PREVENTIVE CONSERVATION PLANNING FOR LARGE AND DIVERSE COLLECTIONS

ROBERT WALLER

ABSTRACT -The Canadian Museum of Nature is in the process of implementing three systems to enable it to plan the use of, and be accountable for, resources directed toward preventive conservation. The first system, risk assessment and management, employs simplifying models to obtain estimates of the magnitudes of specific risks to collections. Based on these, mitigation strategies are proposed and evaluated in terms of costs, risks, and benefits both during the implementation phase and over a projected period of time. The system of categories of specimens facilitates, when necessary, setting priorities for risk mitigation projects on the most important parts of collections. Finally, specific preventive conservation issues that are not best quantified from the broad perspective of risk assessment and management are addressed by a collection profiling system. This system was derived from the collection health index system introduced by R. McGinley. It identifies preventive conservation issues arising within demarcated parts of collections.

1. INTRODUCTION

Over the past two decades considerable progress has been made in making the planning of preventive conservation more systematic and comprehensive (Wolf, 1993; Michalski 1990a, 1994). At present, conservation plans developed in accordance with recognized methodologies will be reasonably comprehensive. Alas, being comprehensive is no guarantee of being effective and certainly no guarantee of being cost-effective. This is true because most of these methodologies are based on inventories or checklists of control systems in place.

Several years ago the Canadian Museum of Nature (CMN) became completely pragmatic in planning for preventive conservation. We are doing this by using risk assessment and management methods coupled with a recognition of a hierarchy of value among objects in collections. This was done knowing well that all of the information required to do this comprehensively and accurately was not currently available. Our several years of experience have proven to us that, despite the lack of reliable information for precisely quantifying all risks and assigning values to all objects, our investment in preventive conservation is now much more effectively focused than it would otherwise be.

2. RISK ASSESSMENT AND MANAGEMENT

Our risk assessment and management systems have been described elsewhere (Waller 1994, 1996) and training in their application is available (Canadian Museum of Nature, 1994). The following is a review of the main concepts.

2.1 RISK ASSESSMENT

Risk of loss and damage to collections arises from exposure to one of ten agents of deterioration. These are: physical forces, fire, flood, criminals, pests, contaminants, light and UV radiation, incorrect temperature, incorrect relative humidity, and custodial neglect. Most of these are self-explanatory. The last, custodial neglect, includes a variety of intellectual or legal shortcomings that lead to loss of value of objects, of objects themselves, or of their data through a variety of means including physical misplacement, failure to secure legal title, failure of information systems, and so on.

Risks vary both in frequency of occurrence and severity and it is important that this be recognized. Although this variation is continuous, we have found it useful to define three types of risk. These are: 1) rare and catastrophic, 2) sporadic and intermediate in severity, and 3) constant and mild/gradual. Many agents of deterioration present risks of all three types. For example, the agent physical forces includes earthquakes, dropping a drawer or crate of objects, and distortion due to improper support. Others, such as fire, type 1, and light damage, type 3, occur only as a single type of risk. Recognizing the distinctive nature of these three types of risk clarifies the idea that different kinds and sources of information are required for estimating magnitudes of each type of risk.

The combination of ten agents of deterioration and three types of risks leads to 23 useful categories of risk that are useful to consider. These 23 categories of risk are not only comprehensive but also are easily seen to be comprehensive. This is a great benefit when approaching senior management, governing bodies and grant-giving organizations with a plan for reducing risks. They are all more inclined to support a plan that addresses an issue in such a comprehensive manner. Although it is possible that priorities may shift as new information becomes available, there will be no completely new issues raised.

The magnitudes of risks over a one hundred-year forecast period are estimated through application of simplifying models to evaluate four parameters. These are: *Fraction Susceptible* (FS) interpreted as the part of the collection that is potentially subject to loss or damage by exposure to the risk being considered. *Loss in Value* (LV) defined as the maximum reduction in value, usually in a utilitarian rather than a monetary sense, resulting from exposure of the fraction susceptible to the risk being considered. *Probability* (P) defined as one for type 2 and type 3 risks, which are certain to occur, and evaluated, in conjunction with extent, for type 1 risks. This evaluation requires expertise from professionals in fields such as seismic engineering, fire protection, and so on. *Extent* (E) is the measure to which a risk is expected to produce the defined Loss in Value to the Fraction Susceptible over the forecast period.

The Magnitude of Risk, for each specific risk identified, is then calculated as the product: MR = FS x LV x P x E. This expression differs slightly from that given in earlier references (Waller, 1994, 1996). P and E are now resolved parameters rather than a blended parameter.

Information required to estimate magnitudes of risks is becoming increasingly available for all types of risks (Agbabian, *et al*, 1991; Harmathy, *et al*, 1989, Michalski, 1990b, Reilly, 1996). It is currently possible to estimate magnitudes of most risks to within one order of magnitude of uncertainty. For those remaining risks, which cannot be estimated reliably, there are four possibilities:
1) The risk can not be quantified accurately but it is known to be so high that it must be accorded a high priority for mitigation.
2) The risk can not be quantified accurately but it is known to be so low that it can be ignored.
3) The cost of mitigating the risk to a known, low level is less than the cost of research or consultation needed to determine the magnitude of the risk accurately.
4) External consultation or new research is required to establish the magnitude of the risk.

The risk assessment of the CMN collections resulted in identification of risks belonging in each of these four groups. What is important to note is that a lack of precise, concrete information does not cause the system to collapse but does result in a recommended course of action.

2.2 RISK MANAGEMENT

After identifying and estimating the magnitudes of risks, potential means for controlling risks must be identified and evaluated. To facilitate the comprehensive identification of means of control, we have recognized three general methods of control:
1) Eliminate the source of the risk,
2) Establish a barrier between the source of the risk and the object/collection,
3) Act on the agent responsible for the risk.
Each of these methods of control might be implemented at one of seven possible levels for control: 1) Location, 2) Site, 3) Building, 4) Room, 5) Storage unit, 6) Object, 7) Policy / Procedure.

As was the case with identification of risks, having a framework within which means of control can be identified greatly facilitates comprehensive identification of all possible means of control.

At this stage, selected mitigation strategies are evaluated in terms of costs, risks and benefits during both an implementation and a maintenance phase. Many strategies will result in temporary increases of certain risks during the implementation phase, especially if construction or extensive movement of the collection is entailed. Early identification of these temporarily increased risks is beneficial. Consideration of all possible benefits to the institution will often result in identification of benefits that are not directly associated with collection preservation but that might be used to leverage the project either in terms of cost or in corporate priorities.

Although the principal outcome of the risk management exercise now appears as this set of well-defined projects given priorities according to their risk-cost-benefit,

the process will result in many valuable decisions. In short, many specific risks are dismissed during the magnitude of risks estimation stage as being insignificant (*e.g.*, meteorite impact on collection), many can be mitigated to a great extent by very low cost methods (*e.g.*, implementing a system to recall overdue loans), and many can be dealt with in groups as part of a major project (*e.g.*, rehousing collections in a new facility).

3. CATEGORIES OF SPECIMENS

For a preventive conservation program to succeed in eliminating unwanted damage and loss in the most cost-effective manner possible the relative value of collections being protected must be considered. Because most collections will contain both objects of very high and objects of very low value, it is not reasonable to compare collections as being more or less valuable. Rather, individual objects within collections must be accorded a value, at least a sense of worth to the institution.

This has been done by the Netherlands Ministry of Welfare, Health and Cultural Affairs (1992 a, b) as part of their *Delta plan for the Preservation of Cultural Heritage*. In this plan objects in museum collections were classified into four groups ranging from: A) the most significant objects, through B) material considered as important in a documentary sense, and C) the reserve or archival parts of collections to D) material that could and perhaps should be deaccessioned (Cannon-Brookes, 1993).

For CMN collections, a system of categories of specimens (Price and Fitzgerald, in press) has been established to group objects according to their value and importance. These categories are summarized in Table 1.

Category 1	Primary type specimens, Extinct Recent Species
Category 2	Secondary types, rare or endangered species, historical specimens, or monetary value over $10,000.
Category 3	Voucher specimens or monetary value of $1,000 to $10,000
Category 4	Identified and catalogued specimens and monetary value less than $1,000
Category 5	Working material

Table 1. Descriptions of specimens assigned to each of five categories in the CMN hierarchy of collection object value.

One of our primary institutional responsibilities is towards the preservation of Category 1 specimens. Consequently, projects to mitigate risks to these specimens will be accorded a high institutional priority. With the exception of Category 1 specimens, due to grouping of collection materials, it is difficult to grade priorities for preventive conservation functions and projects among all of the other categories. Exceptions to this occur in some collections where Categories 1 and 2 and/or where Category 5 objects are housed separately from the remainder of the collection.

Although some conservators might still object to this stratification of level of care, it really just formalizes what we know to be true and already are doing. I am sure that nobody would argue that the constitution of a country deserves a higher level of care than the specifications for supplies of toilet paper, even if they are both held in the same archives collection. Formal recognition of this difference in importance and value of objects in collections is one of our most important tools for focusing resources for preventive conservation to achieve the maximum cost-effectiveness in retaining collection value over time.

4. COLLECTION PROFILING

Certain preventive conservation issues affect only limited numbers of objects in collections. These issues are not well resolved by the broad perspective of a risk assessment and require more detailed surveys. For large collections, doing object-by-object surveys is not practicable so that some surveying strategy must be adopted. Considerable work in the design of such surveys has been done in the United Kingdom in recent years and is well summarized by Keene (1991).

In the field of natural sciences collection management, a system for profiling both the conservation and collection management needs of a collection has been developed for entomology collections (McGinley, 1993). This system uses the standard entomology tray as the unit of measure and assigns a value between one and seven according to the conservation needs and processing stage of each drawer. As the CMN wanted to address both preventive conservation and collection management processing issues in our survey procedure, the entomology system was used as a starting point.

In a 1994 workshop facilitated by Ron McGinley, CMN collection staff initiated development of our own collection profiling system. The concept of a storage unit, either a shelf, a tier of shelves, a cabinet, a drawer, or similar unit was retained. Instead of a single numeric descriptor of the state of objects in the unit we have adopted two descriptors, each ranging from one to four. It is interesting to note that the adoption of four levels, instead of three or five, was the recommendation reached independently by the United Kingdom Institute for Conservation (UKIC) working party on collection condition surveys (Keene, 1991). One of the CMN descriptors applies to the level of processing of objects, in a collection management sense, from initial preparation, identification, and cataloging to final integration into the collection. Although this is of equal importance to the preventive conservation descriptor in terms of setting collection maintenance standards and priorities, it is not further discussed here as it is not part of the primary focus of this paper.

There are two main purposes for the preventive conservation aspect of our collection profiling system. These are:
1) To establish a basis for defining resource requirements for continuous maintenance. That is, collections should not change level of care as a result of lack of resources for continuous maintenance.

2) To define, cost and prioritize remedial maintenance projects required to address specific preventive conservation issues in collections.

The working definitions of each of the four levels of our preventive conservation descriptor is given in Table 2.

	Definition	Examples (dry collections)	Examples (fluid-preserved collections)
Level 1	Total loss or destruction within a few years	Evidence of live pests	Broken jar or lid
Level 2	Significant loss or damage within a few years or total loss or destruction within a few decades	Faded or deteriorated object data labels	10 to 50% loss of preservative fluid
Level 3	Long-term risk of loss or destruction	Deteriorating container or support	Overcrowding within jars
Level 4	No problems apparent	No problems apparent	No problems apparent

Table 2. The four levels of the preventive conservation descriptor, working definitions of each, selected specific examples of observations in dry or in fluid-preserved collections that would result in assignment of that level.

Considerable work is being done to ensure uniformity between characteristics used to define levels for all of our diverse collections. This will result in our ability to assign levels to collection units that are truly equivalent in terms of risk to objects regardless of whether those objects are dry plants, fluid-preserved worms, books, microscope slides, objects of art, or anything else.

5. MAKING IT WORK TOGETHER

The CMN is implementing a business planning process to replace our existing practice of developing a complete new set of work plans each year. Our preventive conservation plans are contained within the Museum's overall business plan; they address one of the four goals of the Collection Division. Specifically, the goal "to manage and preserve collections, by controlling risks and performing essential maintenance, so that present and future generations can understand and appreciate our natural heritage".

The plan includes two parts: the ongoing activity of continuous maintenance and a series of remedial maintenance projects. Resources for continuous maintenance are assigned to ensure that overall risk to collections is kept at an acceptable level and that no collection material in categories one to four drops in level of care. Collection risk assessments will be repeated every five years and we anticipate repeating collection profiles every two to three years. Both of these will serve as the basis for performance indicators.

Remedial maintenance projects are defined on the basis of risk management strategies or on analysis of collection profiles. They are given priority according to categories of specimens involved, ratios of cost to risk reduction and other benefits, relation to high priority corporate projects, availability of external resources, and other factors.

6. SUMMARY AND CONCLUSION

The CMN has made the leap from planning preventive conservation on the basis of implementing as many control measures as possible to planning on the basis of minimizing overall risk to collections. The latter approach ensures the maximum possible return on our investment in terms of maintaining collection value. There are some difficulties associated with doing this in advance of having all of the technical information we would like. Nevertheless, planning based on achieving the desired impact, that is to maintain the value of collections in a cost-effective manner, carries advantages that greatly outweigh the difficulties.

ACKNOWLEDGMENTS

I gratefully acknowledge the contributions and assistance of all of the Canadian Museum of Nature Collection Division staff in completing the work outlined in this paper.

REFERENCES

Agbabian, M.S., W.S. Ginell, S.F. Masri and R.L. Nigbor. 1991. Evaluation of earthquake damage mitigation methods for museum objects. *Studies in Conservation*. 36: 111-120.

Canadian Museum of Nature. 1994. Assessing and Managing Risks to Your Collections. Brochure.

Cannon-Brookes, P. 1993. The 'Delta Plan' for the preservation of cultural heritage in the Netherlands. *Museum Management and Curatorship*. 12: 303-307.

Harmathy, T.Z. et al. 1989. A decision logic for trading between fire safety measures. *Fire and Materials*. 14: 1-10.

Keene, S. 1991. Audits of care: a framework for collections condition surveys. *Storage. Preprints for UKIC conference, Restoration* '91. London, U.K. 6-16.

McGinley, R.J. 1993. Where's the management in collections management: Planning for the improved care, greater use, and growth of collections. In *Current issues, initiatives, and future directions for the preservation and conservation of natural history collections*. ed. C.L. Rose *et al*. Consejeria de Educación y Cultura, Comunidad de Madrid, Direccion General de Bellas Artes y Archivos, Ministerio de Cultura, Madrid. 309-338.

Michalski, S. 1990a. An overall framework for preventive conservation and remedial conservation. *Preprints of the 9th Triennial Meeting of the International Council of Museums Committee for Conservation.* Dresden. 589-591.

Michalski, S. 1990b. Towards specific lighting guidelines. *Preprints of the 9th Triennial Meeting of the International Council of Museums Committee for Conservation*. Dresden.583-588.

Michalski, S. 1994. A systematic approach to preservation: Description and integration with other museum activities. *Preprints of the 15th International Congress*. International Institute for Conservation of Historic and Artistic Works. 8-11.

Netherlands Ministry of Welfare, Health and Cultural Affairs 1992a. *Deltaplan, Preservation of cultural heritage in the Netherlands*.

Netherlands Ministry of Welfare, Health and Cultural Affairs 1992b. Deltaplan for the preservation of cultural heritage in the Netherlands. Fact Sheet C-11-E-1992.

Price, J.C. and G.R. Fitzgerald. in press. Categories of specimens: A collection management tool. *Collection Forum*._

Reilly, J.M. 1996. IPI's Environmental Assessment Technology.This volume.

Waller, R. 1994. Risk management applied to preventive conservation. *Preprints of the 15th International Congress*. International Institute for Conservation of Historic and Artistic Works. 12-16.

Waller, R. 1996. Risk Management Applied To Preventive Conservation. In: *Storage of Natural History Collections: A Preventive Conservation Approach*. ed. C.L. Rose et al. Society for the Preservation of Natural History Collections,
21-28.

Wolf, S.J. 1993. Conservation assessments and long-range planning. In *Current issues, initiatives, and future directions for the preservation and conservation of natural history collections*. ed. C.L. Rose et al. Consejeria de Educación y Cultura, Comunidad de Madrid, Dirección General de Bellas Artes y Archivos, Ministerio de Cultura, Madrid. 289-307.

ROBERT WALLER received a BSc from the University of Manitoba and is accredited by the Canadian Association of Professional Conservators (CAPC). After fifteen years of work on mineral conservation he served as Head of Conservation for two years, for the past three years he has been Managing Director, Collection Division at the Canadian Museum of Nature. He has taught and consulted on preventive conservation issues throughout North America, Europe and the Caribbean. Address: Canadian Museum of Nature, P.O. Box 3443, Station "D", Ottawa, Ontario KIP 6P4, CANADA, rwaller@mus-nature.ca