

Engagement and Management: Developing a Monitoring System for Open-air Rock Art in the UK and Ireland

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Abstract:

Neolithic and Early Bronze Age rock carvings in the United Kingdom and Ireland represent an internationally unique rock art tradition as it is, to the best of our knowledge, the only wholly abstract global rock art tradition. This heritage resource is, however, under threat from an array of factors, such as increasing population densities and agricultural intensity. In this paper, we report on the Condition Assessment Risk Evaluation (CARE) project that had as one of its primary objectives the co-production of a user-friendly, non-invasive condition assessment risk evaluation Toolkit for gathering and organising information essential for the long-term conservation of open-air rock art. We describe the public involvement CARE process through co-experience participatory focus groups, which evaluated the Toolkit, concluding that we can have confidence in the results obtained from the public. Furthermore, the variables that form part of the Toolkit and related management recommendations are presented.

Key Words:

Open-air rock art, monitoring, condition assessment, risk evaluation, co-production

Introduction

Neolithic and Early Bronze Age rock carvings in the United Kingdom (UK) and Ireland represent an internationally unique rock art tradition as it is, to the best of our knowledge, the only wholly abstract global rock art tradition. Made between about 6000 and 3800 years ago, the art is predominantly curvilinear (Figure 1) with occasional square-shaped designs, such as grid patterns (Figure 2). The carvers used a reasonably small set of motifs to create a variety of designs ranging from simple to more complex (Figure 3), with carved panels varying from well-decorated massive outcrops to small cup-marked portable rocks. Carvings usually were made on open-air outcrop rocks and boulders, however, a small proportion have been found in ceremonial monuments, burial cairns, and rock shelters (e.g. see Mazel 2007 for the

situation in Northumberland). About 7000 rock art panels are known in the UK and Ireland, occurring mostly in England (ca. 3500 panels) and Scotland (ca. 2500 panels) (Sharpe 2012); see Table 1.

The importance of this resource is not only reflected in its status as a visually iconic component of the UK and Ireland's heritage, but also in the contribution it has made to our understanding of Neolithic and Early Bronze Age society (e.g. Beckensall 2001; Bradley 1997; Darvill 2014; Fairén-Jiménez 2007; Frodsham 1996; Mazel 2007; Sharpe 2012; Waddington 1998, 2007). The geographical distribution of decorative motifs in the north of England have, for example, revealed elements of regionality in Neolithic and Early Bronze Age society. According to Sharpe (2012, 50), the 'analysis of Cumbrian rock art based on landscape situation, context, and motif-type identified three geographically discrete groups with distinctive contexts, styles, and potentially different functions', while Ross (2004) has demonstrated variation in the motifs represented in northern and central Northumberland, which may reflect different groups of people.

This extensive, valuable, and largely open-air heritage resource is, however, under threat from an array of factors, such as increasing population densities and agricultural intensity (Barnett and Díaz-Andreu 2005; English Heritage and Northumberland County Council 2008; Giesen et al. 2010, 2014a, 2014b; Mazel et al. 2013; see also Agnew et al. 2015 for a discussion of the vulnerability of rock art globally). Rock art panels are being trampled and scratched by livestock (Figure 4); discarded on the edge of fields during clearance operations; and even being driven on by cars, tractors, and other farming equipment. In the past, they also had been quarried for stone to build dry stone walls and for use in built structures (Figure 5). Moreover, the 'visible' threats are exacerbated by the additional risks presented by climate change, particularly as climate modelling envisages warming temperatures, added seasonally variable precipitation, and increased wind speeds in the future, which would encourage the intensification of stone deterioration resulting from enhanced physiochemical weathering (Giesen et al. 2014a, 2014b). Therefore, despite the appearance of robustness, the carvings occupy a fragile place in the landscape.

Laws in the UK protect rock art when it is designated as a Scheduled Ancient Monument (SAM), although only a small proportion of rock art panels has been assigned this status (Table 1). While it is a criminal offence to undertake certain works to SAMs without consent, Darvill (2014, 30) states 'it remains to be seen if Scheduling is effective as a means of protection for rock-art,' noting that 'in practical terms Scheduling has little effect regarding potentially damaging activities (such as cattle poaching, browsing animals, atmospheric pollution, and visitor damage).' While legislation and policy frameworks are intended to protect SAMs from deliberate damage or acts that might cause damage and 'encourage owners and occupiers to maintain their scheduled monuments in good condition so that the remains survive for future generations' (Historic England 2014, 6), they do not require landowners/manager to proactively manage the rock art on their land. Personal observations reveal that the overwhelming majority of rock art panels are not managed by organisations with large budgets, but instead by private landowners with limited budgets, many of whom are unwilling to put their own resources into the management of rock art. Indeed, the landowners/managers we interviewed during the project (see later) about their attitudes towards the rock art for which they had responsibility indicated that while they were sympathetic about its plight and some even indicated a willingness to support management arrangements and monitoring initiatives, they consistently mentioned the need for a financial incentive, preferably through the 'Higher Level Stewardship' scheme (<https://www.gov.uk/government/collections/environmental-stewardship-guidance-and->

[forms-for-existing-agreement-holders](#), accessed 19 October 2018) to support any monitoring and related actions they might take.

The abovementioned predicament is exacerbated by rock art panels tending to be scattered across the landscape, making it time consuming to visit them for condition monitoring. Additionally, the abundance of panels renders it unlikely that any UK and Ireland heritage agencies have the capacity to monitor even a representative sample of panels. This is despite Historic England (HE, 2008, 51) recognising ‘Regular monitoring should inform continual improvement of planned maintenance and identify the need for periodic repair or renewal at an early stage.’ The current situation has been aggravated by the difficult funding climate for the UK and Irish heritage agencies during the last decade (e.g. An Roinn Cultúir, Oidhreacht, agus Gaeltachta/Department of Culture, Heritage and the Gaeltacht 2016; Historic England 2016; Waite 2013). Therefore, even if sites formally are designated, it appears that their monitoring has been done on a diminished basis during the last decade. For example, Table 2 indicates the last time rock art SAMs in the North East and Yorkshire regions of Historic England were visited, showing that the overwhelming majority (i.e. 86%) received visitation in the 1990s and 2000s, while only 8% were visited between 2010-2018.

Different mechanisms exist in the UK and Ireland for the protection of rock art. In England, for example, one mechanism to ensure that rock art panels are protected would be their inclusion on the ‘Heritage at Risk’ register. To be considered for inclusion on the Register, ‘archaeological sites must be listed as scheduled monuments and included on the National Heritage List for England’ where the ‘risk assessment is based on their condition and vulnerability, the trend in their condition, and their likely future vulnerability’ (Historic England 2018a, v). It is stated further that ‘A site’s condition is expressed in terms of the scale and severity of adverse effects on it, ranging from ‘extensive significant problems’ to ‘minor localised problems’ (Historic England 2018a, v). It is, therefore, significant that only six of the 140 places (i.e. 4%) on the Heritage at Risk Register 2018 for Northumberland (Historic England 2018a) are rock art, particularly as about 1000 rock art panels exist in the Northumberland countryside (Sharpe 2012). Only one mention of rock art, out of 596 places, occurred on the 2018 Yorkshire Heritage at Risk Register (Historic England 2018b, 26), which includes Cumbria and Lancashire; this is disquieting given that these together counties contain over 1000 open-air panels (see, e.g. Boughey and Vickerman 2003; Brown and Brown 2008; ERA 2018). In contrast, rock art panels comprise 10 of 63 places (i.e. 16%) on the Heritage at Risk register for County Durham, (Historic England 2018a) which houses about 300 panels (ERA 2018). Overall, the Heritage at Risk programme does not seem to be an effective vehicle for managing and monitoring threatened rock art. Similar information is not available for Irish open-air rock art, however, Twohig and Williams (2014, 79) commented ‘Condition assessment and risk evaluation investigations need to be undertaken more extensively’.

In this paper, we introduce the CARE project, present the CARE Toolkit reflecting on how it was refined during the course of the project, describe the CARE Management Guidance, followed by a Discussion and Conclusion.

CARE project

The above-described factors (e.g. reduced funding, ad hoc monitoring, and poor representation on the Heritage at Risk Registers in England) provided the context for the ‘Heritage and Science: Working Together in the CARE of Rock Art’ project (hereafter CARE project). The CARE project started in 2013, with one of its primary objectives being

the co-production of a user-friendly, non-invasive condition assessment risk evaluation Toolkit for gathering and organising information essential for the long-term conservation of open-air rock art. It already was evident in the early 2010s that the official heritage agencies lacked the capacity to effectively monitor threats to rock art on a sustained and regular basis. Although funding from UK Research Councils (e.g. Mazel and Avestaran 2010; Mazel et al. 2013; Scotland's Rock Art 2018) and Historic England (HE, e.g. Barnett 2010; Darvill 2014) have been available for recording and researching rock art, including the CARE project, it is fair to conclude that sustained rock art monitoring has received little attention in the UK and Ireland.

The CARE Toolkit (including a report, report definitions, scorecard, management guidance, and portal, including the dataset) was developed to encourage greater public involvement in the collection and organisation of information essential for the long-term preservation of rock art and to prioritise rock art panels for management and intervention. Its creation was in direct response to the lack of capacity among the heritage agencies and landowners/managers to monitor rock art. At the time, we were cognisant of Agnew et al.'s (2015, 22) insight that 'Government professionals and decision-makers have an important role to play in the conserving of heritage such as rock art but, essentially, the ongoing care and concern of relevant traditional owners, site custodians, and local communities is critical for ensuring proper respect for rock art and its long-term conservation.'

The usability of the CARE Report and CARE Definitions were evaluated following feedback from the advisory board and two focus group events in Northumberland with rock art 'enthusiasts' on 29 June 2013 and 'non-experts' on 9 November 2013. This feedback was supplemented by extensive field 'testing' undertaken by the CARE Team in Northumberland (May 2013), Scotland (July 2013), and Ireland (September 2013). Initially, we intended to produce only a paper-based monitoring report form but during the course of the project the opportunity arose to convert the report into a bespoke mobile app supported by an online portal and centralised database. The development of the app has taken advantage of the potential that new technology provides to the crowdsourcing of rock art base heritage information in order to gather data needed to make decisions over deployment of resources and heritage conservation funding (Turner et al. 2018; Giesen et al. Forthcoming; Mazel and Giesen 2018; Mazel et al. in prep.). The majority of the components of the CARE Toolkit are downloadable and printable; therefore, if required reports can be completed from a paper source. The recorded data will, however, need to be entered into an online report via the CARE Portal to be assigned a management score, geographic mapping, results forwarded to heritage officials, and inclusion into the CARE Dataset.

Refinement of the CARE Toolkit

In the initial iteration of the CARE project, we suggested using a formalised assessment scheme as a management tool to enable the prioritization of individual ancient stone monuments in greatest need of urgent intervention based on a standard guide (Giesen et al. 2011). We proposed a formalised universal tool be created to allow for a rapid easy-to-use Condition Assessment and Risk Evaluation (i.e. CARE). We suggested the tool be adapted from the Unit-Area-Spread Staging System designed for assessing the decay of architectural stone (Warke et al. 2003), which was modelled after the internationally recognised triage system for identifying the stage (condition) of disease in cancer patients (Hermanek et al. 1987).

Following assessment of the initial approach in the field, in 2014, we reflected on the condition assessment side of the CARE Report in relationship to 27 geochemical and physical descriptors of local environments (Giesen et al. 2014a). Modifying the method used by Warke et al. (2003), we defined panel 'stage' according to the condition of the motif (M) and stone matrix, or panel surface area (A) immediately around the motif. This was called the 'MA' method, where stage values were assigned based on the paired values of M and A (one to four, good to poor) (Figure 6). This enabled us to show significant correlations between stage and environmental variables in Northumberland's rock art panels (Giesen et al. 2014a, 55), concluding that additional geographical settings, with different types of stone were needed to further validate the MA method. Additionally, we recognised the need to prioritise some rock art panels for immediate attention, especially given our observation 'there is a distinct possibility open-air rock art will disappear as our environment changes unless interventions occur soon' (Giesen et al. 2014a, 55).

Thereafter, our efforts were three-fold. Firstly, to refine and extend our CA (previously known as MA – motif and area, now reflecting condition assessment) method to include Risk Evaluation (RE) variables to produce a true CARE Toolkit, which is universal in application, user-friendly, relatively quick to use, inexpensive, and, critically, provides repeatable results. Moreover, we desired the tool to be used by non-specialists for prioritizing rock art panels for management intervention. Secondly, and linked to the previous point, we wanted to produce management intervention guidance for use by landowners/managers and heritage managers of rock art panels. Thirdly, we felt it necessary to gather additional environmental data and new risk variables from locations in Northumberland, Republic of Ireland, and Scotland to validate further the scientific core of the CARE approach.

The CARE Team compiled an extensive list of risk or threat variables associated with open-air rock art, then narrowed down the number of variables to those we believed had the greater impact based on fieldwork observations, considering the feedback from the CARE Advisory Board (also see Giesen et al. 2014b). For example, we found a strong correlation between panel height and soil exchangeable cation levels around the panels and panel condition (Giesen et al. 2014a). We included panel height as a variable in the Toolkit but excluded soil composition, as it would not be viable for members of the public, managers/owners, or even heritage managers to provide these data. In essence, we desired to keep the CARE variables to a minimum and only include those variables that were easy to record by the non-specialists and still achieve the objectives outlined above.

The new set of recording criteria was field-tested by nine people familiar with rock art/geology to ascertain if the combination of variables worked to accurately record a panel's condition and the perceived risks. We started by dividing variables into either an environmental or condition category. Environmental variables considered land use, land status, and both direct and indirect impacts on or near the rock art panels, while condition focused on variables related to the panel surface ranging from its height to surface stability to motif angle.

Based on our experience in the field, we refined the list of variables to create a one-page monitoring CARE Report supported by accompanying CARE Definitions for use by our focus group participants. These were refined further following the abovementioned focus-group feedback (<https://rockartcare.ncl.ac.uk/modules/core/attachments/rock-art-care-report.pdf> and <https://rockartcare.ncl.ac.uk/modules/core/attachments/rock-art-care-report-definitions.pdf>). The 'area' aspect of the MA condition assessment was removed as it was determined to put panels in double jeopardy and that an average motif condition alone was

adequate given our new scorecard approach (see below). The motif stage now reflects the old MA motif sub-category with options of 0 to 3 stages. Focus-group feedback also suggested the term 'angle' was preferred over 'slope' to record the steepest angle of the motif(s).

A CARE Report consists of 24 data entry categories (Table 3). Four standard entries specific to the panel being monitored (1-4); three standard entries relate to the recorder (5-7); five entries relate to the environment (8-12); ten entries relate to the panel condition (13-22); and two remaining entries relate to image capture of the panel (23), and an open comment field (24).

From these 24 variables, we used direct risk (11 and 12), non-direct risks (8, 10, 13, 14, 15, 19, and 22), and motif condition (20) to create the CARE Scorecard, resulting in a traffic light rating system to inform management decisions. This triage approach indicates when a panel is not at risk, at risk, or at serious risk (Figure 7). A red signal, denoting at serious risk, suggests immediate intervention, while an amber signal raises concern and possible need for intervention.

The overall signal is generated by calculating weighted values for the direct impact and non-direct risks on panels. A direct risk signal is obtained from the nine possible human impacts (e.g. deturfing, field clearance, graffiti within 10 years (if that is discernible), litter, ploughing/worked field, road/track, vegetation clearance, walking wear, and other direct impact) and the four potential animal impacts (i.e. droppings (excluding bird droppings), rubbings, scratches, and other direct impact). If a panel has any direct impact (e.g. an impact score of 1-13), then the signal is red. Lacking any direct impact, the rating is 0, with a green signal.

The non-direct risks signal is calculated by filtering other risks against motif condition stage, where Stage 2 and 3 motifs will be either as risk (amber) or seriously at risk (red) (Table 4). The non-direct risk weighting was derived from known impacts on built structures (Warke, 2010) and observations made on 78 rock art panels from 18 different sites across Northumberland (England), Dumfries & Galloway (Scotland), and Donegal (Republic of Ireland) (Giesen et al., Forthcoming).

The overall signal is obtained by combining the direct impact and non-direct risks signals, where the signal with the greater risk takes precedence (Figure 8). This weighting of variables can be adjusted based on new information obtained from the growing baseline dataset. For example, the form currently gathers information on algae, lichen, and moss coverage and motif direction even though these variables are not included in the scorecard. These conditions likely play a role in panel condition, however, their relationship to rock art deterioration is not understood sufficiently to use them.

Currently, CARE reports and scorecard are emailed to specific heritage officials in the UK and Ireland. Only a few known landowners/managers are included in the notification cycle. Although, it would be ideal to include all known landowners/managers, it was not feasible, or sustainable, to obtain their names and contact details. Furthermore, local authorities are deemed to be better placed to make the necessary notifications to land owners/managers should this be required. The CARE Portal provides these officials with the opportunity to map all reports, allowing them to identify useful geographical patterning of threats and damage to the carvings.

The CARE Portal accepts CARE reports from non-UK and Ireland locations; however, it does not have the capacity to forward notices to relevant authorities. Nevertheless,

individuals can use the portal to produce downloadable scorecards, map their reports, and use it at a local level regardless of their geographic location.

Engagement and Replication

As noted, a primary objective of the CARE project was to create a user-friendly and non-intrusive Toolkit for gathering and organizing information essential for the long-term safeguarding of ancient open-air rock art. Achieving this required not only the input of project members and associated colleagues, but also that of members of the public and the people responsible for managing the land. Input from project members and associated colleagues occurred through participation in project fieldtrips and two CARE Advisory Board meetings. The project fieldtrips, in 2013, generated the input of nine researchers, with four individuals recording all the 78 panels using the CARE report and definitions.

Members of the public were involved in the CARE process through co-experience participatory focus groups which evaluated the Toolkit. Two factors informed the holding of these focus groups. The first being an increased openness and ethos of co-creation in the archaeological and heritage sectors (e.g. Bonacchi and Pett 2012; Richardson and Almansa-Sánchez 2015) and the second being that, as discussed earlier, heritage organizations appear to lack the capacity to undertake the monitoring of rock art. Regarding the first point, The Royal Society (2012, 8) reported that ‘In some fields, there is growing participation by members of the public in research programs, as so-called citizen scientists: blurring the divide between professional and amateur in new ways.’ This has been reflected in rock art studies during the last decade with several exemplary projects where volunteers have been at the forefront of recording initiatives (e.g. Barnett 2010; Scotland’s Rock Art 2018; Sharpe 2014).

Public consultation was done through two focus groups, with one group referred to as rock art ‘enthusiasts’ (29 June 2013) and the other ‘non-experts’ (9 November 2013). We defined the ‘enthusiasts’ as people who had a keen interest in or had specialist knowledge of open-air rock art, while ‘non-experts’ were people who might not have a strong knowledge of open-air rock art but were interested in being involved with the project. Twenty-five people participated in focus groups, sixteen ‘enthusiasts’ and nine ‘non-experts’. Both focus groups took place at Rothbury, in central Northumberland, and included visits to panels in the nearby Lordenshaw rock art area. The focus groups were arranged along similar lines: (1) introducing participants to the CARE project and its goals; (2) providing them with the report and definitions necessary to complete it; (3) going on-site where they completed reports for eight panels (Figure 9); and (4) a debriefing session about their experiences of completing the report. We purposefully met with the ‘enthusiasts’ first as it was deemed appropriate to first obtain feedback from people who were familiar with the rock art before asking those with no familiarity with the resource to engage with it and the report and definitions. This allowed us to rectify any difficulties raised by the ‘enthusiasts’ before trialling it with people with no experience of rock art. For example, one of the issues that the ‘enthusiasts’ required clarification about was how to measure the height of the panel, which led to the creation of a simple graphic to support this criterion (Figure 10).

While a key aspect of the focus group exercise was to ensure the user-friendliness of the report and definitions, it also was critical to establish how the different groups ‘performed’ to ascertain the viability of the report as an instrument that could be used by a range of user groups. Before making the report and definitions public, it was imperative to have confidence the observations were consistent and repeatable among the groups. To achieve this, all groups

recorded observations from eight rock art panels from Lordenshaw in central Northumberland. Figure 11 compares the results of the ‘enthusiasts,’ ‘non-experts,’ and ‘experts’ (i.e. CARE Team) with regard to motif, height, motif angle, and lichen parameters, while Figure 12 provides scatter plots of how the different user groups estimated motif and height. It is evident from Figure 11 that no statistically significant differences exist between any groups for the parameters measured. In general, motif and height were estimated with greater consistency, while there was more variation between groups with the measurement of angle and lichen coverage with the greatest variations seen for the ‘experts.’ It is acknowledged that individual measurements differ among groups (Figure 12), but that differences seems to be more related to the parameter being something that can be measured more or less objectively, such as motif condition.

Although the differences, between the groups, regarding motif angle and lichen were not deemed statistically significant, steps were implemented, in the creation of the CARE app, to encourage greater consistency in the readings (Turner et al. 2018; Giesen et al. Forthcoming). Regarding the motif angle, which requires recording the steepest angle of the motif(s), the software designers created a facility whereby the reading can be obtained by placing the mobile device on the appropriate place and pressing a button entitled ‘Save Angle Reading’ (Figure 13). In terms of the percentage of lichen, moss, and algae, a set of graphics was introduced to encourage a greater consistency in the scores.

Reference to Figure 12, which compares ‘motif’ and ‘height’, shows that these criteria can be measured consistently and accurately without specialist knowledge. For example, panel height which can be measured with a high level of precision because height is explicit, which was supported by the graphic (Figure 10) developed to explicitly indicate what was required. In contrast, some measures, such as ‘motif’ (Figure 12), that have a similar mean across all panels for each group can have considerable variation in panel-by-panel comparisons. This is likely due to the recorders feeling the need to apply greater judgement in determining the combined average condition of all the motifs on the panel from the set stage options that have been provided. Based on the available data, we concluded that the ‘experts’ and ‘enthusiasts’ did not judge large differences among panels in motif stage; whereas, the ‘non-experts’ judged much wider differences in stage for the same panels. This may be because the ‘non-experts’ only judged panels based on what they saw in that particular area whereas the ‘enthusiasts’ and ‘experts’ were considering the panels based on their wider experience. Nevertheless, sufficient uniformity among the participants exists to have confidence that recorders from different constituent groups will provide consistent results required for the monitoring of rock art.

Finally, seven landowners/managers, with responsibilities for safeguarding rock art, who were interviewed between 5 and 18 September 2013, felt the CARE report and definitions were straightforward and usable. However, they did raise some concerns that were addressed in the development of the app and the electronic submission of paper-based forms to the CARE Portal. For example, four of the seven interviewees mentioned the need for photographs, which supported our intention to include them in the CARE Toolkit; people submitting reports are asked to submit an image of the ‘Panel in the Landscape’ and the ‘Panel only’. Other suggestions included requests for more effective explanations of what panel height, slope (angle), and panel surface stability meant, which were addressed in the CARE Definitions.

Management Guidance

An important component of the CARE project was to produce intervention for use by land managers/owners, tenant farmers, and heritage managers of rock art, underpinned by the premise that responsible parties should avoid any interventions that could harm the panels. This management guidance provides effective and no or low-cost guidance on how to minimise or resolve particular risks; it is available at <https://rockartcare.ncl.ac.uk/#!/guidance>. Often the intervention is as simple as a change in management of the area inclusive of the rock art panel, while at other times solutions may require specialist advice and more detailed action(s). In terms of the former point, for example, advice given where the threat is either within 10 metres of, or actually on the panel includes removing animal feeders and drinkers (Figure 14), redirecting footpaths and farm tracks that crossover panels, and covering up signs of deturfing so as to discourage others following suit.

The CARE Management Guidance is underpinned by the sentiment expressed in the Historic England (2008, 47) Conservation Principles that, 'Ideally, proposed changes will cause no harm to any of the values of the place, and the right decision will be obvious.' In drawing up the guidance, we were mindful of well-intentioned management interventions that are likely to be inappropriate; for example, Bakkevig (2004, 67) has drawn attention to the removal of lichen with chemical agents, which has not only left unsightly 'large light spots on the rock' but are likely to be harmful to the panel. We, therefore, suggest not attempting any cleaning of the panels or the removal of lichen, moss, or algae without seeking advice from the local authority archaeologist or heritage officer. Natural vegetation coverage is encouraged. When possible, panels at high risk from humans and animals should be covered in consultation with local authority archaeologist or heritage officer.

The CARE Scorecard using a traffic light system allows different rock art panels to be scored consistently allowing universal results from which to make comparisons. This means landowners/managers are able to evaluate the panels for which they have a responsibility and prioritise the interventions required to keep them safe. We appreciate that not all panels can be safeguarded, so when interventions are not possible, and panels are identified as being at serious risk, then maximum recording of the panel should be performed. According to Andrew et al. (2000, 527), the latter approach known as 'preservation by record', 'demands that archaeological remains can be recorded prior to their destruction and the record preserved as an archive' although it is appreciated that it will always be a 'partial record' which 'can never 'stand in' for that which has been destroyed'. This is not an ideal situation given that various factors, which could be important to the interpretation of rock art may be lost. It is of some consolation, however, that the increased sophistication of recording methodologies during the last few decades (e.g. photogrammetry, laser scanning, and reflectance transformation imaging) have produced detailed recordings (e.g. Bryan and Chandler 2008; Díaz-Andreu et al. 2005; Duffy 2010). Nevertheless, it remains a challenge ensuring that extensive recordings using these technologies are futureproofed and accessible in the future (for an example of this approach see Janik 2014).

The only land use type currently identified at risk for a panel is that of the 'Active Military'; although, other uses may be introduced as a risk in the future. When a panel is located on land used for active military activities, it is recommended that the 'preservation by record' approach be followed and that they be documented to the highest standard to ensure that there is a record of their existence.

Furthermore, preservation by record is highly recommended (1) for any motifs that have been assigned a Stage 3 condition, meaning they are barely visible and are likely to disappear

sooner than motifs at other stages, and (2) when a panel is identified at a serious risk and intervention is not possible. To determine how such a record can be achieved best, we suggest the responsible party seek advice from the local authority archaeologist or heritage officer.

Many variables can come into play when prioritising management interventions, ranging, for example, from (1) the large number of panels that any one landowner/manager might have responsibility for managing, (2) the possible cost of intervention, and (3) to the understanding of a panel's uniqueness in comparison to other known panels. For this reason, the CARE Management Guidance encourages landowners/managers to avoid any interventions that could harm the panels without seeking advice from the local authority archaeologist or heritage officer. Moreover, prioritizing panel protection should be done in consultation with a local authority archaeologist or heritage officer, which is in line with HE's (2014) strong recommendation that 'owners and occupiers' contact their local heritage office 'at an early stage if [they]... are planning changes that might affect a scheduled site or monument.'

To assist with prioritising actions and specific interventions, each CARE Report identifies the risks associated with a given panel, where management solutions often can be grouped into current land use, direct human impact, direct animal impact, impact within 10 meters, and/or motif score. When the risk is related to 'Direct Human Impact on Panel', we recommend the following:

Cover up all signs of deturfing so as not to encourage others to follow suit. If possible, do not move a rock art panel during field clearance. However, if this is unavoidable consult with the local authority archaeologist or heritage officer. Do not use rock art panels as a base for stacking items cleared from fields. Do not remove graffiti on a panel without obtaining specialist advice as it might fade gradually without any conservation intervention. Remove any litter or extraneous material left on the panel. Ensure that ploughing or other fieldwork does not interfere with the panel. Ensure that the equipment used in vegetation clearance (e.g., strimming and mowing) does not have direct contact with the panel. Redirect any paths or tracks that cross over a panel as extensive walking and driving on a panel can lead to wear. Create firebreaks around panels at a sufficient distance when burning takes place.

When the risk is 'Direct Animal Impact on Panel', we suggest:

Remove all droppings from the panel; if required, this can be done with a soft brush. Do not use brushes with stiff bristles (plastic or wire) or metal tools. Where a panel is being damaged by animal activities (e.g., rubbing, scratching) or erosion it may be necessary to fence it off or create another form of protective barrier. In these instances seek advice from the local authority archaeologist or heritage officer as fencing off a panel can have advantages, however, it may lead to problems.

For 'Impact Within 10 Metres of Panel', we advise:

Where possible, remove the impact, e.g. animal feeders and drinkers, footpaths, road/track. Cover up signs of deturfing so as not to encourage others to follow suit. When a panel is in or adjacent to a ploughed/worked field make individuals who are working the land aware of the panel and ensure that equipment is kept at least 10 metres away from the panel. Monitor potential impact where trees and shrubs are

present. If trees and shrubs need to be removed it is essential that it is done carefully to ensure no damage is caused to the panel.

Discussion and Conclusion

It is widely recognised that the monitoring of open-air rock art is central to its safeguarding. However, as Darvill and Fernandes (2014, 1) note, the management of open-air panels generally has ‘received relatively little attention’. While Wright (2018, 912; but also see Agnew et al. 2015 and Marshall and Taçon 2014) states a dearth of resources for rock art conservation and management exists, with interventions being mostly reactionary rather than pre-emptive. According to Agnew et al. (2015, 30), ‘monitoring forms an important aspect of the strategies for the safeguarding of rock art’ to identify issues that may warrant management interventions. Hence, supporting the view expressed previously by Loubser (2001, 103) that frequent ‘monitoring does not necessarily imply intervention, but rather assessing signs of deterioration and the need for various degrees of intervention.’ The CARE project has responded to the challenges expressed by Agnew et al. (2015) and Loubser (2001) by creating a rigorous system that allows for the identification of threats levels at different panels, supported by the provision of a scorecard (Figure 7) and accompanying management guidance. These features are enhanced by the provision of a portal giving access to the monitoring reports by the necessary people and authorities. In addition, the monitoring data generated via CARE will create a baseline resource for assessing threat levels to open-air rock art in the UK and Ireland, which supports ERA’s (2018) understanding that the assessment of the decay in rock art and the threats it faces it ‘enables us to identify those carvings most at risk, and alerts us to where conservation and management resources should best be deployed’.

Numerous challenges continue to face open-air rock art despite efforts to promote their monitoring. Urging the authorities, especially heritage and management agencies, to make available more resources into their conservation and management is critical. This is complemented by the need to facilitate and encourage members of the public and landowners/managers to support the safeguarding of rock art. In the South African context, for example, Jopela (2010, 65) notes that ‘landowners of public rock art sites can play an important role in the monitoring process’ emphasising their ability to regularly visit to rock art places and recognise any significant changes to a site. The landowners/managers we interviewed for the CARE project showed a willingness to contribute to the process, however, as already mentioned, they consistently indicated the need for a financial incentive to support any monitoring and related actions they might take. This is an issue that requires addressing. Furthermore, while volunteers have been used effectively in recording rock art in the UK (e.g. Barnett 2010; Scotland’s Rock Art 2018; Sharpe 2014), this commitment to rock art has not been sufficiently harnessed to support the monitoring of rock art and requires addressing.

Agnew et al. (2015, 34) propose that ‘monitoring should be ... appropriate to the resources and skills of the people undertaking site monitoring activities.’ In this respect, the CARE project has revealed that with appropriate supplementary information members of the public are well suited to undertake monitoring without training and thereby to make a significant contribution to rock art conservation. In this way, the CARE Toolkit differs from the Rock Art Stability Index (RASI) developed in the USA as a ‘rapid, quantitative approach’ to rock art condition monitoring ‘for use by college students, volunteers and archaeologists, following a minimum amount of training’ (Cervený et al. 2016, 871). According to Cervený

et al. (2016, 871), the ‘minimum amount of training’ for their RASI based research at Petrified Forest National Park (USA) was a two-day training session.

Although McKinley et al. (2017, 18) acknowledge that scientific projects often do not lend themselves to citizen science, they, however, note that citizen science can in particular circumstances enhance data analysis. In particular, they (2017, 18) comment that ‘Volunteers with no specialized training (such as high school students) have performed as well as or better than highly trained scientists and state-of-the-art algorithms in certain analytical tasks, for example in “protein folding” to help scientists better understand proteins through the Foldit computer game’. As shown earlier, a high degree of uniformity exists among the CARE non-professional workshop participants in the completion of the CARE Toolkit, which provide confidence in the public’s ability to yield consistent results in the monitoring of rock art (Figures 11 and 12). This is supported by the provision of two images for each record, one directly of the panel and another of it in the surrounding landscape; these images will also enable independent verification of some of the criteria recorded without an *in situ* visit by a heritage specialist. These records, especially when completed for the first time, will yield baseline records of the current condition and risk with ‘which future evaluations can be compared in order to monitor decay processes through time and across weathering agents’ (Wright 2018, 913).

The CARE Toolkit supports Agnew et al.’s (2015) and Cerveny’s et al. (2016) recommendation that rock art monitoring should be easily repeatable. We suggest that this aspect of the CARE Toolkit will be enhanced by its conversion into a high-quality mobile app (Turner et al. 2018; Mazel and Giesen 2018). The app is a cost-effective means of carrying out broad scale, long-term monitoring of open-air rock art while fostering heritage stewardship among the members of the public completing the form. Moreover, it can facilitate Twohig and Williams’s (2014, 79) recommendation that ‘follow-up studies [should be] scheduled to assess the levels of deterioration.’ Promotion of the app is currently underway and will be reported in due course (Mazel et al. Forthcoming).

As indicated in the Introduction, the paucity of open-air rock art conservation and management in the UK and Ireland has been exacerbated by the current funding climate for the heritage agencies in these countries, which is unlikely to be rectified soon. Other mechanisms, therefore, need to be found to promote the safeguarding of this vulnerable resource. The CARE Toolkit provides an effective resource by which the management of the rock art can be advanced, particularly as it is a no cost, user-friendly tool for assessing condition and risk of open-air rock-art. It is not designed to replace detailed recording systems but allow quick retrieval of useful CARE data to allow immediate management interventions.

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