



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**

Conference of the National Museum of the Palace of Versailles (EPV), the Association of European Royal Residences (ARRE), and the Research Centre of the Palace of Versailles (CRCV)

In collaboration with the International Committee for Historic House Museums (DEMHIST), held at the National Museum of the Palace of Versailles and Trianon

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## **Conference Proceedings**

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# Life After a Collections Risk and Condition Survey

## Abstract

In 2010, English Heritage published internally the results of a national risk and condition survey called the State of English Heritage Collections Report which has had a fundamental positive impact on resources directed to preventive conservation. Using evidence from a condition and risk survey of over 12,000 objects located in 115 properties, risk factors responsible for causing damage were ranked providing a powerful tool for prioritising preventive conservation actions nationally, by territory and by property. The survey methodology is summarised. The paper focuses on how and why the “State of Collections” survey and report has been such a force for change over the past seven years. Impacts have been wide ranging from improvement in stores and showcases to investment in conservation cleaning and conservations science. With effective management of risks, led by conservators and conservations scientists, care and access to collections whether in store or on display has been transformed. The approach taken to complete a follow up national survey is also described.

## Keywords

Preventive conservation, combined condition and risk survey, collections care, heritage collections.

In 2010 English Heritage (EH) completed a national collections risk and condition survey. Results were presented in the State of EH Collections Report which defined the priorities for preventive conservation over the following 10 years to 2020. This report was followed up with a mid-plan progress review completed in 2016. Following a summary of the survey methodology which is already published [Xavier-Rowe and Fry, 2011], this paper then focuses on the impact of the survey results on helping to put preventive conservation onto a sustainable footing at EH. It then finishes with a brief review of plans to complete the second national survey by 2020.

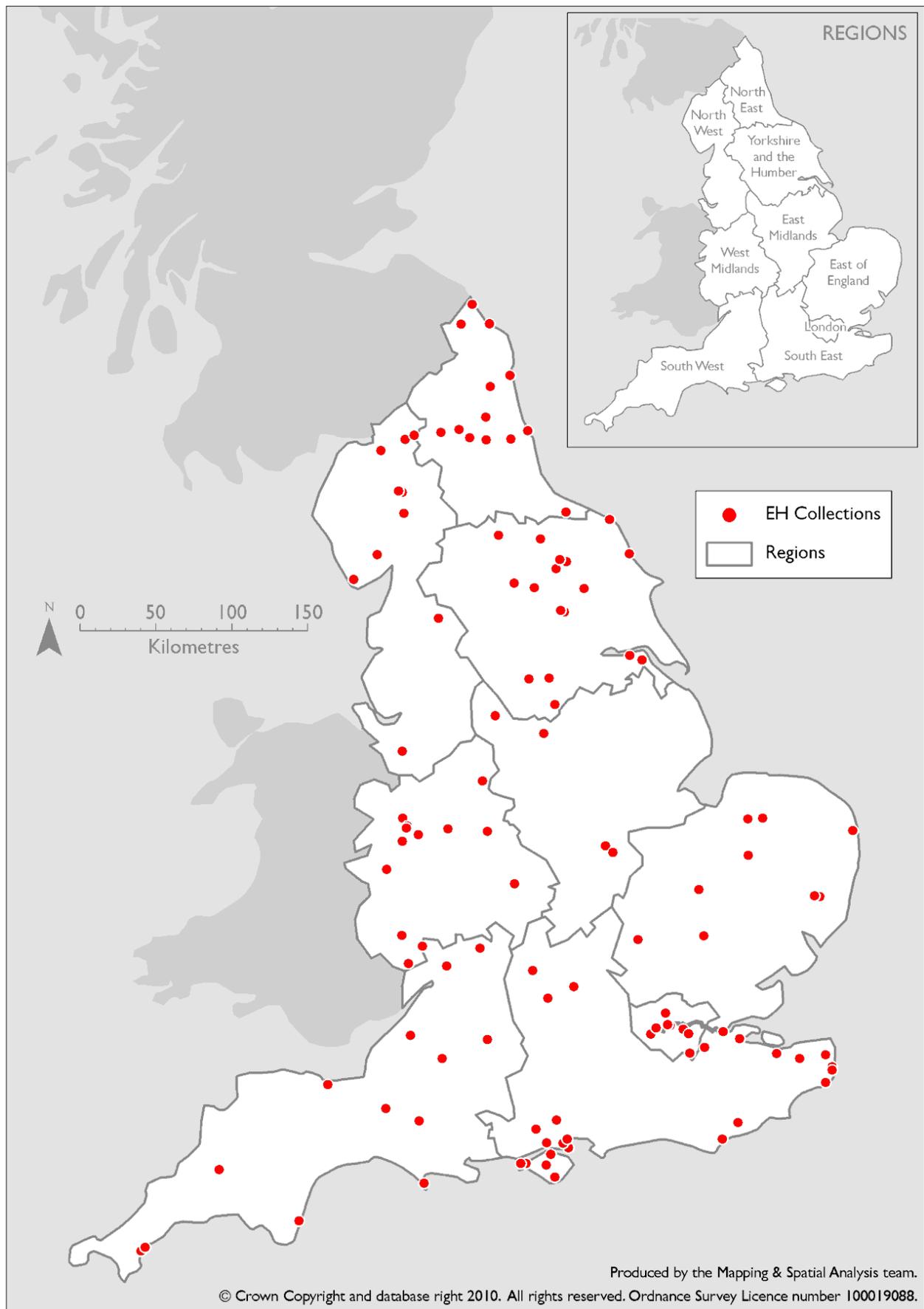
## Survey Methodology

English Heritage is a charity responsible for the care of over 400 sites and half a million objects across England. Collections are housed in 115 historic houses, museums and stores (fig. 1). Caring for such a

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*Fig. 1*  
The location of 115  
English Heritage sites  
housing collections.



<b>Risk Factors</b>	<b>Examples</b>
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 and 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.
Disasters and 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.
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 symptomatic of poor collection care and may result in further neglect.

*Table 1*  
English Heritage risk factors 2010 [Xavier-Rowe, 2011].

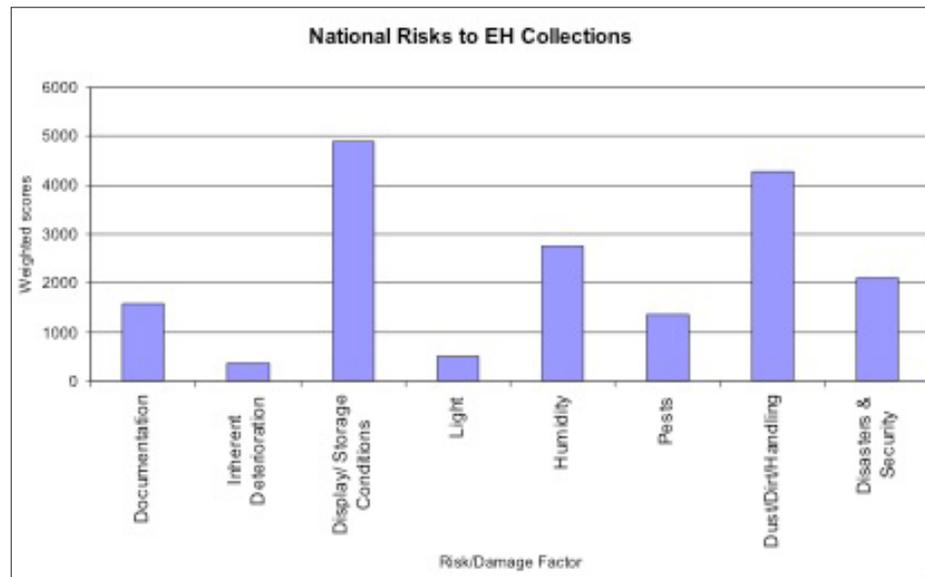
dispersed collection across multiple sites and housed in a range of building types from castles, museums, historic houses and underground tunnels, is a challenging task.

The collections risk and condition survey completed from 2004 to 2009 was undertaken by the EH collections conservation team working with external consultant conservators Frances Halahan and Jennifer Dinsmore. It produced baseline data to identify the principal risks facing over 1/2 million objects in the care of EH and produced prioritised action plans to address these risks for the following 10 years up to 2020.

Combining information from a site risk assessment and the condition of a sample of objects from the collection was informed by the work of Dr Joel Taylor. Taylor argues that the condition of the collection has a role to play in assessing which risk factors are actively or highly likely to result in damage. “Corroboration between a risk assessment and condition survey indicates both exposure and consequence of risk” [Taylor, 2005].

The survey methodology integrates object condition, site based risk assessment and collection significance to define and rank preventive

Fig. 2  
National overview of risk factors facing English Heritage collections.



solutions across a range of sites [Xavier-Rowe, 2011]. It does this through quantitatively combining evidence of damage, provided by a sampled object condition survey (resulting in a damage score) and risk levels provided by a risk assessment (resulting in a risk score).

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], Waller's risk types [1994].

The same experienced conservation consultants completed each site survey alongside EH conservators to ensure a good degree of consistency was established.

The risk assessment for each site was structured around the eight EH risk factors listed in 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, e.g. insect pest monitoring. If a system had been implemented and maintained the potential of a risk factor causing damage was then judged to be largely reduced. If a risk question however received a 'no' indicating a collections care system was not in place, then the likelihood of damage occurring was judged to be higher and the recommended solution and cost was recorded. The level of risk to a collection was measured by a risk score. This was calculated by multiplying; the probability of the risk factor occurring (P) by the quantity of the collection at risk (Q) by the potential loss of display or research value (LV).

The condition survey was completed on a random sample of objects from each site (5% for a mixed historic house or museum collection and 2% for a store). Over 12,000 objects were condition assessed

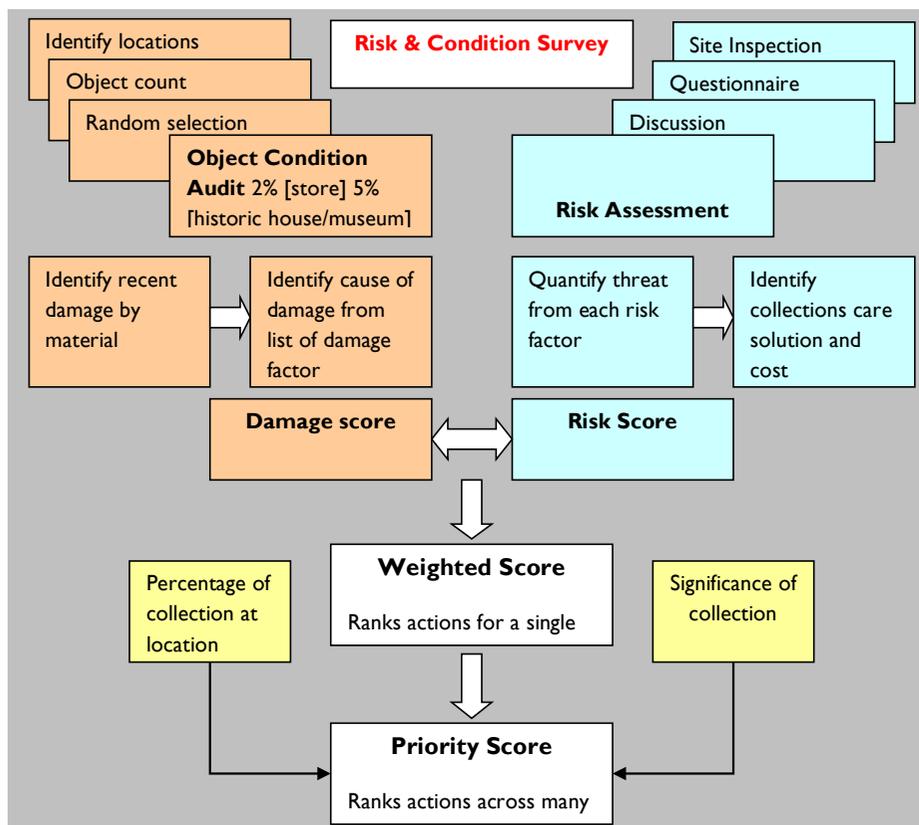


Fig. 3  
Risk and Condition Survey  
– methodology [Xavier-  
Rowe and Fry, 2011].

across 115 locations. 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 (judged to have been caused within the past 10 years) was recorded.

Combining the data from both the risk assessment and object condition survey resulted in a weighted score. The weighted scores for each risk factor were then totalled resulting in a national overview on the risks facing EH collections (fig. 2). This overview helped to define and highlight where resources needed to be focused.

In order to rank preventive conservation action across multiple sites the weighted score was multiplied by the significance of the site based collection and the number of objects at each location. The resulting priority score was used to generate prioritised collections care and conservation plans for each territory (table 2). The methodology is summarised in (fig. 3).

### Impacts

The impacts of the State of EH Collections Report 2010 have been both wide ranging and specific and are outlined below.

### *Preventive Conservation*

The first impact of the State of EH Collections Report 2010 has been to highlight the role of preventive conservation as the principal strategy for mitigating the high and medium risk factors. This resulted in conservators and conservation scientists in the collections conservation team leading on the planning and delivery of preventive conservation programmes relating to:

1. Storage environment, packing methods and storage materials.
2. Technical design, manufacture or refurbishment of showcases.
3. Conservation cleaning .
4. Protection strategies relating to visitor access during functions, filming, photography and building work.
5. Object moving and transport.
6. Environmental monitoring relating to humidity, temperature, light, dust and pollutants.
7. Insect pest management.
8. Emergency salvage planning and training.
9. Targeted condition surveys and risk assessment.

### *Control of Resources*

The collections conservation team has been able to move from influencing others (usually those who held the budgets) to raise standards of preventive conservation to direct control of staff and budgets. Central leadership of conservation with teams based in the territories has encouraged the targeting of resources in an expert, flexible and effective manner. It has also resulted in an increase in resources both financially and in terms of staff (more conservators, conservation scientists and collections care assistants).

### *Conservation Science*

Linking preventive conservation practice and conservation science in the collections conservation team has raised the quality and cost effectiveness of preventive conservation in our properties and stores. Fundamental questions for example relating to safe relative humidity levels to store and display archaeological iron and copper alloys have been answered by EH scientists, directly impacting on the technical design of our showcases and the type of plastic storage boxes we use, how high they are stacked and how frequently moisture absorbing silica gel needs to be replaced. The preventive conservation expertise across the team has been strengthened and continues to be a priority to maintain and develop.

### *Corporate Impact (Influencing Directors)*

English Heritage became a charity in 2015 entering into a lease arrangement with the UK government to conserve and operate the

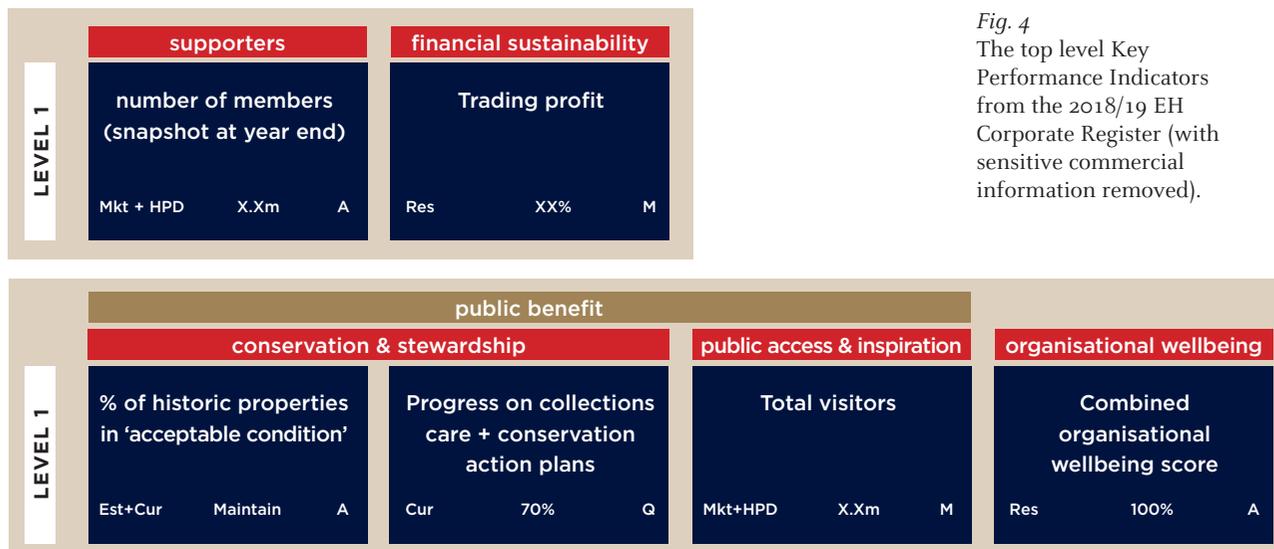
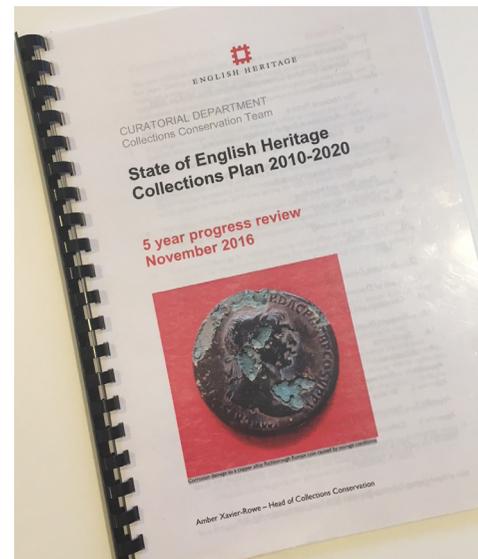


Fig. 4  
The top level Key Performance Indicators from the 2018/19 EH Corporate Register (with sensitive commercial information removed).

national collection of properties, monuments and collections. The standard to be achieved relating to the conservation of the collections is outlined in an appendix to the lease agreement titled “Standards on historic chattels care and conservation.” The State of Collections Report directly informed the creation of a key performance indicator (KPI) to judge achievement of the standard which states: “The data from the collections risk and condition surveys completed in 2010 will be used to draft and update territory and national collection conservation plans. Over a cycle of five years the Charity will aim to make progress against 70% of the actions as listed in territory and national plans.” A summarised version of this KPI has also been captured in the EH Corporate KPI register for 2018/19 at the top level as “Progress on collections care and conservation 70%” (fig. 4). This is the first time at EH that collections conservation has been specifically highlighted in a corporate planning document.

A five year progress review was completed in November 2016 titled “State of English Heritage Collections Plan 2010-2020 – 5 year progress review.” This provided the opportunity to highlight the messages from the 2010 report aiming to influence new directors and trustees. The review was presented by the author to a full house of Trustees and Directors including the Chair and Chief Executive on 15 June 2017. Using a carefully crafted presentation focusing on the message that the State of Collections Plan has led to sustainable long-term conservation resulted in strong positive support from the board of Trustees and Directors. To attract attention at the start of the presentation a story about the damage caused by off gassing storage materials to a copper alloy roman coin was used to great effect.

*Fig. 5*  
The front cover of the State of EH Collections Plan 2010-2020 with the image of a copper alloy roman coin suffering from corrosion caused by off-gassing from the paper envelope it was stored in.



Conservators need to use examples like this to help illustrate the complexity of risks facing historic materials and why expertise in preventive conservation is essential to understanding and mitigating them. This coin has become a mascot for the State of Collections concept and was used on the front cover of the mid plan review (fig. 5).

#### *Resources Prioritised Towards Addressing Highest Risks*

An objective national perspective of the risks that have or are very likely to cause damage to EH collections was achieved (fig. 2). Display and storage conditions, closely followed by dust, dirt and handling, are the two highest risks. Incorrect humidity in third place is also causing damage. Disasters and security, pests and inadequate documentation represent a medium risk to EH collections. The risk of damage caused by light and inherent deterioration is low.

#### *Display and Storage Conditions*

Display and storage conditions proved to be the highest risk to EH collections in 2010. Damage was actively being caused by poor packing and support methods as well as off-gassing from storage and display case materials.

The majority of EH collections are in store at 38 locations and a substantial number of archaeological objects are on display in 550 showcases at 59 sites. Conservation resources have therefore been focused towards mitigating this risk factor over the past five years aiming to substantially reduce the risk from Display and Storage Conditions by 2020.

Since 2010 excellent progress has been made on addressing the state of our stores. Investment in four stores (Wrest Park, Fort Brockhurst, Helmsley and Temple Cloud) has improved environmental



*Fig. 6*  
Primary school education  
visits to Wrest Park  
Collections Store.

conditions and packing standards for around 70% of our stored collections (as estimated 296,367 objects). Conservators and conservation scientists have been at the heart of this undertaking ensuring that sustainable, cost effective solutions based on scientific evidence were delivered for building design, environmental control, packing and transport. The remaining 30% of our stored collections in poor conditions, predominately made up of material from West and South-east sites, we are aiming to address by 2020.

The positive side effect of improving storage conditions has been the associated documentation overhaul which has unlocked greater access for research by curators and visiting experts. The other significant impact has been access by school children and public tours (fig. 6).

The EH Conservation Science Research Strategy 2016-2020 will continue to address the risk posed by display and storage conditions through research themes, including preventing damage to archaeological materials, storage methods and appropriate enclosures for physical protection of robust objects vulnerable to wear from touching.

Showcase materials used in new showcases are carefully policed and tested to ensure that off-gassing is prevented. Old showcases have been retrofitted to reduce the amount of off-gassing and when this has not been possible vulnerable objects have been removed from display.

#### *Dust, Dirt and Handling*

Evidence from the risk and condition survey revealed that significant damage was being caused to collections from dust, dirt and handling by staff/visitors/hospitality/filming resulting in chips, marks and scratches. It is our second highest risk factor.

Keeping collections and historic interiors free of dust and dirt remains a challenge at all our sites with collections on open display. Not only will dust bond to surfaces if it is not regularly removed but the visual presentation of the site is compromised. With the increase in collections care assistants (CCA's) the capacity to undertake conservation cleaning across all sites with collections has become achievable. The number of CCA's has increased from nine part-time posts in 2010 to ten full time posts in 2015. Based at a territory hub site the CCA's managed by the collections conservators can now deliver conservation cleaning and collection care tasks across the smaller sites in the territory. Our London collections and interiors are benefiting from this development with a noticeable improvement in dust levels raising the overall standard of presentation. The team is now in the position to achieve a step change in the standard of conservation cleaning across all 115 sites over the next three years.

However, help from historic properties stewards who open and

operate the sites is still required to vacuum visitor routes and undertake daily conservation cleaning tasks. After unsuccessfully following a strategy of training and supporting site teams to help carry out conservation cleaning over the past ten years a new direction was implemented in 2016. It was agreed with historic properties Directors that historic properties stewards would vacuum the visitor route and that collections care assistants would carry out the conservation cleaning of the objects and interior fixtures “behind the ropes.”

Where additional hours are needed for daily and monthly conservation cleaning tasks historic property stewards would be selected, trained and paid to complete these additional hours directed by the collections conservator. A trial of this approach took place in 2016-2017 with an allocated budget of 20k and has continued with mixed results as finding additional hours during the busy summer season has been a challenge.

There is also the potential to engage local volunteers to help clean our collections and interiors. A volunteer cleaning programme has been set up at Boscobel House, Dover Castle, Down House, Kirby Hall and Wrest Park Store. Initiatives are being investigated for Helmsley Stores, Temple Cloud Store and Audley End House.

Damage from accidental knocks, spills and touching also needs to be prevented. Practice relating to the staging of hospitality events has improved following the implementation of site ‘Memorandums of Understanding’ based on risk assessments. Management of filming and photographic shoots has been transformed under the newly configured Hospitality and Filming team. Collections conservators are consulted from the first enquiry which has improved the planning and delivery of protection supported by the employment of freelance conservators. We have also contributed to the EH filming and photography guidelines 2016 which will help establish good practice, preventing accidental damage.

The practice of recruiting project conservators for major capital and conservation maintenance projects involving interiors housing collections has proved successful in preventing damage during building works and ensuring that collections care programmes can continue across the territory.

#### *Incorrect Humidity*

Incorrect humidity caused by damp and dry internal environments is resulting in damage to EH collections. It is our third highest risk factor.

Fundamental to preventing damage from incorrect humidity is precise information about the daily levels provided by continuous monitoring. The data however must be expertly interpreted and then used to inform actions that can help control the conditions. In 2013,

we took the decision to bring in-house the maintenance of sensors which allowed us to recruit a second conservation scientist. Over the past five years there has been significant progress in environmental monitoring and management, driven by major heating and humidity control projects and Government Indemnity Scheme (GIS) Guidelines for non-national institutions (July 2012) to which the EH as a charity must now comply to be eligible for cover against loss or damage to our loans (of which we are responsible for over 17000). Temperature, relative humidity and light sensors have therefore increased to 309 and blue wool light dosimeters to 61. With the addition of a third conservation scientist and working as a team with the conservators and collections care technicians a system for replacing batteries, calibrating, archiving and interpreting the data has been established.

We have also been able to upgrade our software to allow remote access to check environmental conditions. The research value of this data to understand the deterioration rates of materials is also essential and directly feeds into the Conservation Science Research Strategy.

EH Showcase standards have been transformed over the past five years since we undertook research to optimise showcase design. They now deliver precise control for vulnerable archaeological objects displayed at our site museums which are often damp or dry (or both). The conservation scientists working with the collection conservators now lead on the technical design of new showcases and are responsible for manufacture and installation to ensure they perform to specification. All cases are now tested in-house to confirm that the air exchange rate meets the specification. This ensures that humidity control is optimised and maintenance time and cost is sustainable long-term.

Archaeological iron followed by wood and then archaeological copper alloys were the most damaged materials identified by the sampled condition survey. Incorrect Humidity registered as significantly contributing to this damage. Research has therefore continued to focus on understanding the tolerances of these materials to relative humidity in order to develop practical mitigation methods.

For major heating or Mechanical and Electrical (M&E) infrastructure projects involving properties displaying or storing collections a conservation scientist is now part of the project team working alongside the M&E consultants. This has resulted in systems being designed to meet the need for humidity control.

Conservation heating where the temperature is controlled by relative humidity via a humidistat is our principal means of control for furnished properties where vulnerable collections are on open display. For stores however we have proved that using dehumidifiers and internal insulated rooms provides good control without the need for using heat. Lowering the humidity levels in our small finds

Priority Order	Property	No. of Objects	Significance of collection	Priority Score	Risk/Damage Factor	Solution	Lead	Progress			Comments
								20%	50%	100%	
1	Apsley House	1863	A - International	7.65	Dust/Dirt/ Handling	Assess housekeeping schedule and amend	Conservator				
						Investigate measures to prevent public handling	Conservator/ Curator				
						Improve system of recording damage	Conservator				
						Staff to attend housekeeping course	Site staff				Training provided for London staff in 2009, 10 and 11. CCA attendance on site periodically and localised training for new starters as necessary.
						Implement programme of cleaning and backing paintings	Senior Conservator, Fine Art				
						Investigate improvements to sealing of display cases	Conservation Scientist				
2	Kenwood House	1887	A - International	6.69	Dust/Dirt/ Handling	Check chimneys are capped and cleaned	Estates				Chimneys were capped and cleaned as part of Caring for Kenwood projects. Chimney cleaning is now on Estates Maintenance planned maintenance list each year
						Replace gravel on drive and south front	Estates				
						Revise housekeeping plan to persuade visitor operations to use	Conservator				HP fund contract cleaners which work to our HK schedule in house for floor cleaning and robust surfaces. Time available is still insufficient.

						Train site staff	Conservator				CCA now based at the site and training provided for contract cleaners.
3	Eltham Palace	1698	A - International	4.12	Dust/ Dirt/ Handling	Check chimneys are capped and cleaned	Estates				
						Revise housekeeping plan	Conservator				
4	Apsley House	1863	A - International	3.9	Display/ Storage Conditions	Install dust seals to windows on front of building	Estates				A trial of dust seals is underway and introduction of these for other windows will form part of future maintenance projects.
						Repack banners	Conservator				
						Replace fabric in display cases	Conservation Scientist/ Conservator				This has been completed for all cases with silver objects displayed.
						Assess store and improve conditions	Conservator				Objects in store are now accessible and on racking, and the majority have been repacked in more suitable methods / boxes.
5	Kenwood House	3564	C - Local	3.4	Display/ Storage Conditions	Improve packing and protection of objects	Conservator				
	(Réserve)					Provide racking	Conservator/ Technicians				
						Improve access	Conservator/ House staff				
6	Down House (Second Floor)	1309	A - International	3.13	Display/ Storage Conditions	Ensure all objects correctly packed and protected	Conservator				Most objects packed and stored correctly but recent additions to the store need to be rearranged to ensure these are suitably stored

*Table 2*  
A section of the London Region Collections Care and Conservation Plan 2016.

rooms is also essential if we are to optimise the lifetime of moisture absorbing silica gel in thousands of plastic boxes storing metal finds. In showcases a range of active and passive control is used.

### **Remaining Risk Factors**

Risks associated with poor disaster planning and poor security measures as well as insect pests scored lower as good systems are in place. Light as a risk scored low as a substantial percentage of the collections are not susceptible and again systems of preventing damage using light plans, blinds and ultraviolet absorbing window film are in place. Lack of documentation scored low as did inherent deterioration related to our collection of plastics, photographs and photographic film.

#### *Prioritising Preventive Conservation Actions*

Prioritised Collections Care and Conservation Plans have been produced for each territory (table 2). These help conservators to focus on actions that deal with the highest risk factors alongside delivery of project related work. These plans are used to plan annual work priorities and inform annual budgets.

#### *Clarity on Roles*

The State of Collections report has helped to clarify roles and responsibilities between conservators, conservation scientists and curators and has led to the internal publication of a Conservation Policy.

### **State of Collections 2020**

As we are reaching the end of ten year State of EH Collections Report and plan we have commenced our second national survey aiming to issue the next State of EH Collections Plan towards the end of 2020. The same methodology will be used. Survey forms for condition survey and risk assessment have been designed in Excel to replace the Access database used last time round. It will be undertaken by our in-house conservators supervised by three core conservators to help maintain consistency. The team has completed two days of training focused on judging condition score and cause of damage. Pilot surveys have been completed to help improve reliability [Taylor, 2013].

The risk factors have been adjusted. Dust, dirt and handling have been split into dust/dirt and handling/use. Disasters and security have also been separated. The associated risk questions and solutions have been revised. The other change is to not record costs for preventive conservation or treatment solutions identified as part of the condition surveys and risk assessments. The cost information proved not to be useful or impactful in terms of planning or for highlighting the conservation resources required. It was also time consuming for the surveyors to add this information. Rather conservators and

conservation scientists will draw up costs for both maintaining current systems of care and delivering new measures as highlighted in the new survey results on a site by site basis.

The survey data will be used to prepare ten year site and territory collections care and conservation plans and a new State of Collections Report and Plan 2020-2030.

### Conclusion

Looking back over what has been achieved in terms of preventive conservation at English Heritage, the results from the collections risk and condition survey has had a major impact on the care and conservation of our collections. The resulting State of EH Collections report has been successful in raising the profile of preventive conservation to senior management. It has also helped to centralise and increase conservation resource under the head of collections conservation. The ability to prioritise actions across multiple sites has proved to be a powerful tool for conservators and conservation scientists to focus resources on the highest risks over a sustained eight year period. Ultimately the survey results have helped to achieve sustainable long-term conservation for EH collections.

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