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HERITAGE COLLECTIONS AT RISK – ENGLISH HERITAGE COLLECTIONS RISK AND CONDITION AUDIT

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ABSTRACT

The Collections Conservation team at English Heritage has completed a national risk assessment and condition audit for collections held in 115 properties. The audit methodology integrates collection condition, risk assessment and collection significance to define and rank preventive actions across multiple sites. Display and storage conditions followed by dust, dirt and handling and then incorrect humidity are the risk factors that scored the highest. Evidence from the audit has resulted in a change in collections conservation priorities, policy and funding distribution and has been instrumental in raising the importance of preventive conservation.

RÉSUMÉ

L'équipe chargée de la conservation des collections d'English Heritage a mené un audit national sur l'évaluation des risques et l'état des collections conservées dans 115 sites. La méthodologie de l'audit incluait l'état des collections, l'évaluation des risques et la valeur de la collection, afin de définir et de classer les actions préventives sur de nombreux sites. Les facteurs de risques qui ont obtenu le pointage le plus élevé sont les conditions d'exposition et d'entreposage, suivis de l'empoussièrement, l'encrassement et la manipulation, et enfin de taux d'humidité impropres. Les conclusions de l'audit ont entraîné une modification des priorités de conservation-restauration des collections, des politiques et de la répartition des financements. Enfin, il a permis de démontrer l'importance de la conservation préventive.

INTRODUCTION

This paper describes how the methodology and data from the English Heritage collections risk and condition audit has been used to fundamentally change planning, priorities, policy and funding distribution for the care and conservation of collections kept in 115 historic houses, museums, churches and stores across England.

BACKGROUND

English Heritage (EH) is the UK government's statutory advisor on the historic environment for England. One of its key roles is the conservation and presentation of over 400 properties.

For the past five years (2004 to 2009) the Collections Conservation team at EH has been gathering data relating to the condition, significance and risks affecting collections housed in 115 properties and stores. 12,977 objects were examined from an estimated total of 480,800, representing 2.7 percent of the national collection.

Audit methodology

The audit methodology integrates collection condition, site-based risk assessment and collection significance to define and rank preventive actions across a range of sites. It combines damage evidence provided by a condition audit and risk levels provided by a risk assessment (Figure 1).

It has been shown by Taylor (2005) that the condition of the collection has a role to play in assessing which risk factors are resulting in damage. "Corroboration between a risk assessment and condition survey indicates both *exposure* and *consequence* of risk" (Taylor 2005, 138). This concept provided the theoretical underpinning for the audit.

The condition audit and risk assessment used a common set of risk factors (Table 1). These were adapted from risks to museum collections developed by others, namely Michalski's agents of deterioration (1990) and Waller's risk types (1994). The EH list of risk factors relate to the preventive conservation systems and activities designed to be delivered to site staff (Xavier-Rowe 2008), the intention being that the risks highlighted for a particular site could be mitigated through delivering pre-existing systems

RESUMEN

El equipo para la Conservación de Colecciones de *English Heritage* completó una evaluación nacional de riesgos y una auditoría del estado de conservación de las colecciones de 115 propiedades. La metodología de la auditoría integra el estado de conservación de las colecciones, la evaluación de riesgos y la relevancia de las colecciones para definir y priorizar las acciones preventivas en múltiples sitios. Las condiciones de exposición y almacenamiento, seguidas por el polvo, la suciedad y el manejo de los objetos, y niveles de humedad incorrectos, son los factores de riesgo que tuvieron la máxima puntuación. Las evidencias de la auditoría han dado lugar a un cambio de prioridades en la conservación de las colecciones, así como en las políticas y la distribución de los fondos, y ha sido fundamental para incrementar la importancia de la conservación preventiva.

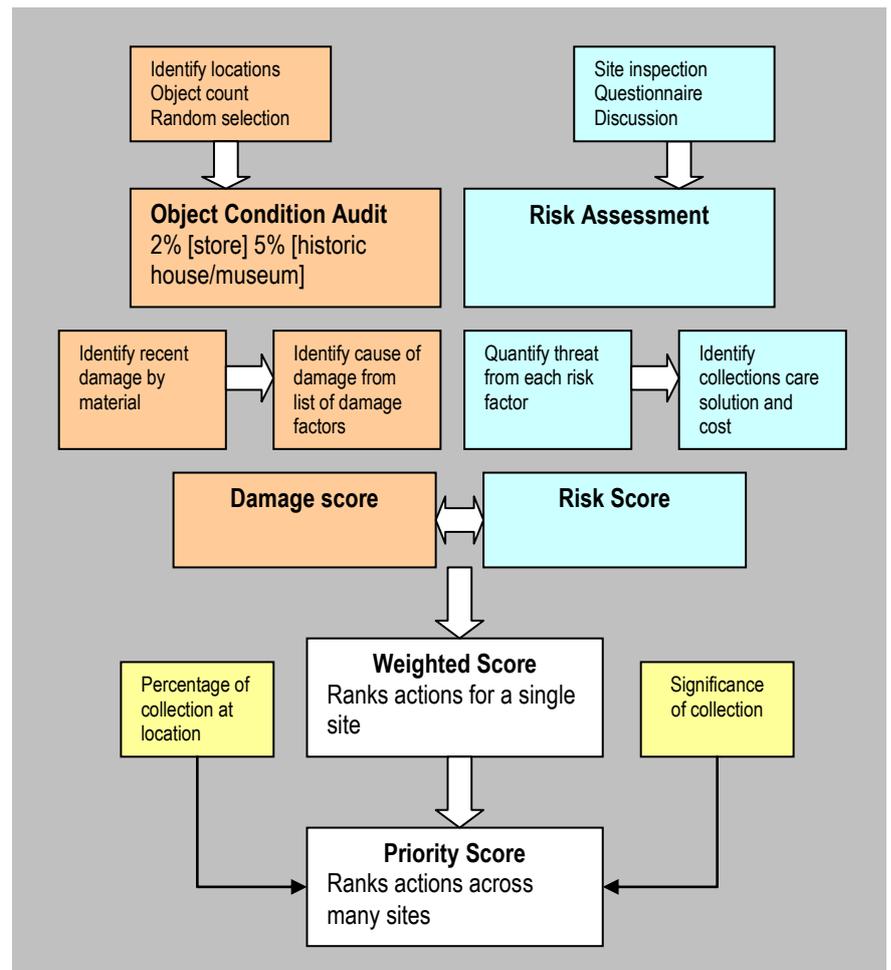


Figure 1
Collections risk and condition audit methodology

of care and training programmes (Fry 2007). There was also a pragmatic decision taken to limit the number of risks to facilitate faster and more focused site surveys and reports.

The same experienced consultant conservators completed each site audit alongside EH conservators to ensure a reasonable degree of consistency was established.

Condition audit

A random sample of objects from each site collection was examined (5 percent for a mixed historic house or museum collection and 2 percent for a store of similar materials). Pre-defined damage types were recorded for each material component of an object. The cause of the damage was then identified from the standard list of risk factors (Table 1). Only recent damage caused by the present display or storage conditions was recorded.

For each damage type noted, the necessary preventive and/or remedial treatment was specified with the estimated time to complete the work. A significance grade was given where A is of international significance; B, national; C, regional; D, replica; and E, to dispose. A condition score

Table 1

Risk factors

Risk Factors	Examples
Dust, dirt and handling	Dust on an object due to insufficient conservation housekeeping; physical damage due to inappropriate handling, such as chips, scratches or losses
Light	Fading of dyes and paints, embrittlement
Incorrect Humidity	Cracks, splits, distortion due to low and fluctuating relative humidity (RH); corrosion, mould growth due to high RH
Pests	Damage and soiling due to insect pests, birds, rodents and bats
Display/Storage conditions	Tarnishing of silver due to inappropriate display case materials; crushing due to overcrowding in storage; Abrasion caused by an inappropriate support
Documentation	Incomplete or missing documentation, no identifying number marked on an object. A lack of documentation for some objects, e.g. archaeology or natural history specimens can mean a loss of research value. This can be both symptomatic of poor collection care and may result in further neglect
Disasters & Security	Fire, flood, theft or vandalism
Inherent Deterioration.	Some materials deteriorate due largely to their composition rather than the conditions in which they are kept. Examples include photographic film and plastic

from 1 to 4 was also assigned where score 1, is very good – no signs of damage; 2, good – slight signs of damage; 3, poor – significant damage; and 4, very poor – severe damage.

In order to quantify the level of damage to a collection from a risk factor, a *damage score* was generated using the following equation

$$DS = \left(\frac{NU}{FS} \right)$$

where DS is the Damage Score, as a percent; NU is the number of units audited showing damage from the risk factor; FS is the fraction susceptible, the number of units audited that are vulnerable to that risk.

For a site with 1000 units, if 500 units were susceptible to light, then FS would be 0.5.

Risk assessment

The site-based risk assessment was structured around the same eight risk factors used in the condition audit (Table 1). A questionnaire completed by a representative of the site operation team was used to assess whether a particular collections care system was in place. If a system has been implemented and maintained, the potential of a risk factor causing damage is largely reduced. However, if a risk question receives a ‘no’ indicating a collections care system is not in place, then the recommended solution and cost is recorded. This information along with observations from the auditors is fed into the site risk assessment.

The level of risk to a collection was measured by the *risk score*. This was achieved by defining and then multiplying the probability of the risk factor

occurring (P) by the quantity of the collection at risk (Q) by the loss of display or research value (LV). Therefore the risk score is

$$RS = P Q LV$$

where RS is the risk score as a percent; P is the probability of the risk factor occurring: 1–3 years 100%, 4–10 years 30%, 11–30 years 10%, 31–100 years 3%; Q is the quantity of the collection at risk: few 10%, some 30%, most 70%, all 100%; LV is the loss of display or research value: major loss of utility 90%, significant loss 50%, minor loss 10%.

Weighted score

In order to rank the eight risk factors at a single property and, therefore, the associated preventive actions, the *damage and risk scores* were combined in different ratios to give the weighted score as follows:

$$WS = \frac{aDS + bRS}{100}$$

where WS is the weighted score, 0–1; *a* is the weighting factor for the damage score and depends on the damage factor; *b* is the weighting factor for the risk score and depends on the risk factor.

The weighting of the damage score (DS) and risk score (RS) allowed for the evidence not seen in the objects examined to be considered. For the risk factor *disasters and security*, which occurs rarely but with catastrophic damage, 100% weighting was applied to the RS. For *pests and display/storage conditions* the damage is sporadic and severe; however, the evidence in the collection is not always immediately apparent. Therefore, in the above equation, the weighting is higher for the RS, *a*=33 and *b*=66. For the remaining risk factors the damage is constant and mild and evident in the condition of the collection. For these risks the DS and FS are evenly weighted.

Priority score

To enable us to prioritise preventive measures territory wide as seen in Table 2, the site risk assessment embodied in the *weighted score* is corrected for the size and significance of the property's collection in relation to the total collection in care.

$$PriorityScore = P \left(\frac{WS}{100} \right) S$$

where P is the percentage of objects at that location; S is the significance weighting where 2=international, 1=national, 0.5=regional.

A priority score of 1 and below was judged to be a low risk. A score from 1.1 to 35, a medium risk, whilst a score of 35 and above was judged to be a high risk. This grading was based on comparing a selection of known

high and low risks against the priority scores. Further testing of this classification is required.

In Table 2, the highest risk at Audley End is *dust, dirt and handling*, which has a priority score of 35.15. This score was arrived at as follows:

$$DS = \left(\frac{NU}{FS} \right)$$

$$60\% = \left(\frac{55}{92} \right)$$

$$RS = P Q LV$$

$$10\% = 100\% \times 100\% \times 10\%$$

$$WS = \frac{aDS + bRS}{100}$$

$$35 = \frac{50 \times 60 + 50 \times 10}{100}$$

$$PriorityScore = P \left(\frac{WS}{100} \right)^2$$

$$35.15 = 50.22 \left(\frac{35}{100} \right)^2$$

P is 50.22, as Audley End showrooms contain 16,047 objects from a total of 31,951 objects in the east territory.

Data processing

The condition audit and risk assessment data was entered into a custom designed Microsoft Access database. The database generated the risk and damage scores and the weighted and priority scores were calculated in Microsoft Excel.

RESULTS

Facts about EH collections

Not all the objects are accessioned, so the audit data has provided new understanding to inform both collections management and collections care priorities. It has determined that the total number of objects is in the region of 480,800 and that they are located in 115 sites. Over 50 percent of the collection is made up of archaeological objects followed by books and archives at 30 percent, decorative arts 8.7 percent and social and industrial history at 4.2 percent (Figure 2). An unexpected statistic is that the majority of EH collections (87 percent or approximately 419,096 objects) are kept for their research and display value in 44 store locations.

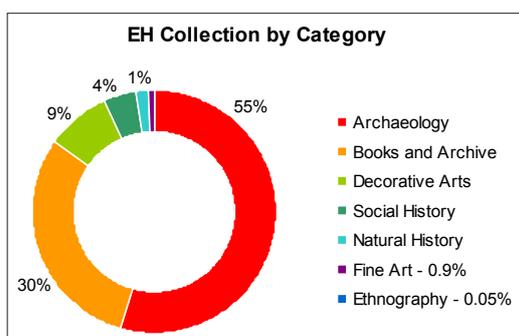


Figure 2
English Heritage collections by category

Table 2

East territory risk and condition audit – collections care plan (first 10 out of 15 actions for 2010/11)

Priority Order	Property	No. of Objects	Significance of Collection	Risk/ Damage Factor	Priority score	Solution	Estimated Cost	Lead	Progress			Comments
									20%	50%	100%	
1	Audley End Showrooms	16047	A - International	Dust/Dirt/ Handling	35.15	Increase CCA hours	£10,000	Senior Conservator				
2	Audley End Showrooms	16047	A - International	Light	17.56	Continue UV film replacement	£2,500	Conservator/ Estates				
						Review light plan		Conservator				
						Refresh training for site staff		Conservator				
3	Beeston Store	4078	A - International	Display/ Storage Conditions	11.70	Re-pack collections	£13,000	Conservator /Curator				Re-packing has started as part of the store move
4	Audley End Showrooms	16047	A - International	Disasters & Security	9.03	Finish Emergency Plan		Emergency Manager				Emergency Plans are now covered by IEPs. Budget for salvage store still required
						Update salvage equipment	£2,500	Emergency Manager				
5	Audley End Showrooms	16047	A - International	Humidity	5.67	Continue replacement of humidistat's	£2,500	Conservator				
6	Audley End Showrooms	16047	A - International	Display Storage Conditions	5.63	Improve protection of collection during hospitality events		Conservator				No longer applicable following end of hospitality events at this site
7	Audley End Storerooms	5494	B - National	Dust/Dirt/ Handling	5.15	Modify housekeeping plan						
						Increase CCA hours as above						
8	Audley End Showrooms	16047	A - International	Pests	3.64	Sweep chimneys	£500	Conservator/ Estates				
9	Beeston Store	4078	A - International	Dust/Dirt/ Handling	2.30	STORE CLOSING						
10	Audley End Storerooms	5494	B - National	Display/ Storage Conditions	1.94	Re-pack collection	£1000	Conservator				

Risks to EH Collections

A national perspective of the risks that have or will cause damage to EH collections was achieved through using the *weighted score*. This was done by simply adding up the weighted score given for each risk factor at each of the 115 sites.

Display and storage conditions, closely followed by *dust, dirt and handling*, are the two highest risks to EH collections. *Incorrect humidity*, in third place, also appears to be a concern, as does the *disasters and security* risk factor. The risks related to *pests* and *light* scored low, mainly because the systems of care including insect pest monitoring and light prevention methods are well established. *Inherent deterioration* also scored low, reflecting the small number of inherently unstable materials in the EH collection and their relatively young age. *Lack of documentation* recorded a low overall score as well.

Analysing the object condition data gathered from over 12,977 objects provided an insight to which materials are the most vulnerable. The materials in poorest condition were ferrous metal, closely followed by wood, then paint (oil, acrylic/alkyd, etc.), non-ferrous metal, and paper (Table 3). *Incorrect humidity* and *storage and display conditions* were the most common cause of damage. This information has refocused the collections conservation research plan towards understanding the tolerances of archaeological iron, bronze and veneered furniture to relative humidity in order to develop practical mitigation methods.

Table 3

Materials in poorest condition

Material	Number of times scored condition 3 or 4 ¹	Most common cause of damage
Metal, ferrous	115	Incorrect humidity [56%]
Wood	88	Display/storage conditions [40%]
Paint (oil, acrylic, alkyd etc)	7	Display/storage conditions & Dust/dirt/handling, both [34%]
Metal, non ferrous	61	Display/storage conditions & humidity, both [36%]
Paper	52	Display/storage [48%]

¹ Condition score 3: poor – significant damage

Condition score 4: very poor – severe damage

Costs relating to preventive and remedial conservation could also be estimated from the audit data. As part of the risk assessment, when mitigation systems were not in place, then a solution was suggested and an estimated cost entered into the database. It was therefore possible to predict that £400,000 needs to be invested in ongoing preventive conservation activities. This amount could be further broken down by territory and by the type of mitigation measure, e.g. insect pest monitoring, packing and support, housekeeping equipment and materials, monitoring equipment and analysis, ultraviolet-absorbing window film replacement, and training.

The condition audit data from examining 2.7 percent of the collection provides an indication of the investment required in remedial conservation treatment. The total investment required in the conservation treatment of objects of international and national significance is in the region of £2.3 million or £230,000 each year for ten years.

NATIONAL PRIORITIES ARISING FROM THE AUDIT RESULTS

For the first time, EH has an objective steer on the risks to the collections in its care. This information will direct priorities relating to collections conservation for the next ten years.

Display and storage conditions represent the greatest risk to EH collections. Collections conservation expertise, effort and funds need to be directed towards mitigating these risks, working alongside the curators who manage the stores. Packing and environmental issues are starting to be addressed as part of an ongoing stores consolidation programme. Knowing that many

of the most pressing issues are with the stores and not exhibitions, as previously thought, has redirected the collections conservation research plan to address environmental control, storage of archaeological iron, bronze, bone, archives and reburial of stone. Materials and methods for repacking small finds have been revised to ensure that damage from organic volatile compounds and relative humidity is reduced. The potential for developing volunteer capacity to assist with repacking campaigns and the replacement of silica gel in thousands of plastic boxes is under development.

EH showcases standards have been transformed over the past five years following research into optimising showcase design. The collections conservators supported by the conservation scientist are now responsible for technical design, commissioning, installation and air exchange testing. However, showcases installed prior to 2005 are causing damage. Where possible, a programme of retrofitting or replacement to improve conditions is underway.

Damage is also being caused to collections from dust, dirt and inappropriate handling by staff and visitors resulting in soiled objects, chips and scratches. Keeping collections and historic interiors free of dust, dirt and knocks across 115 sites remains a challenge. Not only will dust bond to surfaces if it is not regularly removed, but the visual presentation of the site is compromised. The objective evidence from the audit has encouraged a new discussion with the department that operates the sites to address an issue that affects both the collections and the quality of the visit. A number of solutions and ideas have been proposed, including: conservation housekeeping schedules published in site operation manuals; annual site-based training days; employment of contract cleaners to vacuum floors and dust robust flat surfaces; and setting up local volunteer teams to help clean the collections.

Incorrect humidity is the third highest risk factor. The monitoring and analysis of internal environmental conditions remains a priority. However,

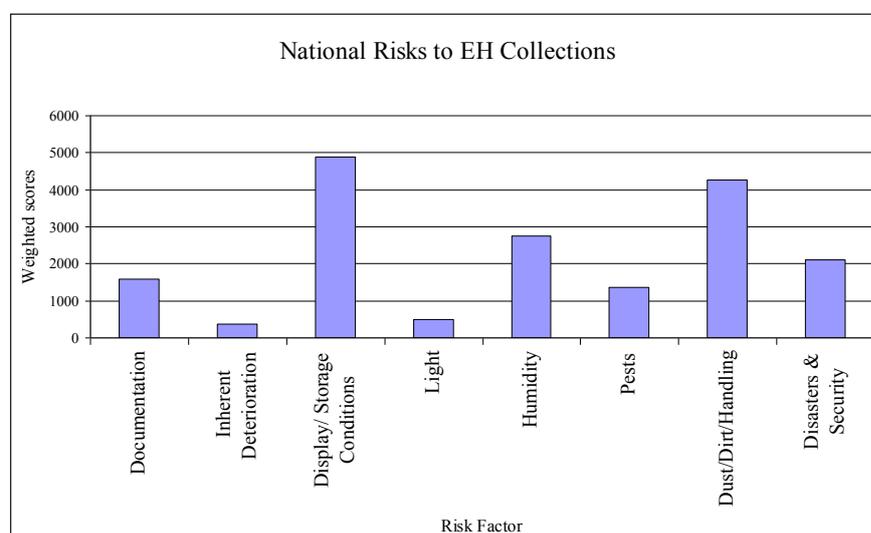


Figure 3
National risks to English Heritage collections

the management of a dispersed monitoring programme is time consuming. The collections conservators are being trained and supported to undertake the annual analysis of site data, which can then be used to inform control strategies. In our London properties, which are opened all year round, a more radical approach relating to heating in winter is required. It has been proposed that the heating thermostats should be set at 19°C to help prevent excessively low relative humidities. Lower winter temperatures will also slow down insect pest activity and reduce the energy bill. Practicalities relating to visitor and staff comfort could be overcome through zoned heating and the wearing of appropriate clothing.

The risk level relating to disasters and security was used to highlight the lack of emergency planning at EH sites, which led to the setting up of a central Integrated Emergency Planning (IEP) team. This dedicated resource has resulted in a step change both in the design and delivery of site emergency plans. The Surviving Emergencies Course, based on a course developed by the Collections Conservation team, and now run in partnership with the National Trust and the Department of Culture, Media and Sport Emergency Planning and Training Group, further supports implementation of site disaster plans.

The remaining risk factors are considered to be less of a concern as long as the established systems and procedures are maintained relating to integrated emergency planning, documentation, pests, light and inherent deterioration.

COMMUNICATING THE EVIDENCE

The evidence provided by the audit can only become influential through how it is communicated. In a large multifaceted organisation like EH, which employs almost 2000 staff, senior management and a range of disciplines and colleagues at all levels need to be informed of the benefits of preventive conservation relating to collections.

To attract the attention and support of senior management, including the chief executive, the *State of EH Collections Report* was prepared (Xavier-Rowe 2010). This report both highlighted facts and figures about the condition and risks to EH collections and also outlined realistic national priorities and solutions delivered by adjusting the way existing resources are targeted. Its purpose was to be a stand-alone factual and objective report to which covering papers could be attached to target different audiences. The report was taken to the EH executive board and successfully raised the profile of collections care through a covering paper which recommended a more integrated approach between visitor operations, estate maintenance and collections conservation.

The national programme relating to property development and maintenance is controlled by a property steering group made up of directors from visitor operations, estates and properties presentation. The state of collections report was taken to this group with a covering paper which raised two

key recommendations: the first being that a series of building-related preventive conservation measures (e.g. cleaning of chimneys, fitting of ultraviolet absorbing window film, adjustments to heating systems) should be funded from the national property maintenance programme; the second recommendation was that the conservation cleaning of interiors and collections should be recognised as an essential visitor operation responsibility supported by the collections conservation team. Both recommendations were endorsed in principal by this senior management group.

English Heritage properties are divided up into six territories. Property maintenance and development for each group of territory sites is managed by a panel of representatives from visitor operations, estates and properties presentation departments. Territory collections risk and condition audit reports were prepared using the audit data. These became the key communication and management tool for both raising the risks affecting the collections and prioritising preventive actions to mitigate the risks (Table 2). Each territory audit report was taken to this panel by the head of collections conservation and the territory-based collections conservator. A covering paper highlighted annual building-related preventive measures for funding from the property maintenance programme.

Site-based audit reports including an action plan were prepared for all 115 sites with collections. These were presented to site team meetings by the collections conservator.

Prior to the communication campaign described above, recognition of EH collections and the resource required to care for them was low. EH priorities relating to its property portfolio are on increasing commercial income and the conservation and maintenance of the built estate. The successful integration of collections care into this dynamic is proving to have a major effect on the establishment of preventive conservation measures.

Existing preventive conservation budgets held by the collections curators and collections conservation teams are now prioritised from a national and territory perspective using the prioritised territory action plans (Table 2).

Increasingly remedial treatment programmes are to be informed by condition surveys of vulnerable collections categories including easel paintings and gilded furniture. Condition surveys now identify the cause of damage using the same risk factors used in the national audit providing further evidence for preventive measures required at particular properties.

The audit methodology has also had a wider impact on EH and Her Majesties Revenue and Customs (HMRC) policy towards the care of inheritance tax exempt collections retained in privately owned historic houses across England. EH monitors the condition of these collections on behalf of HMRC and has recently promoted risk-based preventive conservation. This policy is in the process of being promoted as best practice through an EH publication titled *Historic House Collections: Drawing up a Collections Management Plan* (Xavier-Rowe 2010).

CONCLUSION

The logistics of caring for a dispersed collection combined with an ambitious programme of improving the presentation of EH properties places considerable pressure on limited resources. Combining risk, condition and significance information into an audit of English Heritage collections has provided a mechanism for prioritising time and funds on a local, regional and national scale. The results have fundamentally changed the way resources are allocated for collections care at EH and established the importance of preventive conservation across the organisation.

ACKNOWLEDGEMENTS

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