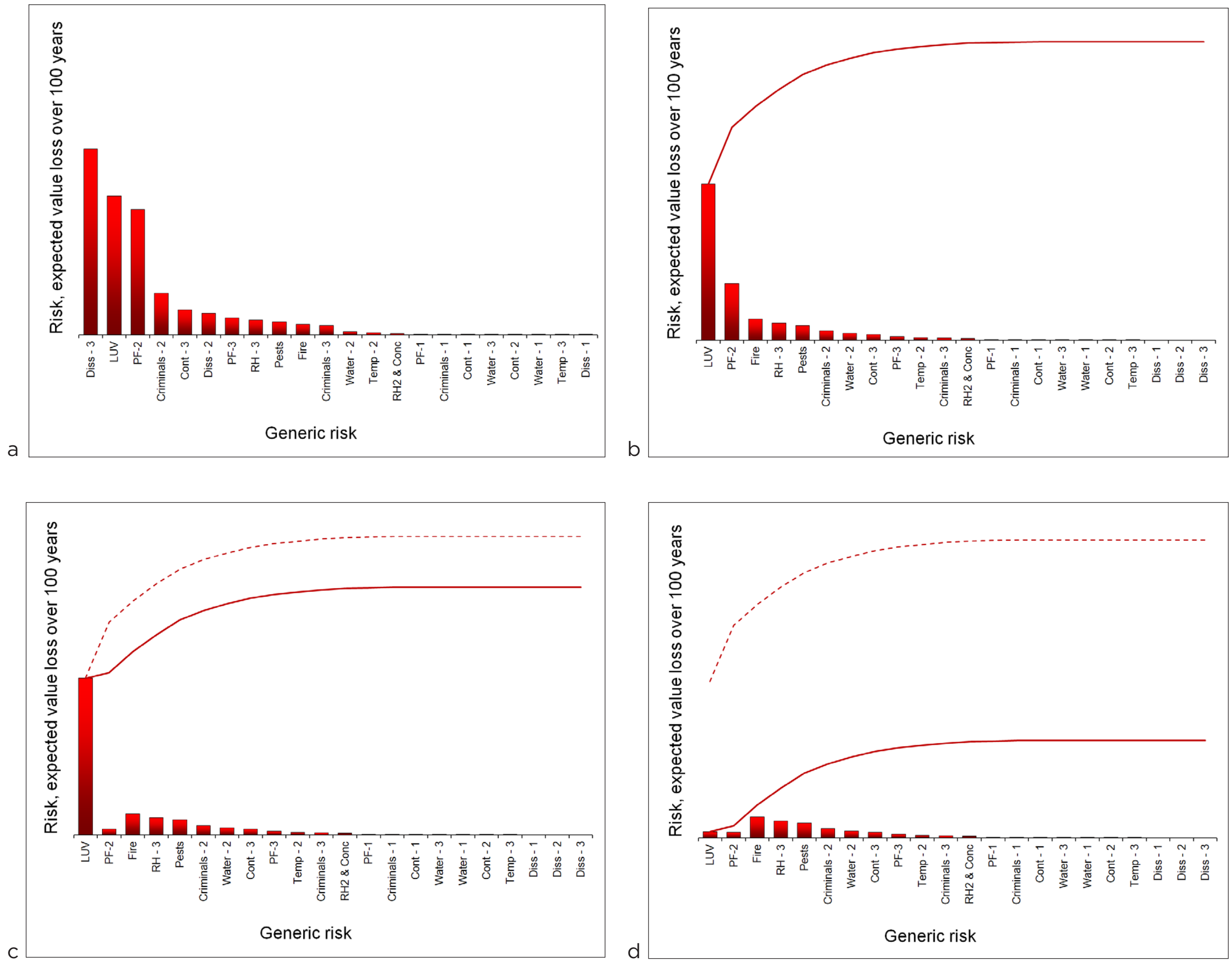
Although risk management approaches are systems themselves, they should not be command-and-control type systems. They involve relatively loose networks of actors, not independent but usually not tightly linked with respect to the goal of risk management. We rely on the expertise of many kinds of professionals to control factors influencing risks to collections. Our challenge is not to control or direct their activities but to inform them of how issues they control will influence risks to heritage.

An example is how the Canadian Museum of Nature's (CMN) risk assessments have informed facility management allowing that group to exercise professional judgment in directing resources to most reduce risks to collections.

Fig. 5
a) Magnitudes of risks to CMN collections by generic risks in 1998.
b) Magnitudes of risks to CMN collections by generic risks in 1998 after filtering to retain only risk controlled by facility management.
c) Magnitudes of risks to CMN collections by generic risks in 2003 after filtering to retain only risk controlled by facility management.
d) Magnitudes of risks to CMN collections by generic risks in 2008 after filtering to retain only risk controlled by facility management.
To enable clarity in scaling, risks specific to fluid preserved collections have been excluded. Only relative risk magnitudes are shown as those convey all important meaning and guard confidentiality.
(© Protect Heritage Corp.)

Figure 5a shows 1998 magnitudes of risks (magnitude expressed as expected loss in value over the next 100 years) to collections by generic risk. That is of limited use to facility management as it includes many risks that are completely outside of that departments control or even influence. Figure 5b shows the 1998 generic risk magnitude distribution after filtering to depict only how much of each generic risk facility management is able to control or influence. The remaining (filtered out) risk magnitudes would be controlled or influenced by other groups such as conservation, registration, etc. The solid line toward the top of the graph depicts the running total risk magnitude across the set of generic risks. It serves as a reference when depicting reductions in overall risk magnitude.

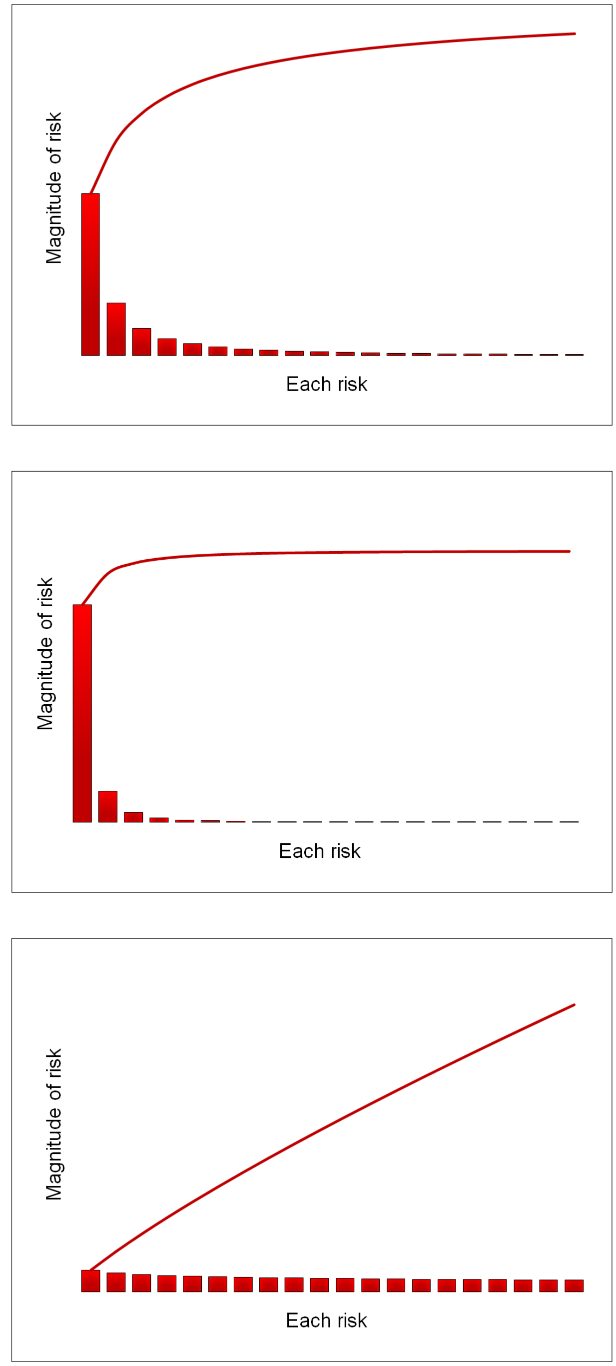
Figure 5c depicts the facility management-related risk magnitude distribution five years later (2003) after facility management was able to address the share of physical force issues it could mitigate. During those years both facilities management and conservation science worked on defining options for – and evaluating risks, costs, and benefits of – reducing collection light exposures in storage. Figure 5d shows the facility management-related risk distribution in 2008 after



a strategy for reducing light damage was implemented. It is evident that facility management was able to focus effort and resources to achieve a substantial reduction in overall risk to collections. Arguably, the CMN facility management group did outstanding work in reducing the amount of risk they could influence.

Finally, in addition to informing institutional priorities, cultural property risk management can impact basic understandings at an individual, and a conservation field, level.

Based on hundreds of risk assessments completed or refereed, the great majority exhibit the form of risk profile depicted ideally in figure 6, as well as practically in figure 3. Figure 6a shows an ideal Pareto distribution indicating that 80% of the risk is associated with just 20% of generic risks. Occasionally, we find an even more skewed distribution where 90% of the risk is associated with just 10%, or even fewer, of the generic risks (fig. 6b). What has never been encountered is the form depicted in figure 6c where there are many generic risks of similar magnitude. Yet, choices and behaviors observed within the field of preventive conservation, including those this author has noted in moments of self-reflection, would indicate an underlying, albeit tacit, belief that magnitudes of diverse risks to cultural resources are much more evenly distributed than they truly are.



a
b
c

Comprehensive

If we consider the second fundamental requirement – that of being comprehensive – then we must consider being comprehensive with respect to: the heritage property being considered, values, and risks.

Regarding the heritage property being considered, it is essential to clearly delineate what is, and is not, considered "in scope" for the risk assessment. For historic properties this will mean clarifying whether, at the large scale, landscape architecture and gardens are within scope; at the medium scale, whether all elements of a building, including foundations, mechanical systems, etc. are within scope; at the detail scale, whether all furnishings and collection items are within scope or some are considered expendable props.

Having clarified the scope in terms of physical items included in the assessment, the issue of what values are to be protected must be addressed. Inanimate items do not themselves have value in isolation from sentient beings. Values result from people, individually or as social groups, attaching meanings to items [see, for example, Significance2.0; Russell and Winkworth, 2009]. Risk-informed preventive conservation now clearly recognizes that its responsibility is to safeguard current and future values of heritage as much as to slow or arrest physical, structural, and chemical changes in heritage items [Luger *et al.*, 2014; Bülow *et al.*, 2016; Brokerhof *et al.*, 2017]. Understanding, and rendering operational, means of representing values of heritage property remains a challenge, especially where both itemized and assemblage values are considered as for historic houses holding important collections [Meule, 2008]. Properly representing value structures of diverse social groups, such as academia and indigenous peoples, within a risk assessment context is another challenge that must be addressed [Tse *et al.*, 2018].

Fig. 6
a) Pareto distribution depicting an 80:20 distribution of importance vs categories.
b) Pareto distribution depicting a 90:10 distribution of importance vs categories.
c) Pareto distribution depicting a 50:50 distribution of importance vs categories.
(© Protect Heritage Corp.)

This will likely require parallel yet separate assessment frameworks. At present, the goal is to structure assessments to provide a best current understanding of values at risk knowing that this understanding is only intended to inform, and not dictate, preservation management decisions. It is also accepted that future assessments will hopefully, and almost certainly, provide better understandings.

Being comprehensive in identifying and defining all risks affecting a cultural property requires demonstrating the bases for belief in having achieved a degree of comprehensiveness (completeness, exhaustiveness). In risk analysis, this is achieved through hierarchical modeling (fig. 7). For cultural property, this process acts as follows:

– starts with combining sources of risk, such as a set of *agents of change* (based on CCI's 10 Agents of Change[1]), with a type of risk based on expected frequency of occurrence to establish a set of *Generic Risks*.
– Each of the 10 agents can be split into 3 *Types of risk*, potentially creating 30 generic risks.
– These generic risks must then be decomposed into a comprehensive set of *Specific risks* within each generic risk.
– Specific risks are defined in terms of s*ource, path* and *effect*.
– In some instances, specific risks are even further sub-divided into *Sub-specific risks*, where that is necessary or helpful as when even a clearly defined specific risk still refers to disjoint sources, paths, or effects that are best defined and quantified separately.

Figure 8 shows a set of 30 potential generic risks. Shaded areas represent our estimate of how comprehensive we are in identifying all specific risks making significant contributions to a generic risk. It is our best understanding of the degree to which ignored or unknown specific risks might contribute to a generic risk. By combining these estimates with calculated generic risk magnitudes we arrive at a quantitative estimate of comprehensiveness. Of course, this still depends on judgment of the risk analyst and remains subjective. Still, it affords a structured documentation of what is known and what is thought to be unknown, or even unidentified (the unknown unknowns). This provides measures of both confidence and credibility [Waller, 2008].

Employing a standard, three-part definition for any specific risk facilitates consideration of comprehensiveness through focussing primarily on one of the three parts (source, path, or effect) as the basis for building a set of specific risks within each generic risk. For example, for Physical Forces-Type-I, rare and potentially catastrophic events, the *source* of the hazard (e.g., seismic or geotechnical events, structural failures, explosions) is most useful for defining a comprehensive set

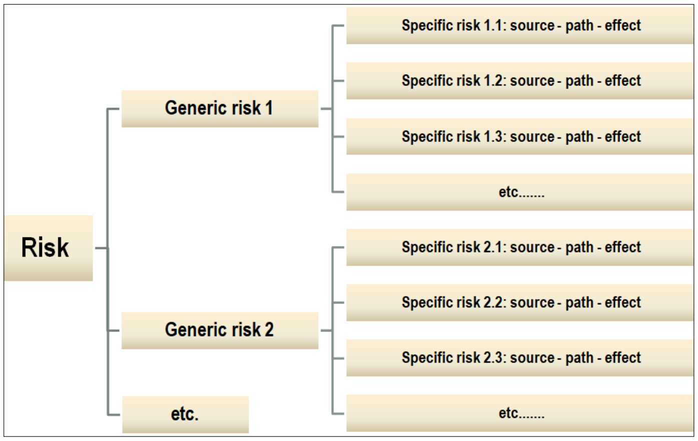


Fig. 7
The structure through which total risk is divided into generic risks then further divided into specific risks.
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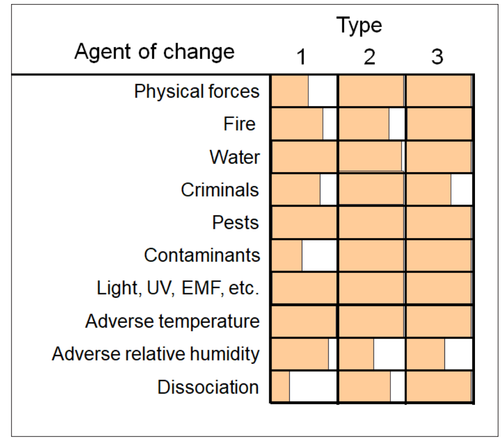

Fig. 8
Best estimates of relative contribution of unidentified, unknown specific risks to each generic risk.
(© Protect Heritage Corp.)

of specific risks. For Criminals-Type-2, *path* (e.g., the route a criminal might take) is most useful, while for adverse relative humidity *effect* on the heritage property (e.g., corrosion or fracture) is most useful. It is also important that, in striving to ensure comprehensiveness, the exclusiveness of specific risk definitions is maintained. That is, the same expected value loss should not be accounted for within multiple specific risks as might happen when several factors influence damage rates. For example, the degradation of cellulose materials depends on adverse (high) temperature, adverse (high) relative humidity, and contaminants (low pH). To avoid double or triple counting of expected damage from this risk it must only be accounted for once. The specific risk for accounting for this will be the one more depended on for control of the risk. That could be adverse temperature if cold storage is the primary control as for film collections, contaminants if deacidification is the primary control as in some libraries and archives, or adverse relative humidity if moisture control is the primary preservation strategy available.

These combinations appear to be complicated but if worked through in a structured manner can be manageable [Waller, 2018]. On-line courses on cultural property risk analysis are also available through Museum Study.[2]

Being comprehensive with respect to factors during risk assessment means also:
– finding and documenting evidence to support every judgment.
– Fully appreciating the roles of all systems and people in influencing risk to heritage.

As Donella Meadows explains well in her book *Thinking in Systems* [Meadows, 2008,] there are many places in which one can intervene with a system to change its performance. She called those “leverage points." These range from very simple, low-level interventions like changing an input parameter, perhaps adjusting a thermostat or writing a procedure to support a policy, to much more challenging, high-level interventions such as changing a system goal or even a world view, such as exactly what is being preserved for whom.

Conclusion

Risk assessment and management are powerful tools. Like all powerful tools they can produce great results. For preventive conservation this can mean much better and more cost-effective preservation. Still, like all powerful tools, if misused or not skillfully applied they can cause great harm. In recent years diverse risk assessment and management approaches to preventive conservation are being developed and promulgated at a great rate, often without the benefit of professional risk analysis review. It is then incumbent on those who would adopt such methods to ensure the method chosen has proven itself to be sufficiently informative and comprehensive to cause more good than harm.[3]

Endnotes

[1] https://www.canada.ca/en/conservation-institute/services/agents-deterioration.html (accessed on 26 September 2018).

[2] http://www.museumstudy.com/courses/course-list/assessing-risk-to-cultural-property-1/ (accessed on 26 September 2018).

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