National Trust

Climate Change Adaptation Guidance – Buildings

Roofless Ruins and Standing Masonry

Climate change vulnerability: medium

Roofless ruins and standing masonry – introduction

In the past, buildings and structures were often abandoned, demolished or fell into disrepair. Many of these roofless ruins and standing masonry remains now constitute important historic features in our landscapes. They can range from commonplace limekiln remains to iconic abbeys that punctuate the skyline. These sites also provide valuable habitats for flora and fauna.

We have over 28,000 roofed buildings in our care at the National Trust. We also own a considerable number of unroofed structures. These can either be categorised as buildings or ruins; sometimes as archaeology or sometimes as standing remains.

Whatever the exact nature of these structures, they are all threatened by their exposure to climate hazards. They are often particularly vulnerable as they lack water-shedding features such as rainwater goods, drainage and appropriate coping or capping.

Most monuments and structures were originally constructed to be weather resilient, with overhanging eaves, rainwater goods and means to get or keep water away (culverts, ditches, soakaways, etc.). Even simple walls were often constructed with resilience-enhancing features such as coping stones and expansion gaps. Some structures were designed to be unroofed and with minimal coping, and some were built without mortar. The ruins we often treasure have survived for so many years because they are made of resilient materials.

The scale and significance of structures is always key to determining an appropriate and proportionate conservation management approach. Bespoke site assessment focusing on these factors will help to determine proportionate adaptation.

Image credit: One of the National Trust's most famous standing ruins is Corfe Castle on the Isle of Purbeck, Dorset (© National Trust Images/Sophie Bolesworth).

Roofless ruins and standing masonry – why do they matter?

The charm and the story of ruins is often bound up with their deterioration over a long period of time. Deterioration may happen suddenly – due to damage or deliberate destruction – or it may be gradual, resulting from neglect and/or weathering.

Ruins also often have a conservation history, with interventions sometimes quite severely altering their appearance and readable history. Decisions to conserve, reinstate, repair and sometimes even restore ruinous structures are informed by a complex set of cultural circumstances and individual events. Stonehenge, once toppled entirely, and large abbey ruins such as Tintern Abbey in Monmouthshire or Fountains Abbey in North Yorkshire are essentially late nineteenth- and early twentieth-century partial reconstructions (though largely with original fabric) based on earlier images, comparable sites and archaeological evidence. Regardless of whether or not their original authenticity is intact, we still put high value on the significance of such sites and they still have the power to tell us a lot about the past.

As climate hazards increase in frequency and intensity, the impacts on exposed standing masonry are also likely to increase. This may mean adapting structures or making informed choices around their long-term management to accept, resist or direct change in how they are looked after. These choices may challenge conservation principles but should not disregard them.

Adaptation will usually involve simple measures such as like-for-like repairs, repointing, using an alternative specification for coping or water-shedding, or alternative coping such as soft capping (although this needs to be adapted to climate projections). Where there has been previous use of cement mortars, this may be removed (if possible, without damaging masonry) and replaced with lime mortar.

While ruins can be expected to degrade naturally over time, they carry great value to people in addition to their aesthetic value, often as part of a wider historic landscape representative of our cultural heritage. Many ruins make a considerable contribution to our enjoyment and appreciation of places, inviting exploration and reflection. This does not preclude modern adaptive measures, but any adaptation will need careful consideration in the context of heritage values and setting, along with all necessary consents and permissions associated with planning and heritage legal frameworks.

By understanding the **relative significance** of our places and remains such as ruinous buildings, we can prioritise their conservation according to their capacity for change, and ascribe **differentiated management regimes** to their physical fabric; these will be determined by heritage values and other priorities such as ecology and public benefit.

Image credit: Standing masonry can be valued aesthetically and provide historical and architectural context worthy of conservation, as here at Fountains Abbey, North Yorkshire (© National Trust Images/Andrew Butler).

Roofless ruins and standing masonry – hazards, impacts and options

Hazards	Impacts	Options
Flooding	Standing water on site and around features; scouring of earth around footings; exposed soil vulnerable to washing away; access prevented.	Flood management (including natural flood management), locally and in wider catchment; flood protection via flood doors and gates; improved drainage through existing or new infrastructure; maintain mortar joints and external coatings on masonry where applicable and appropriate.
Shrink/swell	Subsidence; collapse.	Monitor any cracking or movement of foundations and walls, underpinning (while being aware of archaeological sensitivities) and tying. Assessments and options should be guided by a structural engineer with conservation input.
Heavy rainfall	Water ingress to masonry, causing damp and potentially structural issues; scouring of capping or coping; foundations and access erosion; increased rate of vegetation growth.	Maintain water shedding features; design and install new water shedding features if appropriate and necessary; maintain mortar joints and external coatings on masonry where applicable and appropriate; reinstate historic render, or introduce render or limewash. Change coping/capping to improve resilience of structure. Consider access options and management of water around footings in particular. More drastic options may include burial and re-roofing/sheltering via an external structure.
Overheating	Cracking of render, open joints, missing or crumbling joints.	Appropriate material and finish of masonry repointing; improved weathering detailing in architectural elements; external coatings on masonry.
Drought	Elevated risk of wildfire during prolonged hot and dry periods; flora desiccation/death affects microclimate (inc. death of soft capping); increased risk of erosion from compounding hazards (e.g. wind and rain).	Ensure soft capping is resilient to drought and periods of heavy rain; encourage cooling around ruins through planting, being mindful not to plant or remove trees too close to structures (there is also potential for natural colonisation of masonry that can form a protective capping or barrier); maximise water storage capacity; develop and implement a drought management plan; develop a wildfire management plan in collaboration with local partners (see separate guidance on *Wildfires*).
High winds	Damage to masonry from wind directly and from associated debris and nearby falling trees.	Regular monitoring of surrounding trees – check for signs of pest and disease or weakness; where compromised, careful management such as reduction, or (if necessary and warranted in agreement with an ecologist) removal or replanting of trees to retain as key features of the designed or evolved landscape; maintenance and repointing flush with masonry will help prevent wind scour.
Sea level rise	Increased likelihood of flooding and coastal erosion. Increased salt-related damage to masonry.	Flood prevention should be combined with measures to minimise flood damage, such as flood stop boards. In cases of extreme repeated flooding and/or coastal erosion, explore options for adaptive reuse/ release; relocation may be warranted if other options are ruled out, though this should be explored after or alongside other options.

Roofless ruins and standing masonry – options and thresholds

Climate change may challenge the ability of standing masonry to withstand climate hazards, especially when maintenance regimes are poor or lacking.

Specific options for adapting our approach to the conservation of ruins and standing masonry in response to climate change include:

Maintenance – a maintenance plan will help ensure that maintenance takes place; it is the best line of defence for any structure against climate hazards. Even a small amount of vegetation removal and monitoring will help prevent untimely decline of features. Key vegetation removal includes saplings and destructive shrubs such as buddleia, bracken and valerian. Ferns and shallow rooted plants are unlikely to have negative impacts and provide thriving habitats amongst ruins. Ivy is actually quite protective (and great for many species), as long as it is growing out of the ground and not the feature. It is important not to cut ivy off from the base because it will not die from this treatment, but instead will plunge roots into the lime mortar of the masonry and create new roots in the wall, forcing masonry apart over time.

Monitoring – if subsidence is suspected, additional regular checks should be scheduled to monitor movement. Electronic monitoring may be necessary, for example, to record movements/cracks in foundations and walls.

Water management – consider flooding locally and across the catchment; access may need to be limited to avoid exacerbating climate impacts. Natural flood management options may improve the site's resilience through reducing water flow with upstream interventions such as gully stuffing or leaky dams.

Adapt detailing/materials – minor adaptations may include changing the coping or capping material for soft capping (with grass or sedum) or extending the reach of coping to shelter wall tops from water ingress. When planned carefully, this may have minimal impact on architectural character. In some cases, more substantial changes to materials or construction design could be explored. Adapting details on designated structures will require consents.

Preservation by record – where loss is inevitable and may be imminent, but relocation is deemed unaffordable or unacceptable, the heritage values of a ruin or structure should be captured in context and in a manner proportionate to the significance of that feature. This may include techniques such as photogrammetry and excavation, or making the most of a feature through interpretation and engagement. These are all valid forms of conservation work associated with climate change adaptation.

Adaptive release – alongside options such as relocation or demolition of a ruinous structure where climate hazards (or other factors) are threatening heritage values, adaptive release might be considered. This looks at the change in values via transformation of an asset such as a ruin, to bring about value to nature or to people, viewed as part of a shift in its overall significance rather than considering loss of heritage value as loss overall. This is not the same as managed decline and would only apply to a small minority of sites.

Supplementary shelter/re-roofing – in cases of significant water ingress and/or degradation of standing masonry, one option may be to install a shelter over a building or monument to dry it out before repairs, or to protect it while adaptive options are considered. Structures erected to protect a building or monument are rarely permanent, though re-roofing and permanent shelters have been implemented at some designated sites in the UK. Designated assets will require consent.

Thresholds & tipping points

Differentiated maintenance governed by relative significance of a structure will constitute the first line of defence against climate change. At what point, based on an agreed monitoring and maintenance regime, might you change management strategy? What thresholds or tipping points might trigger a change in approach?

- Increased need of maintenance and repair interventions.
- Death of soft capping.
- Increased rate of deterioration of ruins (such as friable masonry more rapidly becoming loose or dislodged).
- Increased rate of masonry deterioration enclosed or surrounded by non-breathable materials (renders or pointing).

Consider 'adaptive windows': where works are being done to repair or resist decline of masonry, there may be an opportunity to consider adaptive changes that will help conserve vulnerable aspects of a structure.

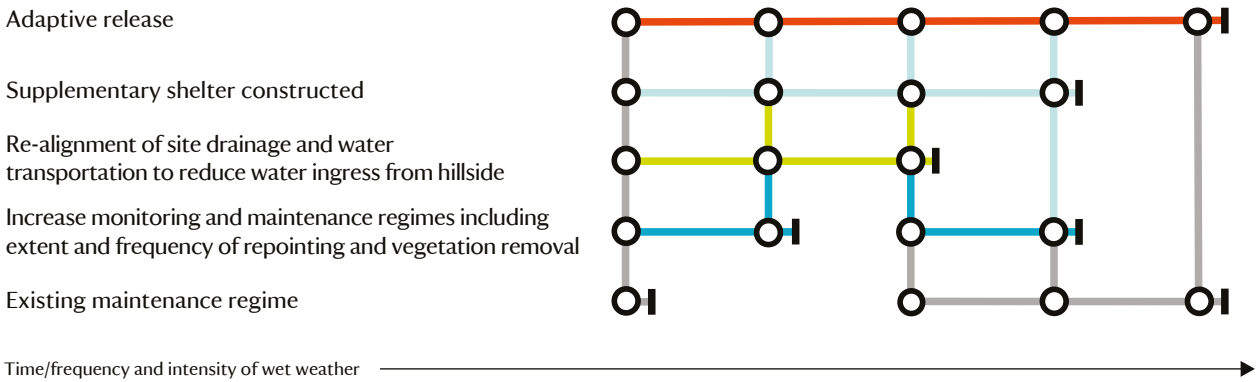
Roofless ruins and standing masonry – worked pathway example

This page applies options and thresholds to a real site example, showing how and when you could make changes to your adaptive response to climate hazards.

It is important to work with a multi-disciplinary group to think about options and thresholds for adaptation. Decisions cannot be made in isolation as there are significant implications for everything from operations to aesthetics through to ecological impacts. It is always more effective to bring together the right people to agree a mutually acceptable solution that benefits the structure and, where possible, ensures continued preservation.

Adaptive pathways will vary and will need to take account of relative significance. The designation and/or relative significance of a building should be paramount in defining the acceptable parameters for change.

The worked example below[1] is representative of how a solution for a significant ruin may come about using the Dynamic Adaptive Policy Pathways approach; it is loosely based on a scheduled monument in a World Heritage Site (Bedlam Furnaces in the Ironbridge Gorge, Shropshire) where the structure was deemed too important to allow rapid deterioration to continue and, despite a regular maintenance regime, fabric was being lost. Given the type of structure and the significance of its location, moving the remains was not a viable option. The pathway below considers the options undertaken as well as hypothetical options for longer-term adaptation, including adaptive release. Note that at each stage, the pathway is likely to circle back to monitoring and maintenance.



(Response thresholds are most likely to be based on the failure of maintenance and repair regimes. Specific trigger points would need to be agreed by the operations decision-maker and relevant consultants and consultees such as building surveyors, historic environment experts and planners. Design and significance of the asset are likely to impact the thresholds and options within the Dynamic Adaptive Policy Pathway.)

[1] Dynamic Adaptive Pathways Approach (Haasnoot, Kwakkel, Walker & Ter Maat, 2013).

Image credit: The permanent shelter of the Bedlam Furnaces ruin in Ironbridge. Sites such as these, in the very long term, may be considered for adaptive release through allowing inevitable change to affect structural appearance and values contributing to significance. This applies particularly when external factors such as climate change cause greater impacts and make other adaptive strategies less tenable (photo by Imogen Wood).

Statutory consent

Check whether the structure is designated and subject to statutory consents; this can be done via an archaeologist, historic building professional or planning adviser. When planning adaptations to a historic feature, you should always consult a historic environment professional such as an archaeologist and also an ecologist as there are likely to be flora and fauna present.

Case studies, signposting and references

As the impacts of climate change are increasingly felt, site teams are constantly working to maintain our historic environment, whilst also reviewing adaptation options. These case studies outline some of the options already in place or being considered for ruins and standing masonry.

At **Fountains Abbey and Studley Royal, North Yorkshire**, the Skell Valley project has worked with local partners to slow the flow of the river which runs through the abbey ruins, to prevent flooding and damage to its foundations and below-ground archaeological features. The site team has also identified a historic tunnel likely to have been used to carry water away from the site and they are considering the possibility of reinstating this to help manage flash flooding.

St Kilda in the Outer Hebrides (National Trust for Scotland) is inscribed as a UNESCO World Heritage Site for its cultural and natural heritage. St Kilda consists of a volcanic archipelago with large colonies of rare and endangered bird species and evidence of thousands of years of human occupation, including a settlement of stone houses, cleitan (unique drystone structures used for storage), and field systems. The archipelago was abandoned in 1930 after the remaining population requested an evacuation. A 2024 Climate Vulnerability Index assessment, undertaken in partnership with Historic Environment Scotland and James Cook University and with support from the Royal Society of Edinburgh, identified three key climate stressors for the site: rising temperatures, increased storm intensity and frequency, and changing ocean currents. Adaptive capacity was assessed as moderate for the first two stressors and low for the third, with the combined vulnerability of the Outstanding Universal Value (OUV) assessed as moderate. Community vulnerability was assessed as low. The Climate Vulnerability Index workshop recommendations included an expanded active conservation programme for the built structures, possible upgrading of natural and artificial coastal defences, watercourse management and improved drainage and gutters. Over the past decade, the site team have observed periods of more intense rainfall followed by drought and believe there may be some shrink/swell causing damage to the drystone structures, but further research is needed to confirm this and explore adaptation options.

Signposting & additional guidance

Historic England's online guidance and webinars include information about safeguarding historic buildings from the impacts of climate change.

Adaptation Scotland, *Guide to Building Maintenance in a Changing Climate* (2015).

Ulster Architectural Heritage and the Department for Communities Historic Environment Division, Northern Ireland, *Impacts of Climate Change on the Historic Built Environment* (2021).

The United Nations Environment Programme has published a *Practical Guide to Climate-Resilient Buildings and Communities* (2021), aimed at a non-specialist, global audience.

In 2011, Historic Environment Scotland published research and advice into the use of plants to protect ruins including soft capping.

Please note: this guidance is a contribution to an ongoing debate and comments are encouraged. The advice given is generic and our historic buildings are unique. Any adaptation should usually be bespoke, to respect the individual significance of each building or structure.

Image credit: left, Fountains Abbey, North Yorkshire, with the river Skell in the foreground (© National Trust Images/Chris Lacey); right, drystone structures at St Kilda (© National Trust for Scotland/ John Sinclair).