SANCTUARY

THE MINISTRY OF DEFENCE SUSTAINABILITY MAGAZINE

Number 45 **2016**

SENNYBRIDGE
Possibly the best waxcap-grassland in Europe

NEW SERVICE FAMILY ACCOMMODATION
Reveals henges and Anglo-Saxon graves

NORTHERN IRELAND
Partnering and collaborating to deliver successful environmental management

SANCTUARY THE MINISTRY OF DEFENCE SUSTAINABILITY MAGAZINE Number 45 2016

SANCTUARY

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Sanctuary is an annual publication about sustainable development in the Ministry of Defence (MOD) and the sustainable management of the natural and built assets across the Defence estate. It illustrates how the MOD is undertaking its responsibility for stewardship of the estate in the UK and overseas. It is designed for a wide audience, from the general public, to the people who work for us or volunteer as members of the MOD Conservation Groups.

Sanctuary is produced for the MOD by the Defence Infrastructure Organisation.

Sanctuary has been printed by the kind sponsorship of the Industry Partners below:

Welcome by **Julie Taylor**

Director General Head Office and Commissioning Services

I am delighted to have the opportunity to provide the welcome to this year's Sanctuary Magazine which illustrates the continuing commitment and innovation of the Ministry of Defence (MOD) with its partners to deliver meaningful and resilient outcomes for sustainability and conservation across the defence estate.

The Strategic Defence and Security Review 2015 reinforced our intent to ensure that we have the infrastructure and estate we need to support current and future military capability. 'A Better Defence Estate' announced in November detailed our vision of how we intend to achieve this via the Estate Optimisation Programme. This programme will bring a number of changes and challenges to the estate both in terms of investment and divestment but the breadth of expertise within MOD and our partner organisations to take up this challenge is amply demonstrated in the following pages.

It is striking that many of the features are narratives on the effective collaboration between MOD, Statutory Bodies, industry partners and non-governmental organisations. This is a reflection of our approach to the continued sustainable management of the estate with much of what we deliver done in partnership with others within a robust legislative and defence policy framework.

It is also good to see we are pursuing secondments such as the exchange between Natural England and the MOD and I hope to build on these foundations with similar arrangements in the future as well as realising opportunities under the Apprenticeship Scheme.

The Sanctuary awards winners and runner ups demonstrates the international, national, regional and local reach of defence and I offer my warmest congratulations to all of this year's winners especially the Silver Otter winner Bob Haycock. Bob in his role with the Countryside Council for Wales and his unstinting support and guidance to the Castlemartin Conservation Group, is a reflection of the many volunteers and stakeholders that belong to the 120+ conservation groups whose members give up their time and expertise to assist in the conservation of the defence estate.

Finally, thanks must go to all of the Sanctuary sponsors for their continued support and I hope you enjoy reading this latest edition of Sanctuary.

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Ministry of Defence

The MOD Sanctuary Awards began in 1991 when the Commandant of Otterburn Training Area donated a Silver Otter trophy to award to the best Conservation Group led project or best individual conservation effort on MOD land. This later developed into a host of awards that covered Heritage, Environmental, Sustainability and Individual. In 2010 to raise 'energy awareness' within MOD, the Energy Awards came into existence to recognise efforts made to reduce carbon and the amount MOD spends on energy.

The coveted Silver Otter © Crown

In 2014 these awards were combined into a single scheme – the MOD Sanctuary Awards, to reflect the increasing importance of the Government's wider Sustainable Development Agenda and MOD's commitment to this agenda.

The Sanctuary Awards which are open to all MOD personnel, Conservation Groups, Industry Partners and other Environmental Stakeholders. The Awards recognise both group and individual efforts shown through projects that benefit the MOD sustainable business agenda. The entry must relate to land, property, utilities or equipment design / use owned or occupied by MOD either in the UK or overseas, or which has a close connection to defence business.

The 2016 Sanctuary Awards were divided into five categories:

Individual Achievement
Energy Project
Sustainability Project
Heritage Project
Environmental Project

The winners of each category were considered for two further awards. The coveted Silver Otter is awarded to Conservation Groups or individuals, MOD personnel or MOD-led projects. The Sustainable Business Award is awarded to more commercial projects who have achieved a particular success in ensuring sustainable solutions that deliver against the commitment to the armed forces by enabling them to live, train and work.

Sustainable Business Award. This award represents the three elements of sustainability; Social, Environment and Economy whilst incorporating military activity on the DIO Training Estate. This is symbolised by three brass precision caps from a 30mm round fired from a scorpion armoured vehicle. The glass stands within a brick salvaged from Scraesdon Fort Antony Circa 1860 which represents sustainable buildings, infrastructure and longevity © Crown

The Sanctuary Award board would like to congratulate, on behalf of the MOD, the following winners and runners up for 2016.

For further information on how to enter the 2017 Sanctuary Awards please see page 99.

INDIVIDUAL ACHIEVEMENT AWARD **WINNER**

SILVER OTTER WINNER

Bob Haycock has been actively involved with the Pembrokeshire Ranges Conservation Group, covering Manorbier, Penally and Templeton ranges. His devotion and commitment to supporting the MOD in the conservation of these ecologically significant areas, and to Castlemartin in particular, being the largest and most ecologically significant, has been key to the management of these sites and in achieving a successful balance between the military training and species conservation requirements. At every opportunity he has given his time, skills and knowledge, promoting the work and enhancing the reputation of MOD and its commitment to conservation on its estate.

It is perhaps for his work with the enigmatic chough *Pyrrhocorax pyrrhocorax* that he is best known, and as a volunteer Bob has led the monitoring of these rare birds at Castlemartin for 33 years and furthermore has diligently researched historic records and archives yielding a dataset spanning the last 50 years. This is potentially the longest running dataset of its kind on the species. The data is of very high quality, all of which was collected at evenings and weekends and has enabled the designation of the Castlemartin Special Protection Area (SPA) for chough.

Bob initiated Annual Cliff Climbing liaison meetings, which has resulted in the evolution of fair, pragmatic, agreed seasonal restrictions whereby everyone can work together with a highly evolved voluntary code of conduct.

He was the principle contributor to the Natural Environment component of the Castemartin Integrated Rural Management Plan and makes the most of every opportunity to promote the reputation and raise awareness of the role of the MOD in managing the estate for conservation and how it successfully balances this with the requirement for training on a site with exceptional ecological value and a busy training schedule.

In 2008 Bob was awarded an MBE in recognition of his overall contribution to nature conservation in Pembrokeshire.

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Bob Haycock seabird monitoring © Annie Haycock

INDIVIDUAL ACHIEVEMENT AWARD **RUNNER UP**

Phillip Dawe led the project to restore 'Building 27' the original Sector Ops room at RAF Northolt. Dating back to 1936 it was of instrumental importance in developing the 'Dowding System' of air defence during the Battle of Britain. The building is therefore of significant historical importance – and without his mammoth individual contribution over the last nine years, it would have been irretrievably lost.

The restoration project started in 2007, when the building was due for demolition, and it was his determination that resulted in the building being Grade II listed. One of the biggest hurdles was funding this restoration but Phillip came up with an innovative idea of organised 'Night Photoshoots', where aviation enthusiasts from all over the country could attend evenings, which were supported by the unit, and photograph aircraft visiting RAF Northolt – this raised over £120,000 for the project.

As well as fund raising he was also project manager, investing over 28,000 man hours, and carrying out almost all of the research, planning and building work including resourcing much of the materials needed, such as light fittings, carpets, electrical conduit and floors from other MOD sites that were closing – making this a truly sustainable project.

This innovative project has inspired other RAF units to use the 'Night Photoshoots' as a method to generate funds, but the evenings also provide the local communities an insight into the work of the units. For RAF Northolt it has enhanced the Station and projects reputation.

Phillip Dawe © Phillip Dawe

ENERGY PROJECT AWARD **WINNER**

SUSTAINABLE BUSINESS AWARD WINNER

Landmarc Support Services Energy Project have targeted buildings across the training estate with the greatest heat losses and consumption of carbon intensive fuels.

Bodney, West Tofts and Beckingham camps have all been fitted with a number of measures, ranging from cleaner more efficient sources of heating and hot water, including air source heat pumps, to more efficient boilers and radiators and 'Tank in Tank' hot water systems.

In the process Landmarc also refurbished the buildings to improve their thermal envelope and upgraded them to include more efficient lighting, dual flush cisterns and time buttons for showers, to reduce overall energy and water requirements.

For example the new 'Tank in Tank' hot water systems have a 'jacket' of hot water (recovered from the heating system) circulating between them. This large surface area preheats the water entering the middle tank and takes just 45 minutes to heat a tank of water, whereas the previous single-element system took up to 10 hours.

The project has resulted in warmer, brighter, energy efficient accommodation © Landmarc Support Services

The project has improved insulation and lighting, resulting in warmer, brighter accommodation, which can be made ready for users much quicker than before. Feedback from visiting units has understandably been very positive.

The newly refurbished Nissen huts have been shown to numerous visitors to the camps, as an example of a successful collaborative project which meets the strategic aims and objectives of Landmarc, SD Training and the wider MOD. Landmarc has contributed to an overall reduction in energy consumption on the Training Estate, and in particular to a move away from carbon-intensive fuels.

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ENERGY PROJECT AWARD **RUNNER UP**

Merville Barracks Energy Consortium (MBEC) was created in late 2014 with membership drawn from the Defence Infrastructure (DIO) Private Finance Initiative (PFI) team, RMPA and Sodexo. MBEC created a Joint Energy Policy to identify 'Who, What, Why, When and How' the aims would be achieved. This is underpinned by an Energy Management System to provide guidance on activities and to monitor progress against energy efficiency targets.

Members of the consortium ensure that all staff new to Merville Barracks are fully briefed on energy use awareness and the meaningful contributions they can make to produce savings. Relevant items are put on standing orders, posters are displayed on notice boards in more than 100 buildings encouraging changes in behaviour; reminders are issued before periods of block leave to turn off electrical items; a 'Waste Less' week has been promoted, with a footfall of 1,000 personnel per day for five days invited to share energy saving tips and enter a quiz. MBEC have also targeted energy use in kitchens, messes and retail areas, and over 500 colleagues were engaged in the successful energy awareness and driving tips campaigns.

Merville Barracks is the first MOD and DIO establishment to receive the highly regarded ISO 50001 Certification, which is testament to the excellent collaborative approach and commitment by all parties.

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From left to right, Genise Hedell, Janet Cranfield and Gary Peaston © Crown

SUSTAINABILITY PROJECT AWARD **WINNER**

RAF Lossiemouth Sqn II(AC) HQ Typhoon Project Delivery Team had the task to design, contract, construct and deliver headquarters for a new Typhoon Squadron and in addition adapt and refurbish its cold war aircraft support facilities. All of which needed to be delivered sustainably to tight costs and time constraints on a complex site at pace.

The delivery team challenged the Assessment Study solution and despite initial resistance, put forward their own solution that they believed could be delivered faster, cheaper and more sustainably and which would produce a much higher quality outcome for the customer.

The new headquarters building provides 'state of the art' secure facilities required to plan and brief complex flying sorties. It also accommodates the Squadron's engineering and logistics facilities, the Survival Equipment Section which maintains all of the high tech equipment worn by Typhoon pilots during flight, executive and administrative offices and classroom.

Typhoon interceptor outside its new 'state of the art' squadron headquarters at RAF Lossiemouth © Crown

By working closely with Sqn II(AC) they refurbished nine Hardened Aircraft Shelters and the 'Feeder' industrial kitchen and canteen seven months early to assist the squadron in preparation to 'stand up'. The main squadron headquarters was also delivered a month early with a saving on the Tender Target Price in excess of £1m.

By 'stepping back' to look at essentially what they were being asked to do, the final outcome was a very low energy, robust, future proofed, climate resilient, customer focused building.

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SUSTAINABILITY PROJECT AWARD **RUNNER UP**

AWE Aldermaston has played a central role in defence of the UK for more than 65 years, providing the UK's nuclear warheads, including those for Trident, the current UK Continuous At Sea Deterrent.

Their capital project teams have embraced sustainable construction as being core to their way of working. In today's climate it has been vital for them to promote sustainability as a means to find innovative and cost-effective measures as part of their mandate to deliver enhanced value to the nation.

In the waste arena, this has seen the target for diversion of construction and demolition waste from landfill raised to 90%, in line with its corporate sustainability plan. In fact, in recent years, AWE has exceeded this target, achieving a 99% landfill diversion rate. The company has found that sustainable construction adds value in environmental, social and economic terms and these lessons have regularly been taken on to other projects outside AWE.

Re-use of waste concrete and subsoil has achieved significant savings © AWE

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HERITAGE PROJECT AWARD **WINNER**

Netheravon Barrow Rescue's aim was twofold; to save the archaeology badly disturbed by burrowing badgers and to remove Netheravon Barrow site from its 'Heritage At Risk' (HAR) status.

The group of mounds which overlook the River Avon have been on the HAR list since its inception due to the presence of a large badger sett. The discovery of 'crockery' was found on the monument's surface, adjacent to a freshly-opened badger entrance meant that the rescue became more pressing.

Wessex Archaeology's Phil Andrews with the Netheravon collared urn, a huge early Bronze Age vessel © Crown

Historic England specialists visited the site and undertook geophysical and topographic surveys of the monument. These showed that the damage was limited to the upper part of the mound. The sett was also monitored to see if it was still active and found it was not.

The excavation team, led by Wessex Archaeology's Jackie McKinley, Phil Andrews and Dave Murdie, and supported by the Bulford Conservation Group and participants from Operation Nightingale, discovered that the badgers had unearthed an important Early Bronze Age (EBA) cremation burial, with its 'crockery' identified as the best part of a complete Early Bronze Age collared urn, dating back over 4,000 years. Once the excavation was complete and the site back-filled, the barrow was covered in a protective wire mesh.

Assembling a disparate group of practitioners, comprising of volunteers, statutory bodies, heritage professionals and wounded service personnel was crucial, due to the variety of skills they could all bring, in enabling successful delivery of all aspects of the project. According to Wessex Archaeology, the Netheravon Barrow has yielded one of the most important EBA discoveries of recent years – alongside the Boscombe Bowman and Amesbury Archer. The site is no longer deemed to be 'Heritage At Risk' and will require minimal maintenance in future.

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HERITAGE PROJECT AWARD **RUNNER UP**

Discovering World War II MOD Boscombe Down was the project chosen by apprentice aircraft technicians at the QinetiQ Apprentice Training School as part of a new training initiative, which aims to instill a greater understanding of conservation, biodiversity and archaeology. This was the brainchild of QinetiQ's Bob Clarke, Boscombe Archaeologist and Emma Elton, co-director of Broad Town Archaeology (an organisation committed to introducing the community and especially young adults to their local and national heritage).

Boscombe Down has been operational since 1917 and holds structures from every phase of airfield architecture, including the Cold and post-cold war. However, the World War II footprint was poorly understood, so recording this historic period was a useful and timely exercise. Once the training sessions were complete, the research, recording and record production for each structure became the responsibility of the engineering students.

All activities were tasked against current archaeological legislation and best practice. The students have carried out earthwork surveys for all identified structures, applying new skills from their archaeology classes and reinforcing those they have learnt in aviation maths and science – often without realising it. World War I has, recently moved beyond living memory. Removing that tangible link between those who experienced the war and young people today. A similar situation is rapidly approaching in regard to World War II. This innovative project has given the students an important opportunity to learn a suite of transferable skills, such as problem solving, communication and observation and to experience their environment first hand.

The Apprentice Archaeology Team students © Crown

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ENVIRONMENTAL PROJECT AWARD **WINNER**

Environmental Protection Guidance (Maritime) EPG(M) was developed from the collaboration between seconded staff of the Navy Command Headquarters (NCHQ), UK Statutory Nature Conservation Bodies (SNCBs), and the United Kingdom Hydrographic Office (UKHO) with the aim to reduce the risk of Naval activities causing inadvertent impacts to the environment whilst maintaining a Commanding Officer's freedom of manoeuvre within and in the vicinity of designated Marine Protected Areas (MPAs) in UK, European and International waters.

This is the only system of its kind to identify Marine Protected Areas that require elevated protection from naval activities. Before EPG(M), operators had no simple way to identify MPAs nor did they have any method to translate military activities into environmental pressures and then consider these alongside various MPA sensitivities.

EPG(M) provides unambiguous and precautionary advice on a range of naval activities which is easy to use and understand. It is compatible with electronic charting systems but also available in other formats so that environmental considerations can be made at the earliest stage of planning not just at the navigation table. With support from UKHO, NCHQ has launched EPG(M) Version 3, geographically expanding the guidance to include European MPAs designated under European legislation (Natura 2000 sites) creating the first Maritime Environmental guidance for UK Military activities across Europe.

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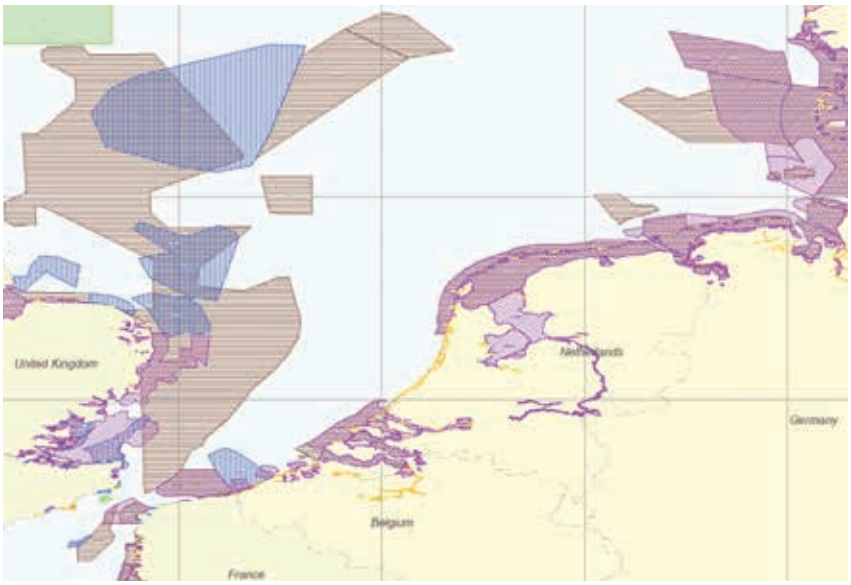

Visual example of EPG(M) © Crown

ENVIRONMENTAL PROJECT AWARD **RUNNER UP**

Akrotiri Environmental Education Centre (AEEC) is a MOD funded and operated facility within the Sovereign Base Area (SBA) next to Akrotiri village, adjacent to RAF Station Akrotiri. Its main objective is to promote the environmental value of the peninsula and other important areas within the SBA, through environmental education programmes, visitor facilities, research, seminars and other events.

The AEEC is directly involved with research and conservation around the peninsula including marine turtles, the greater flamingo, Eleonora's falcon, wetland restoration and rare and endangered plant species protection.

The Akrotiri Environmental Education Centre, Sovereign Base Area, Cyprus © Crown

Its design embraces many environmentally friendly building concepts including photovoltaic panels on the roof and the brown water effluent is used for the irrigation of its botanic garden. AEEC is innovative in many ways: as a concept, operationally, as well as for its purpose. The dome-shaped building is a landmark for Cyprus and its location was carefully selected to overlook Akrotiri Salt Lake. It was designed to encompass a wide range of sustainable features.

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Sennybridge Training Area possibly the best waxcap-grassland in Europe?

Splendid waxcap *Hygrocybe splendidissima* © Sam Bosanquet

A few fields on the Sennybridge Training Area, Wales, have for many years been known to be important for grassland fungi, with one particular area by the Disgwylfa Visitor Centre specially protected for this reason. To gain a better understanding of the extent of the fungi interest across the whole training area, the Countryside Council for Wales (now Natural Resources Wales) commissioned a survey* over the three years 2012-2014.

It is estimated that the training area supports 1500ha of grassland potentially suitable for grassland fungi and of this, 372ha were selected for survey, divided up into 46 separate sub-sites. Fungi-rich grassland, often referred to as waxcap-grassland, can be easily overlooked as the fungi are only visible when they produce their fruitbodies, so most survey work was undertaken in autumn when they are most abundant. The main target groups were waxcaps (very colourful fungi with a waxy feel), earthtongues (black or brown tongue-like species), clavarioids (another colourful group with club- or coral-like growth forms) and pink-gills (often drab, similar-looking species). The results were measured against nationally recognised scoring systems which allows for comparison of sites.

Comparison with other Welsh and UK sites indicates that Sennybridge is not only the best waxcap-grassland site in Wales, but it is also the best in the UK and possibly the best in Europe.

The results more than justified undertaking the survey. Comparison with other Welsh and UK sites indicates that Sennybridge is not only the best waxcap-grassland site in Wales, but it is

also the best in the UK and possibly the best in Europe. One of the sub-sites was so rich in species that on its own it is rated the 10th best in the UK.

Although some of the fungi recorded are widespread species, a good number are uncommon or rare. Of the species found, 20 are included on the Welsh Red List of threatened fungi, 26 species were new to the county of Breconshire and four species new to Wales. Species with a high biodiversity profile, such as dark-purple earthtongue *Geoglossum atropurpureum*, olive earthtongue *Microglossum olivaceum* and violet coral *Clavaria zollingeri* were also recorded. One of the pink-gills has not yet been matched to any known species in Europe and could be new to science. Bonus non-waxcap grassland fungi included contorted strangler *Squamanita contortipes* (a parasite of other fungi) which was thought to be extinct in Britain, having last been seen in 1950 and fen puffball *Bovista paludosa* which was found during an unrelated vegetation survey of a wet field and is new to Wales.

Key to the presence of such a diverse and important fungi assemblage is the long history of low-intensity agricultural management and absence of ploughing. In order to protect and nurture the interests, the survey report makes some recommendations for habitat management and the MOD have included these areas on their constraints map/sensitivity plan to help protect them.

Parts of the training area have yet to be surveyed and it seems very likely that the importance of Sennybridge could be greater still, potentially world-class.

Graham Motley
Senior Conservation Officer Usk Team
Natural Resources Wales

**Evans, S.E. & Roberts, P.J. (2015). Mycological Survey of Mynydd Epynt Ranges, Sennybridge, Powys. NRW Evidence Report No. 176.*

Crested coral *Clavulinopsis corniculata* © Graham Motley

Pink waxcap *Hygrocybe calyptriformis* © Graham Motley

Beige coral *Clavulinopsis umbrinella* © Graham Motley

Netheravon Camp, Salisbury Plain
Clawing back our heritage

Wessex Archaeology's Phil Andrews with the sensational result of a three-dimensional jigsaw puzzle, the Netheravon collared urn, a huge early Bronze Age vessel © Crown

The burial mounds of Wessex and, in particular, those close to Stonehenge have long been known to hold wonderful artefacts and deposits of the prehistoric past. Even where sites have been excavated in the past or where the mound has been ploughed away there is still the potential for finds of huge importance – the 'Amesbury Archer' and 'Boscombe Bowman' being recent cases in point. Often these burial mounds (sometimes called 'tumuli' or 'round barrows') are badly affected by the actions of burrowing animals – especially badgers. The disturbance caused by the powerful claws of these animals can lead to the monuments being included on the 'Heritage At Risk' (HAR) list of Historic England. The Ministry of Defence, in adhering to the Department of Culture Media and Sport (DCMS) protocol on care of the Government historic estate, has agreed to minimise the numbers of such monuments on this list.

One group of mounds overlooking the River Avon near Netheravon Camp on Salisbury Plain was on the HAR list from its inception – thanks to the presence of a major badger sett. This situation became particularly pressing following a site visit by Mr Tom Theed of Landmarc Support Services. Whilst checking on the work of contractors clearing scrub from the barrow, Tom was told that a certain amount of 'crockery' was present on the monument's surface, adjacent to a freshly-opened entrance to the badger sett within the mound. Tom immediately recognised that this 'crockery' was in fact archaeological – the best part of a complete Early Bronze Age collared urn, dating back over 4,000 years.

This was only the start of the recovery work however as it soon became apparent that the pottery was not the only material that the badger had brought to the surface. Discoveries included antler tools, a flint knife and other items including cremated human bone. These being recovered, a team was put together to plan how on earth they could recover any other items, conserve them, and protect the rest of the monument.

The first step was to have a close inspection of the area around the sett entrance to check for other items in the spoil from the sett. This immediately illustrated that the site had held a collection of national importance. In addition to the items found earlier – other wonderful things emerged. An archer's wristguard of the Beaker period (c2500BC), part of a bronze 'saw', and a beautiful bronze chisel still with its decorated bone handle being just three of the artefacts. Then it was essential to establish just how extensive the badger sett was and to consider the context which had yielded the finds. Historic England specialists visited the

An archer's wristguard and shaft straighteners from the Beaker period c2500BC © Crown

site and undertook geophysical and topographic surveys of the monument. These showed that perhaps the damage was really limited to the upper part of this 5m high mound.

Under License from Natural England, the site was monitored to see whether the badger sett was still active (it was not) and then Historic England and the Ministry of Justice gave their permission for a limited excavation of the site. This excavation team, led by Wessex Archaeology's Jackie McKinley, Phil Andrews and Dave Murdie, identified that the monument had been dug in part in the past but that this excavator had simply dug a large central hole – even discarding some prehistoric human bones in the process! The badger had uncovered an Early Bronze Age cremation burial, with the collared urn which contained the cremation being placed upside-down in the mound. A large portion of the urn was recovered and more antler, human bone and the other part of the bronze saw. The latter may well have been a re-worked bronze dagger.

A sherd from the Netheravon collared urn showing the claw marks from a badger © Crown

The team, which also included members of the Bulford Conservation Group and military participants on the Operation Nightingale recovery programme, completed their excavation in a week and then sent all the items off to join the collection undergoing conservation work with the specialists at Wiltshire Council. The conservator, Gabrielle Flexer, was faced with a three-dimensional jigsaw puzzle of huge complexity in putting the urn back together but the result was sensational. A huge Early Bronze Age vessel which will soon reside in the Wiltshire Heritage Museum in Devizes.

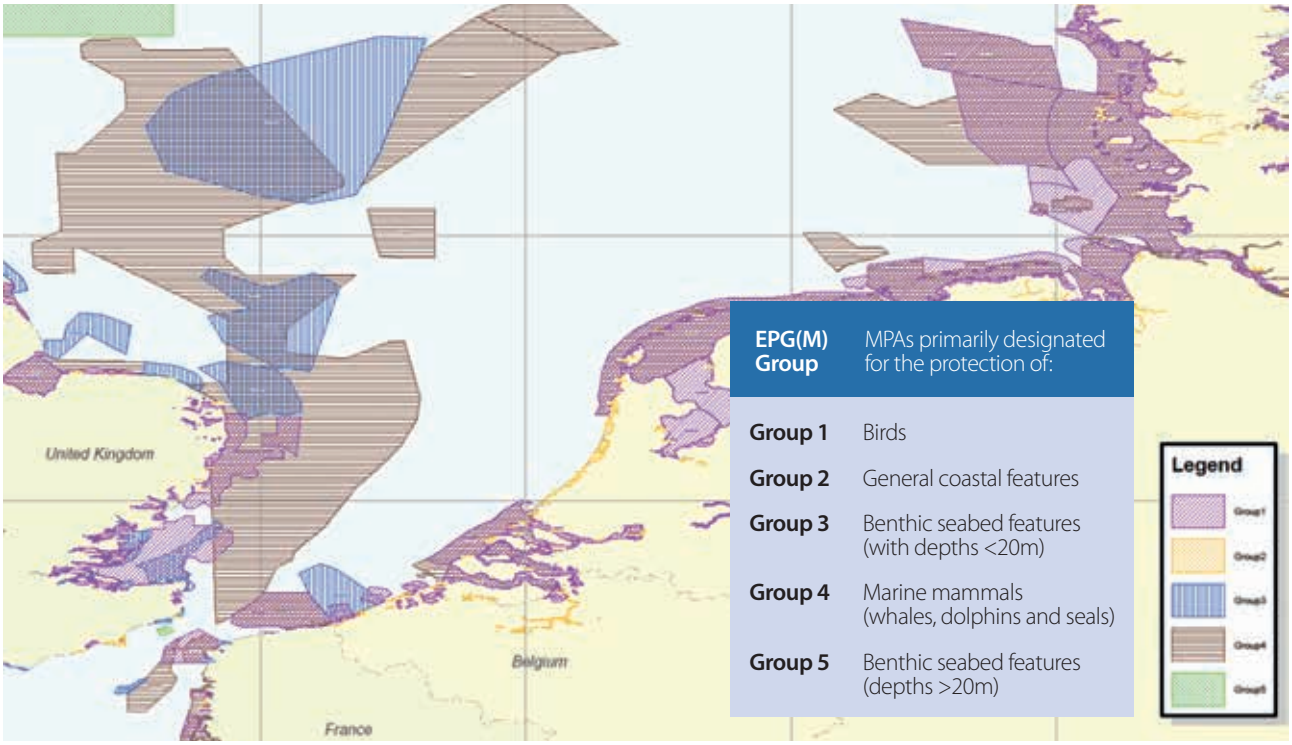
The artefacts all seem to have been with this urn and there is the possibility that this represents the finding of the panoply of a Beaker burial by people who came to place a cremation burial within the mound hundreds of years later; the Beaker grave goods being incorporated in the later collection of offerings. These items – of importance to rival those of the burials of Boscombe and Amesbury – really serve to illustrate that even when a site has been excavated in the past, there is still the potential for deposits of huge significance to be present. Deposits worthy of our protection.

So what then for this particular monument? Once the excavation was complete and the site back-filled, the barrow was covered in a protective wire mesh as the badgers had moved elsewhere – hopefully without an aspiration to carry out further archaeological fieldwork.

The monument has been removed from the 'At Risk' list and should now survive as a prominent feature on this most extraordinary of archaeological landscapes, safe from the claws of inquisitive animals.

Richard Osgood
Senior Archaeologist
Defence Infrastructure Organisation

Maritime Environmental Protection Guidance for Royal Navy operators at sea



Visual example of EPG(M) in PDF format © Crown

In recent years there has been an unprecedented rise in the number of Marine Protected Areas (MPAs) in UK, European and international waters. Correspondingly, this has increased the challenge for the MOD to continue to ensure that its military activities are sufficiently mitigated within or adjacent to designated MPAs. Of all the UK Front Line military Commands, Navy Command faces the biggest challenge of operating compliantly throughout the changing marine operational area. Back in 2009, this initiated positive action to assist ships' staff to understand and respond to these developments.

Together with the UK Statutory Nature Conservation Bodies (SNCBs), the United Kingdom Hydrographic Office (UKHO) and with invaluable input from a series of seconded members of staff, Navy Command Headquarters (NCHQ) established the Environmental Protection Guidelines (Maritime) (EPG(M)). This guidance aimed to reduce the risk of Naval activities causing inadvertent impacts to the environment whilst maintaining a Commanding Officer's freedom of manoeuvre within and in the vicinity of designated MPAs. In doing so it also reduced the risk to Royal Navy (RN) operations of 3rd party legal challenge on environmental grounds. In 2013 EPG(M) was sufficiently robust and resourced that NCHQ and all the UK SNCBs signed up to a Statement of Intent which committed all parties to ongoing collaboration to ensure that it remained relevant and readily utilised.

EPG(M) remains the only tool available for RN planners and operators to rapidly identify designated MPAs and access specific military guidance to mitigate their activities. The continued development of EPG(M) relies on close external collaboration between NCHQ staff, SNCBs and the UKHO. Regular up to date Additional Military Layers (AML) are produced for display and analysis within a variety of RN systems including the WECDIS (Warship Electronic Chart Display and Information System). Interactive PDFs are also generated from this data for advanced shore based planning activities.

There are many different types of MPAs around the world with widely diverse features being protected and differing conservation objectives. Even within the UK the current 281 MPAs have been created under different legislation most

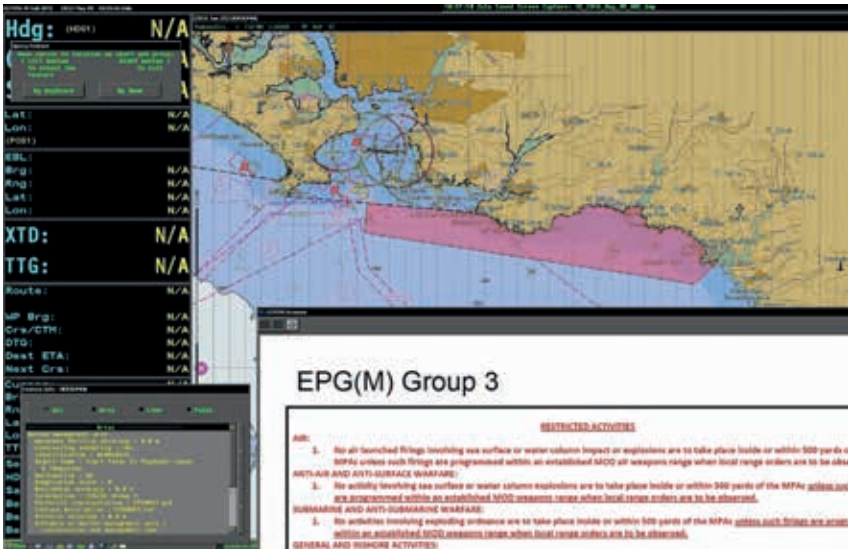
Vertical launch Seawolf © Crown

of which is devolved across four UK parliaments. These processes have led to a raft of information and advice available from several external sources but none give much advice on the conduct of military activity. The challenge facing NC was therefore to assimilate this diffuse information and transform it into concise guidance suitable for those considering or conducting maritime operations.

Within EPG(M), UK, European and certain MPAs beyond national jurisdiction have been divided into five groups (see table below), each group providing RN operators and planners with specific guidance on their activities when operating within or in the vicinity of MPAs.

Pink sea fan *Eunicella verrucosa* © Delphine Coates

Each group within this guidance contains a list of restricted activities, activities where enhanced control measures are required and permitted activities. The guidance is intentionally precautionary, building on existing RN standard operating procedures and when followed, negates the need for further consideration of environmental impacts by operators. Within Group 3 and 5 for example, anchoring and mine laying activities are two of several restricted activities which should not take place within 0.5nm of the MPA. Group 4 of EPG(M) contains mitigation measures in and around MPAs with marine mammal interests such as the recently proposed harbour porpoise *Phocoena phocoena* Special Areas of Conservation and various other areas designated for the protection of the bottlenose dolphin *Tursiops truncatus*, grey seal *Halichoerus grypus* and harbour seal *Phoca vitulina*. In these



WECDIS Navigational chart illustrating the Special Area of Conservation 'Start Point to Plymouth Sound and Eddystone' with EPG(M) Group 3 Guidance (red shaded area) © Crown

sites it is recommended that live munitions or explosive ordnance are not used. The MPA boundary information from Group 4 is also fed directly into the RN's sonar risk assessment tool (S2117), ensuring an efficient use of data to support effective mitigation for marine mammal species is in place.

Harbour seal *Phoca vitulina*. One of the Natura 2000 protected species © Jo Crewsdon

Since its inception, EPG(M) has been developed to assist RN operators with daily operations as well as during the planning and execution of large-scale exercises such as the bi-annual, multi-national, Tier 3 Exercise Joint Warrior (JW). In close collaboration with Joint Tactical Exercise Planning Staff, an Environmental Assessment is carried out for every JW Exercise utilising NC's Maritime Environmental and Sustainability Assessment Tool (MESAT). These assessments take the guidance within EPG(M) as the baseline for mitigation across the whole range of JW maritime activity. The planned exercise activities are assessed in relation to the MPAs in the area, ensuring the correct mitigation is in place. If the generic guidance within EPG(M) is found to be so precautionary that it prevents achievement of JW training objectives, more specific mitigation can be devised for sensitive marine areas. After external consultation with the relevant SNCBs an Environmental Statement is subsequently distributed internally to participants and externally to other Government departments, Regulators and SNCBs. QHM Clydes Exercise JW public website also carries the Environmental Statement allowing local residents and other interested parties to see what activity is planned and which mitigation is in place during JW to safeguard the environment.

With support from UKHO, NCHQ has launched EPG(M) Version 3, geographically expanding the guidance to include European MPAs designated under European legislation (Natura 2000 sites) creating the first Maritime Environmental guidance for UK Military activities across Europe.

Dr Delphine Coates and Rod Jones
Maritime Environmental
Protection Advisers
CESO (Royal Navy)

Kevin Rigg
AML Technical Support
United Kingdom Hydrographic Office

Army Basing Programme
From Masterplanning to Planning approval

Unimproved chalk grassland at the Larkhill SFA development site © Crown

The Army Basing Programme (ABP) is one of the MOD's biggest current Capital investments; in total, MOD will be investing approximately £1bn across Salisbury Plain. The ABP arose from the 2010 Strategic Defence and Security Review and 'Army 2020' Plan, requiring the return of troops from Germany and a reconfiguration of the Army. As detailed in Sanctuary No.43 (2014), 917 new Service Family Accommodation (SFA) homes are planned at Larkhill, Bulford and Ludgershall, with 322 additional SFA now being built at Tidworth. Over 2,500 Single-living units and extensive technical infrastructure are also planned across the Salisbury Plain garrisons.

The majority of Salisbury Plain Training Area (SPTA) forms the largest expanse of chalk grassland in NW Europe and is designated a Site of Special Scientific Interest (SSSI), a Special Area of Conservation (SAC) and a Special Protection Area (SPA). The River Avon and its tributaries form the largest chalk river system in England. Many stretches are designated as SSSI/SAC, including sections of the Rivers Avon, Bourne, Till and Wylye which flow through or close to SPTA. These chalk stream habitats rely heavily for their base flow on the principal aquifer underlying the area. SPTA is also rich in heritage, lying adjacent to Stonehenge and Avebury World Heritage Site.

The Overarching Environmental Appraisal (OEA), which was written to inform the 2014 Salisbury Plain Masterplan, identified the following strategic environmental challenges that would need to be resolved before the ABP infrastructure could be developed:

- The direct loss of non-SSSI neutral and calcareous grassland to development
- The potential impacts of groundwork on buried archaeology
- The visual impact of new development on the setting of heritage assets
- The potential for increased disturbance to stone curlew *Burhinus oedicnemus* (an SPA species) from increased recreational access
- The impacts on the already poor condition of the River Avon SAC from increased abstraction and sewage discharge
- The potential for the construction phase to disturb unknown contamination or unexploded ordnance, pollute the aquifer and/or cause disturbance to the community.

MOD Army Basing Salisbury Plain representatives joined Wiltshire Council to sign the Section 106 agreement for 917 new Service Family Accommodation homes on Salisbury Plain © Crown

The increase in military training will not significantly impact on SPTA, since the existing sustainable training thresholds and measures implemented following the 2004 Strategic Defence Review will still apply.

The Masterplanning approach itself was found to be generally successful in screening out sites that were unacceptably environmentally constrained and/or were otherwise unsuitable for development. However, as you will read later in the feature, constraints can only be factored into the decision-making process if they are known about at the time.

The extent of the environmental constraints to development on Salisbury Plain (particularly for housing) was such that it was necessary to develop a range of binding Masterplan environmental commitments. These commitments encompass a range of measures that will be taken to mitigate both the strategic and the site-specific impacts identified in the OEA. By adopting these Commitments, the Defence Infrastructure Organisation (DIO) was able to positively determine the Plan-level Habitats Regulations Assessment (HRA) and obtain statutory approval for the Masterplan.

After the Masterplan was formally recognised by Wiltshire Council in July 2014, DIO worked closely with its supply chains and Regulators to find practical ways of implementing the Commitments on the ground, given that they would be imposed as Planning conditions on individual developments. The thorniest challenge was finding workable and cost-effective ways to mitigate the impacts of ABP development on the European protected features of SPTA and the River Avon; in particular stone curlew disturbance and the need to develop a more sustainable way of managing water resources.

A stone curlew (an SPA species) © Crown

The remaining challenges were finally resolved in Spring this year, allowing Wiltshire Council to positively determine the project-level Habitats Regulations Assessments, grant Planning consents and agree its largest ever Section 106 agreement with MOD.

Going forward, the Commitments will be delivered through Section 106 and/or specific Planning Conditions, with progress being monitored through two Regulatory Steering Groups. The benefits of both Masterplanning and on-going engagement with industry, Local Authorities, the public and Regulators remain very clear – not least in the amount of enduring goodwill from all sides and the strong working relationships that have been developed, which together are helping deliver the military output.

The following four articles detail the progress that DIO and its Industry Partners have made towards implementing the Commitments since Wiltshire Council recognised the Masterplan in July 2014. Firstly, they detail how the strategic challenges of water resources, nutrient enrichment and direct habitat loss are being addressed; secondly, they show how best practice in archaeological investigation and sustainable waste management is being delivered for individual SFA and garrison developments.

Dr Sue Jordan
Senior Environmental Manager
Defence Infrastructure Organisation

Salisbury Plain
Biodiversity Offsetting Plan

Degraded chalk grassland habitat at Furze Hill offsetting site, Tidworth © Crown

The focus of ABP development will be on MOD land on and around Salisbury Plain Training Area (SPTA) which is an area of outstanding ecological importance. In accordance with best practice DIO and its partners developed the ABP projects following the standard mitigation hierarchy which prioritises the avoidance and reduction of environmental impact.

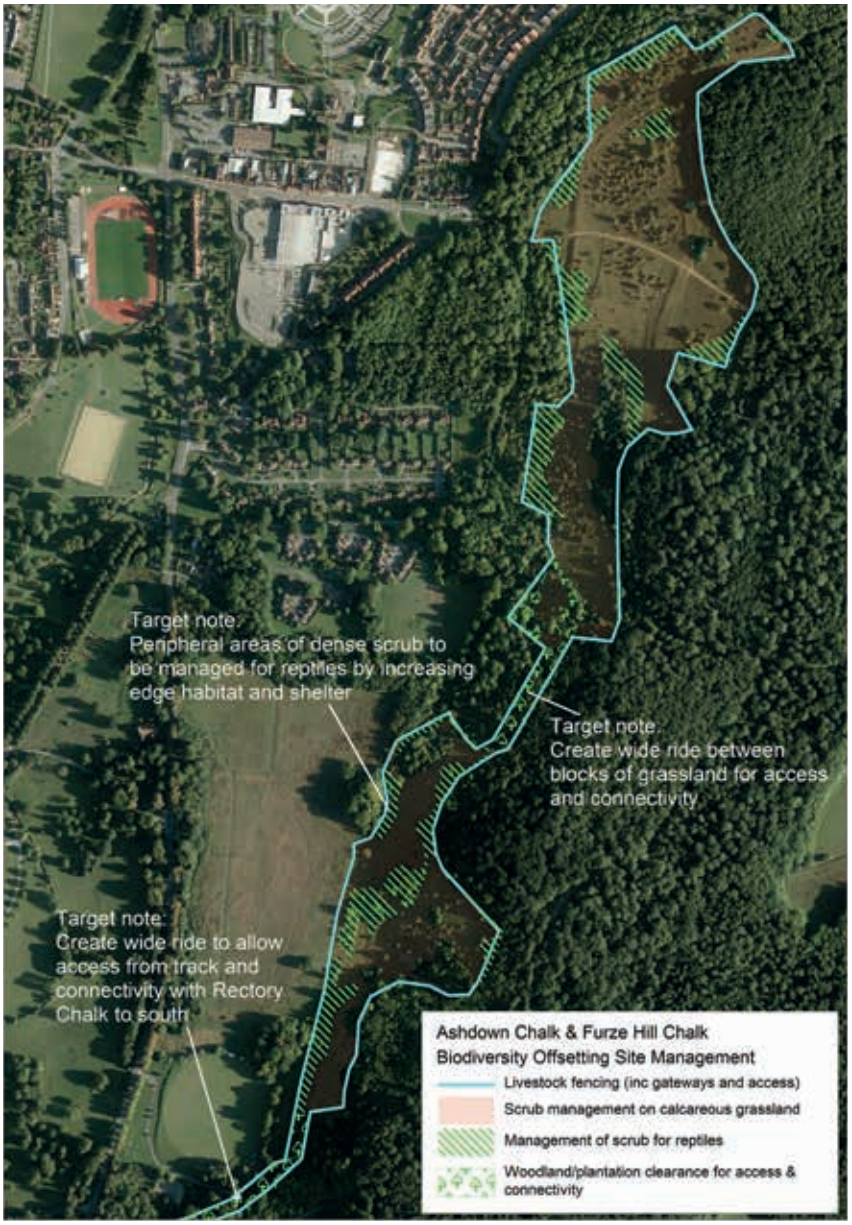
However, due to other site constraints, the ABP developments will still result in the loss of 8.91ha of semi-improved grassland and 28.02ha of lowland calcareous grassland (a priority habitat) across Salisbury Plain. All of these losses occur outside Salisbury Plain SSSI/SAC/SPA. The main losses will occur at Larkhill Camp and SFA development; however additional smaller areas will be impacted at Bulford Camp, Perham Down and Tidworth Garrison.

To meet Wiltshire Council's Planning requirements for the developments, DIO agreed with the County Ecologist that the use of a Biodiversity Offsetting approach would be more achievable and give greater biodiversity benefit across SPTA than compensating for lost habitat within the footprint of each individual development.

Defra's Business and Biodiversity Offsets Programme (BBOP) defines offsetting as: *'Measurable conservation outcomes resulting from actions designed to compensate for significant residual adverse biodiversity impacts arising from project development, and persisting after appropriate prevention and mitigation measures have been implemented'.*

Biodiversity offsets are distinguished from other forms of ecological compensation by the requirement for measurable outcomes – the losses resulting from the development and the gains achieved through an offset are measured in the same way.

The measurement is expressed in 'biodiversity units', which are the product of each area's size and the distinctiveness and condition of the habitat it comprises. Offsetting therefore delivers a quantifiable amount of biodiversity benefit to effectively offset the loss of biodiversity resulting from a development.
WYG and Black Sheep Countryside Management were engaged to assess the habitat losses from ABP using the Defra guidance, and prepared options to offset these losses across the wider Training Area. Wiltshire Council was consulted throughout the process to ensure that the outputs met Planning requirements.



Ashdown Chalk and Furze Hill Chalk Biodiversity Offsetting Site Management Plan © Crown

Firstly, condition assessments were undertaken on the sites being lost to development, in line with the Farm Environment Plan handbook. These concluded that a total of 309 offsetting credits would be needed. An assessment of potential offsetting sites across SPTA and their current condition was then undertaken in conjunction with DIO, using the same methodology. Habitats within candidate offsetting sites were then assessed for their offsetting credit potential, considering the technical difficulty of restoring the target habitat, the amount of potential condition improvement, how long it would take to deliver the habitat improvements and the practicability of delivering long-term sustainable management on each site. From this, 403 potential offsetting credits were identified across SPTA. The final offsetting sites were then chosen, and a costed capital works programme to deliver the biodiversity credits was agreed. Work will typically involve scrub clearance and rotational management, plantation removal, the re-introduction of grazing and over-seeding where required.

The use of biodiversity offsetting will greatly enhance a substantial area of existing valuable (but currently degraded) habitat across SPTA, whilst enabling ABP developments to take place. In addition, the scheme should generate a surplus of offsetting credits, providing some flexibility for the works themselves and also allowing DIO to develop a 'biodiversity bank' for offsetting future schemes beyond ABP.

Management works are planned to start in Autumn 2016. Progress will be monitored through the long-standing regulatory Salisbury Plain Environmental Steering Group, to ensure that the goals are delivered in line with Statutory Planning and Section 106 requirements.

CASE STUDY
Furze Hill and Ashdown Chalk

Furze Hill and Ashdown Chalk are two County Wildlife Sites lying above Tidworth. They consist of an extensive mosaic of scrub and calcareous grassland, separated by an area of early successional woodland. These areas were identified as being suitable for offsetting, since restoration of the existing degraded calcareous grassland habitat should be relatively rapid and uncomplicated. Improving the grassland habitat at these sites is estimated to provide a potential 79 offsetting credits. Initial management will focus on scrub and self-sown tree clearance; further areas of scrub will continue to be controlled through an existing management programme which will enhance conditions for reptiles by creating glades and 'scallops' into dense scrub, providing sheltered areas and edge habitat.

A wide ride will also be created between Ashdown Chalk and Furze Hill to improve connectivity between two otherwise isolated areas of chalk grassland. Long term management will be achieved through the introduction of livestock grazing, which will naturally control scrub development. This will require appropriate fencing, so DIO is working with the Training Area management team to make sure that it does not affect military training.

Chris Meddins
WYG

Simon Smart
Black Sheep Countryside Management

Henges and Anglo-Saxon graves new service family accommodation, Bulford

Aerial photograph showing the two ring ditch complexes (right) and the graves of the Saxon cemetery (left) © WYG/Wessex Archaeology

Putting new houses in a field with known archaeology might be considered risky, but teamwork at Bulford has shown how this need not be the case.

Troops returning to Salisbury Plain will require new homes, including 227 at Bulford. As part of the 2014 Masterplanning process, archaeological desk-top studies looked at all sites short-listed for the SFA. At Bulford, two circular features, believed to be the remains of prehistoric burial mounds were identified on air photographs. Their presence suggested a higher potential for other remains to be present, because reuse of ancient sites is common, for instance, prehistoric barrows are known to become the focus for later burials, particularly in the Saxon period.

Once the Bulford site was chosen, WYG were engaged as consultants to deliver the planning permission, with archaeological heritage identified as a 'project risk'. WYG developed an evaluation strategy with Wiltshire Council designed to identify remains, understand and consider their significance in line with Government planning policy, and indicate the amount of archaeology to be dealt with.

The results would inform further mitigation, so that archaeology didn't cause delays and that valuable information was not lost. Clearly, the sooner information could be incorporated into plans, the better. Wessex Archaeology undertook a geophysical survey followed by trial trenching. Meanwhile, the WYG designers included the ring ditches in the green space between the housing, preserving them and saving excavation costs.

Trial trenching revealed a range of archaeological remains across the site, from prehistory to the present day. The modern remains included a dump of used World War I horseshoes, which may be evidence of Army horses being re-shod before transport to the Front from Bulford station. There was also unexploded ordnance from the use of the site as an anti-tank range during World War II.

An Anglo-Saxon cemetery of 150 graves was identified on the crest of the hill and close to the ring ditches, which in turn turned out not to be as straightforward as first thought. Instead of the two circular ditches that the air

The careful excavation of the cowrie shell, the workbox with their Saxon owner © WYG/Wessex Archaeology

photographs and geophysics suggested, excavation revealed more complex remains. Both had a solid circular ditch each surrounding areas already enclosed by earlier ditches. These earlier ditches were segmented – dug in distinct sections, giving the appearance of a string of sausages – and characteristic of Neolithic henges and causewayed enclosures. These earlier ditches have an opening towards the north, looking over the Nine Mile River and towards the Stonehenge landscape.

Excavation provided more evidence of their age and importance, including Neolithic Grooved Ware pottery from around 2600BC. Other discoveries included worked flints and a wolf/dog skull, though it cannot be said whether it was domesticated or a wild animal. The later Bronze Age ditches (circa 2200-1800BC) may indicate a 'closing' of the henges, or a change of religious practice, like the changes seen in English churches during the Reformation. Whatever else, the paired henges seem to be incredibly rare, if not unique and their preservation in situ, with protection designed into the final development means they will remain a feature of the site, probably with Historic England protection, which WYG is negotiating.

A series of Neolithic pits were found close to the henges. They included Woodlands-style pottery, stone and flint axes, a disc-shaped flint knife, a chalk bowl, and the bones of red deer, roe deer and aurochs (wild cattle). These pits were being dug and filled around 2800BC, (slightly earlier than the henges), showing continuity of human activity in this special place.

One of the Neolithic pits, showing the density of material typical in these deposits © WYG/Wessex Archaeology

The Saxon cemetery was located under planned houses, so complete excavation was agreed with Wiltshire Council. The burials appeared broadly Christian, lacking the 'glitzy' grave goods of earlier pagan Saxon cemeteries, though there were some personal items present. One of the burials was radiocarbon dated to AD 660-780 – the mid-Anglo-Saxon period in England. This date fits with intriguing objects buried with one woman and a child: both were buried with cowry shells from the eastern Mediterranean or beyond, that were presumably brought to Wessex by pilgrims or imported with silks or spices. These shells are found in female burials of this era and may relate to childbirth or fertility. The woman was also buried with a copper alloy container, sometimes called a 'workbox.' These are also principally found with women and many have a cruciform design on the lid and/or base, suggesting a Christian origin. Their function remains unknown, but they may be amulets or containers for holy relics; burial with both cowry shell and workbox may demonstrate piety or even pilgrimage.

The archaeological work that uncovered these remains was undertaken as part of the normal planning process, and demonstrates how development can help us understand our past. Early consideration of archaeology and a forward-thinking attitude by DIO means these important discoveries have not caused delays or unnecessary costs. The most significant archaeology will be preserved and all the remains are recorded and they can tell us more about Bulford and Wiltshire while adding interest and roots to the new homes.

Martin Brown
WYG

Simon Cleggett
Wessex Archaeology

Salisbury Plain water commitments
A partnership between Kelda and DIO

The River Avon near Netheravon, Wiltshire © Crown

Kelda Water Services Defence provides water services to MOD under the Aquatrine contract, which is predicated on effective stewardship of MOD water resources. Since the contract commenced in 2003, Salisbury Plain has consistently presented a unique utility management challenge. Kelda services most of the camps on the west and central areas of Salisbury Plain and some existing Single Family Accommodation (SFA) from eight (currently unlicensed) boreholes. It also manages two sewage treatment works (STW), associated soakaways and miles of buried pipework. Veolia Water supplies Tidworth, Ludgershall and Perham Down from three licensed abstractions and also manages most waste water in the area. The major chalk aquifer feeding both the River Avon SAC and local MOD water supplies is under pressure from the cumulative effects of abstraction and nutrient enrichment; consequently, river flows and water quality are significantly lower than the SAC Conservation Objective targets.

Currently, MOD abstractions are not statutorily licensed; it is known that these abstractions, in combination with other non-MOD abstractions, can adversely affect low flows in the SAC. MOD abstractions are due to become Statutorily-licenced by the Environment Agency by around 2020; however, to obtain positive Habitat Regulation Assessment (HRA) determinations and Planning approval for Army Basing Programme (ABP) development, Kelda and DIO needed to find a way of accommodating the increase in military population under the ABP without adversely impacting either the SAC or the associated ponds at Bulford supporting great crested newts *Triturus cristatus*.

To address these strategic water issues, originally identified in the Overarching Environmental Appraisal, Kelda and DIO (with consultants WSP) developed an Integrated Water Management Strategy (IWMS) for Salisbury Plain. Its purpose, which was agreed at the outset with the Regulators, is to assess the structure and resilience of the current military supply and waste water system, determine its ability to manage future flood risks, climate change impact and ABP uplift, and detail how ABP's impacts on the water environment would then be mitigated.

The Environment Agency/Wessex Water's Wessex Basin Groundwater Model was updated to quantify the impact of existing MOD abstractions on

One of the ephemeral pools supporting great crested newts along the Nine Mile River © Iain Perkins

river flows, before being used to assess the impacts of additional ABP water demand and of closing Larkhill STW surface soakaway, which supports groundwater levels in the surrounding area. This modelling identified that ABP-related abstraction and discharge would have an unacceptable impact on low flows in some parts of the river system if not mitigated for effectively.

The Regulatory requirement that ABP development must not adversely affect existing flows in the SAC and Site of Special Scientific Interest led to a range of mitigation measures being developed and agreed with the Environment Agency and Natural England. These include a programme of work with Aspire to reduce leakage and improve water efficiency on a number of the Garrisons; installing enhanced flow monitoring across the supply network to identify where water is being lost; installing groundwater and pond-level monitors along the Nine Mile River to better understand how the two interact, helping to improve habitat management measures for great crested newts; using licensed Veolia/ Wessex Water supplies for the new SFA developments; reducing local MOD abstractions in water-critical locations and making up the shortfall by installing supplementary Wessex Water supplies into Larkhill and Bulford camps, the latter from a new two-mile main installed underneath the A303.

ABP will also increase the discharge of sewage. Flows from Larkhill are currently handled at Kelda's Larkhill STW, which discharges to a surface soakaway which naturally removes most of the phosphorus (P) from the effluent. However, the STW lies alongside the Stonehenge Cursus so cannot be expanded. Following an options assessment, it was concluded that Larkhill STW should be closed and flows diverted to Wessex Water's Ratfyn STW, which discharges directly into the River Avon. Added to increased discharges from Bulford, this would increase the phosphorus input into the river, even though the phosphate stripping facility at Ratfyn STW already reduces concentrations to around 0.6 mg P/litre, and the additional flows could be accommodated within Wessex Water's existing Environmental Permit. The increase was of particular Regulatory concern, as stretches of the Avon already fail the SAC conservation targets for phosphorus. The River Avon Nutrient Management Plan, which was published part-way through the Planning negotiations, effectively now requires that any major new developments discharging additional flows into the river will now need to effectively address the impacts of the additional phosphorus burden.

Kelda and DIO worked in partnership with Natural England, the Environment Agency and Wessex Water to explore possible options. The agreed solution, detailed in the IWMS's Phosphorus Action Plan, is based around the principle of Offsetting, whereby direct phosphorus inputs from the STW are reduced by an equivalent amount from diffuse sources elsewhere in the catchment. In order to implement this, DIO is funding a Catchment Sensitive Farming Officer (CSFO) until 2021 to support existing Natural England catchment management projects on the River Avon. The CSFO will work with DIO, Kelda and farmers on the MOD Estate and in the wider catchment to identify and pursue opportunities to reduce diffuse nutrient inputs from farms, buildings and tracks. If sufficient progress towards offsetting (as agreed with Natural England) is not achieved within two years, further land management measures on SPTA will be investigated.

Going forward, the Regulatory environment is likely to change, so the IWMS will be a 'living' document, with progress against the water resource and nutrient targets remaining under review. Further groundwater modelling will be used to inform future iterations of the IWMS and to quantify the impacts of existing MOD abstractions on river flows as part of forthcoming statutory abstraction licencing negotiations. MOD's phosphorus discharges will be checked periodically to make sure the offsetting requirements reflect the magnitude of the actual phosphorus uplift from ABP development; if enhanced phosphorus removal technologies are adopted on Wessex Water's STWs along the Avon after 2020, the targets will be reviewed.

With the IWMS being formally updated every five years, Kelda and DIO will continue to work in partnership with all of Salisbury Plain's stakeholder groups to ensure that effective stewardship of the water environment is maintained both during, and after, Army Basing has been delivered.

Matt McConville
Kelda Water Services Defence

Dr Sue Jordan
Senior Environmental Manager
Defence Infrastructure Organisation

Safe and sustainable demolition at Corunna Barracks, Ludgershall

View of the site from a drone used for building © ADSL

Aspire Defence Services Limited (ADSL) supplies Total Facilities Management for Project Allenby/Connaught, a 35 year contract and largest infrastructure PFI ever let by the MOD, covering four Army garrisons on Salisbury Plain and in Aldershot.

ADSL has been commissioned as part of the Army Basing Programme to demolish buildings at Corunna Barracks, to be replaced by 230 Service family homes and a primary school.

Corunna, on the edge of Salisbury Plain, is a complex site used since before World War II as a railhead, vehicle maintenance depot, industrial site and, prior to D-Day, a US Army base. ADSL's challenge was to demolish asbestos-clad buildings across this 50 acre site in a residential area close to Wellington Academy and a main road. ADSL set out to accomplish this in line with the MOD's commitment to sustainable development in a safe, environmentally responsible manner, minimising waste and disruption.

Firstly, the project team built a relationship with the local community, giving presentations to the community and Town Council, and giving residents a helpdesk number for reporting concerns. With nearly 850 11-18 year old pupils, Wellington Academy generates a lot of traffic and the team agreed to restrict site vehicle movements on the main road at the start and end of the school day.

On site, buildings were individually risk assessed for hazardous materials and were dismantled piece by piece. Along with the acoustic mats fitted to site hoardings, this helped to minimise noise. The procedure also kept dust to a minimum, evidenced by the reports from dust monitoring systems installed by the team. Walkways segregated asbestos removal from demolition to prevent cross contamination and the 4 'Cs' were applied by all subcontractors in a weekly foreman's meeting where Communication, Cooperation, Collaboration and Coordination allowed them to jointly tackle the most challenging aspects of the project.

A highlight was a visit by Year 11 construction students from Wellington Academy for presentations about the project and the removal of hazardous materials. Serve On, a disaster response charity, also visited on a cold wet day in February to train in a mock earthquake scenario and their team were delighted with the opportunity to work in such a realistic environment.

ADSL has now demolished 31 buildings, one of these containing a large bee colony which specialists relocated to local woodland. Recovered timbers have been sent for biofuels and furniture manufacture, and metals have been recycled. Brick, concrete and tarmac have been crushed for engineering fill, and so far over 450 loads of certified crushed concrete have been re-used locally.

Serve On search team and dog © ADSL

Less than 5% of the 2,500 tonnes of mixed building waste has gone to landfill and the ADSL team believe that this has been their greatest achievement.

Julie Tite
Communications Manager

Nick Kirwin
Environmental Manager
Aspire Defence Services Limited

MOD and Ulster Wildlife
A partnership for nature

Magilligan small eggar larval web © Crown

October 2016 sees the beginning of an exciting new partnership between Ulster Wildlife and MOD. The two organisations will be working together to build on the good work carried out in the last eight years to implement management schemes at Ballykinler and Magilligan – two of the most important sites for wildlife in Northern Ireland.

This new partnership sees the employment of a part-time Conservation Officer based with Ulster Wildlife and jointly funded by Defence Infrastructure Organisation (DIO) and the Northern Ireland Environment Agency. Ulster Wildlife is the largest local nature conservation NGO in Northern Ireland and is part of the Royal Society of Wildlife Trusts, the umbrella body for the 47 Wildlife Trust's across the UK. Ulster Wildlife manages 18 nature reserves across the Province, covering a broad range of habitats and species, as well as several landscape-scale, education and marine-based projects.

The newly appointed Conservation Officer, Adam Mantell, will be carrying out a wide variety of tasks to help deliver the conservation objectives for both sites in parallel with military training requirements. The project includes a review of existing site management plans, the implementation of scrub management plans, supervision of contractors and graziers, as well as liaison with the MOD Conservation Groups and other stakeholders. This will include raising awareness amongst the military user about the special interest at these sites and the statutory responsibilities that come with training and operating across an Area of Special Scientific Interest.

Given the high status of both sites from a nature conservation perspective a proportion of the role will also include vegetation and species monitoring. Ballykinler, in Co. Down, is known for having one of the largest common seal-outs in Northern Ireland – the colony here will be monitored as well as surveys for other key species such as the rare marsh fritillary butterfly. In Co. Londonderry, the MOD training facility covers most of Magilligan Special Area of Conservation – this area is especially noted for its humid dune slacks that include an array of rare flowers, such as petalwort, and is home to main UK populations of small eggar and scarce crimson and gold moth.

Ulster Wildlife's CEO Jennifer Fulton says of the partnership: *"We are delighted to be working closely with MOD on the conservation of these two very important areas. Ballykinler and Magilligan are of two of NI's most special sites for nature and we look forward to delivering a productive and positive programme of action on both sites over the coming months."*

Richard Brooks (DIO Principal Environmental Advisor) said: *"As a public body MOD takes its responsibilities towards managing ASSIs very seriously. Collaborating with Ulster Wildlife is a great way of achieving our objectives for these sites and I'm particularly excited about improving engagement with the military user to explain why these two sites are so important and what that means for MOD".*

Dawn Miskelly
Operations Director
Ulster Wildlife

Ulster Wildlife's view on conservation on the Northern Ireland Estate

Large flocks of sanderling *Calidris alba* can be found at Magilligan and Ballykinler © Derek Charles

Ballykinler and Magilligan Training Centres form the most important parts of the two major sand dune systems in Northern Ireland. These two army camps lie at opposite ends of the province – they have many similarities but sometimes the differences in habitats and wildlife can be striking.

Both of these sites are Special Areas of Conservation (SAC) and as such rate amongst the best sites for nature conservation in Northern Ireland. For instance, the sand dunes at Magilligan are characterised by wet dune slacks – some of the best examples of these in the UK are found here. By contrast the dunes at Ballykinler are dry dune heath – rarer even than dune slacks! Both sites are stunning in terms of their floral diversity – Magilligan has creeping willow, grass-of-parnassuss and pyramidal orchids whereas Ballykinler has the nationally rare shepherd's cress and is carpeted by wildflowers throughout the summer.

Both sites are important for declining bird species such as skylark, linnet, meadow pipit and cuckoo – these are all species that have become alarmingly scarce in the wider countryside. Small flocks of sanderling can be found scattered around the Northern Irish coast – is it just coincidence that the largest flock (over 500 birds) can be found at Magilligan and the second largest (not far behind the Magilligan total) spends most of its time on Ballykinler beach?

Ballykinler also offers the best chance to view the largest common scoter flock in Northern Ireland – during winter several thousand of these black ducks congregate a few hundred metres from the shore. With a bit of patience (and luck) there's always the chance to see a rare visitor from the other side of the Atlantic amongst this flock – the surf scoter.

Butterflies such as the rare marsh fritillary can be found at Ballykinler while the dark green fritillary can be

A military exercise on the Magilligan dunes © Crown

The seal colony at Ballykinler one of the best 'haul-outs' for common seal in Northern Ireland © Antony Canniford

found zooming around both sites. Other uncommon or declining species include small heath, small copper and common blue – over the course of a summer you can see most of the butterfly species in Northern Ireland at these two sites!

Magilligan is one of the only sites in the British Isles for scarce crimson and gold moth (this species is now extinct in GB so the importance of the colony at Magilligan can't be overstated).

Additionally, Magilligan is also home to the largest colony of small eggar moth in the UK – a species that has almost disappeared from mainland Britain. Whereas, Ballykinler offers one of the only sites in Northern Ireland for the sand dart moth – hundreds of species of moth have been recorded at this site.

There is a simple logic to why these two sites are amongst the best conservation areas in the UK – humans only enter these sites as a necessity, as part of their job. By and large (apart from the odd loud bang or bright light) wildlife is left to its own devices. This is in stark reflection to similar sites nearby, which battle with high levels of disturbance and visitor pressure – at these protected MOD sites, in common with many others across the UK, wildlife not only survives but literally thrives.

A classic example of this is the seal colony at Ballykinler – one of the best 'haul-outs' for common seal in Northern Ireland (as well as good numbers of grey seal). Despite Ballykinler being a focus for military activity for over 100 years the seals draw their line in the sand here rather than suffer the publicly accessible beach nearby – the very existence of Ballykinler camp allows a much-needed compromise between man and nature.

It isn't all rosy though and both sites suffer from similar ailments – the introduction of Myxomatosis in the 1950s has left a legacy of too few rabbits to properly combat the scrubby plants and rough grasses, to mitigate against this grazing with conservation cattle has been introduced at both sites. Sea buckthorn is found along the shore at both these sand dune systems – some people try to make room for this spiky horror with talk of the benefits to wintering birds and the high in vitamin C content of the berries. Forget it! This plant is a curse that devours Irish sand dunes – thankfully major removal works have been carried out by MOD in recent years, with still more to come to control and prevent its spread.

Marsh helleborine *Epipactis palustris* © Crown

Some people like machines and weaponry others like birds and moths – happily there's room for everybody at Ballykinler and Magilligan. Maj Tony Canniford and DIO ecologist Olly Howells from the MOD have made a real effort to involve local naturalists and conservation NGO's (such as Ulster Wildlife, Butterfly Conservation and the Ulster Museum) in wildlife recording and conservation management. Developing on this the MOD and Ulster Wildlife are to appoint a Conservation Officer for Ballykinler and Magilligan to deliver upon the conservation goals and commitments that the MOD and the Northern Ireland Environment Agency have for both SAC sites.

Andy Crory
Nature Reserves Manager
Northern Ireland

Energy improvements on the MOD Training Estate

The project has resulted in warmer, brighter, energy efficient accommodation © Landmarc Support Services

Driven by the Greening Government Commitment targets and the strategic objectives set out in Act & Evolve: Sustainable MOD Strategy 2015-2025, Landmarc Support Services and the Defence Infrastructure Organisation (DIO) have implemented new energy efficiency upgrade projects at three camps in the East Region of the Defence training estate, helping to save cost and increase energy resilience for the future.

A collaborative approach was taken by the team to understand energy consumption across the Estate, coupled with a piece of first hand research on effective renewable energy sources and the optimisation of existing sources. The aim was to use the energy hierarchy to reduce carbon emissions, while still reducing running costs and increasing service value.

In order to achieve the maximum impact, the project began by targeting buildings that were found to have the greatest heat losses and consumption of carbon intensive fuels. Across Bodney, West Tofts and Beckingham Camps 83 accommodation and ablution buildings were identified and fitted with a number of measures, ranging from cleaner, more efficient sources of heating and hot water, including air source heat pumps, to more efficient boilers and radiators, and 'tank-in-tank' hot water systems.

A stripped out Nissen hut before refurbishment © Landmarc Support Services

The buildings were also refurbished to improve their thermal envelope and upgraded to include more energy efficient lighting, an automated urinal flushing system, dual flush cisterns, percussion taps and timer buttons for showers, to reduce overall energy and water requirements.

Further innovative controls were fitted to each building that allow temperatures of 18.5ºc to be maintained when occupied, or 12ºc background heat when unoccupied. A simple red/green light on the outside of each accommodation block indicates whether the heating system is on or off. This enables the Landmarc Facilities Management Team to override programmes and 'turn on' blocks which are booked for visiting units on arrival, and turn them off upon departure. A new Utilities Management Service receives meter readings for electricity, gas and bulk fuels (such as LPG and heating oil), offering a 'view' of sites' consumption, comparing expected energy consumption and targets for reduction.

After refurbishment © Landmarc Support Services

The calculated savings for these most recent projects are 40,363kWh per year per building, giving a payback of around 7.5 years for the investment. For the 83 buildings across the three camps, this gives a total saving of approximately 3,230,000kWh per year – the equivalent to around £296,000 per year in LPG costs.

Landmarc now plans to develop bespoke solutions for each of the sites across the Estate, tailored to their individual energy demands, helping the MOD well on its way to significant carbon reductions by its 2025 commitment deadline.

Camilla Timms
Sustainability Adviser
Landmarc Support Services

Castlemartin choughs are in a safe pair of hands

The craggy cliff dwelling chough © David Kjear

The chough *Pyrrhocorax pyrrhocorax* is a bird of legend and the rarest member of the crow family in the UK which is identified by its distinctive red bill and legs. In Pembrokeshire it nests on the rugged sea cliffs of the county including the limestone cliffs of the Castlemartin range, and the outlying Pembrokeshire islands; this represents approximately 44% of the UK breeding population. Historically, their decline was thought to have been from egg collectors, possible disturbance from rock climbers and also a change in the land use; cliff top grazing is now rare, so there are fewer invertebrates associated with grazing animals to feed on, plus the natural process of scrub invasion into this habitat has led to its loss.

The MOD, through the Pembrokeshire Ranges Conservation Group, covering Castlemartin, Manorbier and Penally ranges are fortunate to have a real chough 'ambassador' in Bob Haycock, a long serving member and it is perhaps for his work with the enigmatic chough that he is best known.

Bob has led the monitoring of these rare birds at Castlemartin for 33 years from a position working for Wales' statutory nature conservation bodies and furthermore has diligently researched historic records and archives yielding a dataset spanning the last 50 years. This is potentially the longest running dataset of its kind on the species and enabled the designation of the Castlemartin Special Protection Area (SPA) for chough.

He also initiated the annual cliff climbing liaison meetings, which has resulted in the evolution of fair, pragmatic, agreed seasonal restrictions whereby everyone can work together with a highly evolved voluntary code of conduct.

As a volunteer Bob has been dedicated to supporting the MOD in the conservation of these ecologically significant areas and to Castlemartin in particular, and has been key to the management of the MOD sites and in achieving a successful balance between the military training and species conservation requirements. He was the principle contributor to the Natural Environment component of the Castlemartin Integrated Rural Management Plan and at every opportunity he has spent his time, knowledge and expertise, promoting Castlemartin and with it the reputation and awareness of the role of the MOD in managing the estate for conservation and successfully balancing this with the requirement for training on a site with exceptional ecological value and a busy training schedule.

Bob in his element © Annie Haycock

In 2008 Bob was awarded an MBE in recognition of his overall contribution to nature conservation in Pembrokeshire and the Sanctuary team wish to take this opportunity to congratulate Bob for winning the Silver Otter Award 2016.

Iain Perkins
Sanctuary Editor
Defence Infrastructure Organisation

RAF Lossiemouth delivery of new Typhoon Squadron headquarters

Typhoon Squadron II(AC) at RAF Lossiemouth (SDWG) © Crown

The Typhoon Squadron II(AC) new HQ and its support facilities recently handed over at RAF Lossiemouth illustrates challenges and fundamental issues that a Defence Infrastructure Organisation (DIO) project team need to address to deliver a truly sustainable outcome for the MOD.

DIO needed to meet an extremely tight RAF timeline, to design, contract and deliver a Typhoon Sqn HQ to fully meet MOD standards on sustainability. A non-standard delivery contract had to be selected to meet this timeline and this contract was directly run by the DIO, the contractor and its designers with no outside Preferred Service Provider inputs i.e. consultants.

After reviewing the Assessment Study (A/S) proposal, this 'Combined Project Delivery Team' looked at the customer requirements, coupled with the build ability of the A/S proposal and found there was a serious disconnect. The site identified had fundamental usability issues, high construction costs and massive negative sustainability issues. As an experienced design and construction team they might mitigate all these issues to a degree, but they chose instead to confront the problem head on and would attempt to move the location and design out the problems.

It is fair to state that the team was met with resistance when challenging the perceived and accepted solution they were expected to deliver. This was not easy. For one thing they needed to show they could relocate slightly a proposed adjacent project, the aircraft control tower, without detriment to its views of the runways. This involved being able to find a weather window (in January, in the North of Scotland) to go up a 25m mobile hydraulic platform to be able to take the photographs necessary to prove this.

However, by producing a number of detailed comprehensive briefing papers in response to concerns, the team managed, in less than two months, to have the case for change for the Sqn II(AC) build location accepted and this promoted a much more sustainable solution. The sustainable benefits that flowed from these efforts were:

- Eliminating the need to excavate, transport and dispose of approx 10,000 tons of soil to landfill
- Avoiding the demolition, relocation and rebuilding of the 'Feeder' industrial kitchen and canteen
- Avoiding having to re-provide a very large concrete aircraft hardstanding area on 'a green field site'
- Re-use of existing roads
- In choosing to locate the new build on a redundant, services clear cir.1938 hangar slab, they avoided having to divert and re-provide major services and CIS hub. It also gave a clean hard standing to the

The new 'state of the art' headquarters building © Crown

contractor for his site compound and they used part of it for the base of the new squadron car park avoiding its pending demolition to landfill.

- Delivery of the main build to the customer three months earlier, which most importantly allowed the customer (RAF) full operational access to the Hardened Aircraft Shelters (HAS) refurbished site facilities over a year earlier

- Estimated savings of £3.77m when compared to the original A/S solution

The new headquarters building provides 'state of the art' secure facilities required to plan and brief complex flying sorties. It also accommodates the Squadron's engineering and logistics facilities, the Survival Equipment Section which maintains all of the high tech equipment worn by Typhoon pilots during flight, executive and administrative offices and classroom facilities.

Officer Commanding II(AC) Squadron, Wing Commander Roger Elliott MA BEng RAF said: *"I cannot thank enough all those who were involved in the design, development and delivery of the Squadron's new headquarters building. I am delighted to take possession of the new building, and all of the renovated associated infrastructure around the southern HAS site at RAF Lossiemouth."*

By working closely with Sqn II(AC) they had already refurbished nine HAS and the 'Feeder' seven months early to assist the Squadron in preparation to stand up. The main Sqn HQ was also delivered a month early with a saving on the Tender Target Price in excess of £1m.

One of the nine refurbished Hardened Aircraft Shelters © Crown

Delivering Sustainability/Climate Resilient gains in the actual building itself should not be about throwing money at the issues to gain DREAM points. If the team is focused to deliver a sustainable solution from the start rather than trying to retrofit to a standard building design then the cost delta can be relatively minimal.

The team did achieve a DREAM Excellent for the Sqn HQ building – uprating drainage, uprated gutters, higher set floor levels, air source heating coupled with internal energy movement systems to keep energy costs to an absolute minimum. Full LED lighting (payback 4.25 years, £36,793 savings over five years), overhang shading and robust high rated construction including window fixings to resist the worst expected results of climate change etc. They also reused 2,000 tons of Type 1 (coarse gravel) from an adjacent MOD project where it was to be taken to landfill, as a piling mat and then when finished with it gave it to the local Royal Engineers for their training and construction tasks which avoided any disposals off site at all – certainly a worthwhile sustainability gain.

In reviewing the completion of this project, the Combined Project Delivery Team's view was that the 'real deep sustainability gain' was made by 'stepping back' to look at fundamentally what they were being asked to do.

The original solution was challenged and despite the quite understandable resistance of a decision already made and approved, reasoned arguments were built until the case for change became overwhelming. Finally the original decision was overruled and a truly sustainable solution was agreed, which was delivered at pace.

Jim Ellistone
Senior Project Manager
Defence Infrastructure Organisation

Gower Peninsular dealing with a potentially explosive World War II legacy

Ordnance recovered this year; 17 and 25 pound projectiles, 40mm projectiles and 3" mortars © Crown

The Loughor Estuary and Whiteford Sands; an area with beautiful coastal views and a tranquil area of peace, lies on the northern edge of the Gower Peninsular in South Wales, with sandy beaches, sand dunes, salt marshes and river estuary. But this stunning area has a darker side, a deadly World War II legacy that is still being dealt with today. The former artillery range at Penclawdd was in active use for just four years between 1942 and 1946. Now a variety of branches of the MOD work together along with a number of external stakeholders to manage the risk from unexploded ordnance that remain in the area. DIO's Explosive Ordnance Clearance team (DIO EOC), based at MOD Corsham, are the MOD's project manager for the regular clearance of ordnance from the former range. The team works with the Royal Navy Southern Diving Unit (SDU1), 33 Engineer Regiment (EOD) EOC Group and Dstl to manage this complex legacy issue. They also liaise with the local stakeholders such as landowners, cockling firms, the National Trust and emergency services.

But this stunning area has a darker side, a deadly WWII legacy that is still being dealt with today

Much of the area is now owned by the National Trust and enjoyed by the general public for walking, bird watching and horse riding. It is an internationally important location for wading birds and other wildfowl with SSSI, SAC and other protections across the site. It is also an important part of the local economy, being used for the wild grazing of cattle, ponies and sheep, and for a thriving cockle and shellfish industry.

Prior to WWII it is believed that the only range with facilities for 'sand firings' (where the 'unfuzed' projectile could be recovered intact for examination) took place at the Proof & Experimental Establishment (P&EE) Shoeburyness. The outbreak of WWII, and the vulnerability of having just one test range, resulted in Penclawdd being developed as a second 'sand range', opening in 1942.

Penclawdd is believed to have been developed mainly for the proofing of conventional artillery munitions. The range headquarters was built at Salthouse Point, including the magazines built to house the projectiles, barracks, workshops, a laboratory, inspection buildings and three of the gun batteries. Three further gun batteries were located around the estuary within two and a half miles of the Salthouse Point. A number of these buildings are still present today.

The future of Penclawdd Range came under discussion in 1944, between the Ministry of Supply (MOS) and the War Office, with the general view that Penclawdd should be retained as a long term munition proof facility. However, it would appear that Penclawdd Range

Demolition of high explosive and phosphorous shells on the estuary at Llanrhidian Sands © Crown

ceased activities around September 1946. The powers of requisition, however were retained by MOD until December 1960.

Around 1953, the MOS sought to reopen part of the former range for proofing of 20 and 25 pounder guns. Opposition was raised by both the South Wales Sea Fisheries Committee and other community organisations, mainly due to the impact on the local thriving cockle industry. They also highlighted the dangers from unexploded shells to both the public and cockle pickers, describing how a cockle picker's horse had been killed after it initiated an unexploded shell and how in 1952 a man and boy were killed on the Loughor Estuary after handling an unexploded shell.

When the range closed, a series of clearance operations were undertaken by P&EE Pendine between 1946 and 1962 to remove legacy items of ordnance, both inert and blinds (live ordnance that has been fired but failed to function), normally uncovered by the tides or exposed due to the constantly changing topography.

In 1962, approximately 1,000 shells were exposed on Whiteford Sands at an extreme low tide, believed to have been dumped when the range was closed. The beach was shut to the public during the clearance works, which took a number of months. It was at this point that the Royal Navy took the lead role for the clearance, supported by the other services as required, as they are the Service responsible for ordnance found below the high water mark. Periodic inspections by the Royal Navy and Dstl followed this initial clearance.

In 2001, the Royal Navy requested the forerunner of DIO EOC to assist them and Dstl with the clearance works by carrying out large scale geophysical surveys of Whiteford Sands. This allows the whole site to be surveyed with areas of highest risk targeted during the clearance, namely the surface and shallow targets, which are more likely to be triggered by the general public. Visual clearance is also carried out. Since 2009, the Army's 33 Engineer Regiment (EOD) EOC Group have carried out six weeks clearance annually in the sand dunes at Whiteford Burrows with Dstl, clearing the footpaths and open areas. Due to the sensitive ecology of the area all work is carried out under an 'assent'; an approval to disturb the ground issued by Natural Resources Wales. Since 2014, the clearance work completed by the Royal Navy and Dstl has included Loughor Estuary.

The work carried out on Whiteford Sands in the last 15 years has greatly reduced the number of ordnance finds and there have been no recent emergency callouts to the site. The combined efforts of the RN, Army, DIO and Dstl have culminated in a highly efficient and targeted risk based approach to clearance activities within this complex and ever-changing environment. These clearance activities remain on-going today, some 70 years after the range formally closed.

Paul Burden and Keri Thomas
Explosive Ordnance Clearance
Defence Infrastructure Organisation

Just a small selection of ordnance removed from the site © Crown

Horsea Lake, Portsmouth Will the moon jellyfish cope with future warming?

Horsea Lake at HMS Excellent, Portsmouth © Danja Hoehn

Horsea Island lake, at HMS Excellent a Royal Navy 'stone frigate' (shore establishment) sited on Whale Island near Portsmouth in Hampshire, is a man-made body of semi-saline water, formerly a Torpedo testing range pre World War I, and used by the military for over 130 years. Currently it is used for Royal Naval Diver training, including bomb disposal and mine clearance plus underwater cutting and burning training. There is also a training facility for Sea Survival techniques. Universities at both Portsmouth and Southampton are encouraged to promote the site for students to do MSC's and PhD's.

Thousands of small-disc shaped jellyfish, the moon jellyfish *Aurelia aurita*, are visible throughout the year in Horsea Lake. The bloom forming jellyfish *A. aurita* is widespread in coastal and estuarine areas in north-west Europe. *A. aurita* belongs to the group known as true Cnidaria, which also includes corals and anemones, all related because they contain stinging cells. However, the moon jellyfish does not sting humans. So one does not need to be afraid of this transparent jelly-like creature, the 'Pysgod wibli wobli' as the Welsh call it.

Jellyfish comprise of a 'dimorphic' life cycle, an ability to change from a free-swimming medusa to a polyp that lives attached to the seabed.

The small (1mm in diameter) sessile polyp lives attached to the seafloor, similar to sea anemones, and bears the scientific name scyphistoma. Jellyfish are made of a special tissue called mesoglea that contains structural filaments and amoeboid cells but mainly consists of water (95%), hence its jelly-like consistency.

Scyphistoma utilise their tentacles that are located around the 'mouth opening' to capture and feed on zooplankton (small organisms living in the water column).

However, where polyp colonies grow is still widely unknown, making population studies in their natural environment a difficult task. As a result, our knowledge of polyps' ecology and reproductive behaviour is still relatively poor. Reproduction by the polyp occurs asexually (a bit like cloning), with new polyps (buds) as well as mini jellyfish (ephyrae) produced during different times in the year.

It is the star shaped ephyra that have been observed in coastal waters in the past, and used as a proxy for determining the recruitment of new medusa.

It is a fact that every spring polyp colonies release millions of mini jellyfish into the water column that will, in time, grow into large medusae and form large blooms in our oceans. Therefore, there is an urgent need to study polyps' natural behaviour. These blooms can be harmless, but occasionally cause problems for fisheries, tourism and power plants (clogging cooling pipes of nuclear reactors).

Warmer waters associated with global warming could stimulate a greater reproduction of new jellyfish from the polyp population living in our oceans. Jellyfish are able to adapt quickly to changing conditions – and when waters are warmer and food is plentiful their abundance can increase suddenly.

Scientists have recorded and monitored jellyfish numbers over time on a global scale. Recorded data show that jellyfish numbers oscillate and have been influenced by changing sea temperatures, food abundance and climate cycles.

Adult jellyfish in Horsea Lake. Medusae can be found all year round in the lake © Nick Owen

Human-induced climate change has been identified as one of the main causes for increasing numbers and extent of jellyfish blooms. We see an increase in jellyfish abundance in some polluted and eutrophicated (high nutrient) areas including the Sea of Japan (giant jellyfish) and the Mediterranean Sea (mauve stinger).

The brackish water of Horsea Lake provides a unique environment of special scientific interest, being fully enclosed from the sea, as it provides an easy environment in which to study jellyfish population without the complicating factor of tides and currents moving the population around.

The medusa population abundance, which has been studied in the 1990s and 2000s, varies uncommonly over a season. *A. aurita* medusae are present all year round, unlike other temperate populations where medusae have a short life-span of less than six months. Furthermore, ephyrae appearance is unusually prolonged in Horsea Lake and extends for seven months following December.

The polyp population within the shallow water lake has not been studied before, and is now investigated as part of the authors PhD thesis at the University of Southampton. The scientific divers from the University of Southampton discovered polyp populations in the lake and collected underwater photographs over a ten-month period.

Pictures were taken on metal structures such as a boat, metal ladders and a landing bridge, that were colonised by *A. aurita* scyphistoma.

Macro-photographs of polyp patches (some might appear indistinguishable as a blur) revealed a range of sizes within the population, indicating new recruits during October. Furthermore, polyps releasing ephyrae were observed for the first time in December indicating the start of the strobilation period. This period of strobilation might continue for seven months, but the reason for an unusually long time of strobilation is still unknown.

Aurelia aurita polyp population in Horsea Lake © Matt Doggett

The geography of Horsea Lake restricts jellyfish movement, including migration and exchange of food supply creating a unique environment. There is no natural predator known to be present within the lake that could reduce the jellyfish population size. Therefore, jellyfish abundance and the timing of asexual reproduction are mainly dependent on environmental parameters and their variation across the season.

Temperature is one of the main factors that influence organism's behaviour and reproductive success. Annual water temperature data will be related to the density of the patches observed and their reproductive activity. The main interest will be to find out the magnitude of strobilation and the budding activity at different times during a year. This study will help to understand the role of polyps in bloom formation of the common jellyfish *Aurelia aurita.*

Acknowledgements The author would like to thank the scientific divers of the University of Southampton (Nick Owen, Linn Baldock, Matt Doggett, Nathan Hubot, Jane Maddocks) for their contribution to the project. Without their passion and determination this study would not have been possible. Special thanks go to Ken Collins, the dive officer, and his wife Jenny Mallinson for organising and supervising each dive activity. Many thanks also go to Ian Mackfall for providing access to the site. Also, many thanks to supervisors Cathy Lucas and Sven Thatje for their supervisory support.

Danja Hoehn
University of Southampton
National Oceanography Centre

Cyprus SBAA designates five Special Areas of Conservation

Some of the best examples of 'Cyprus Forest' in the lowlands occur in the Special Areas of Conservation © Crown

On the 30th December 2015 the Cyprus Sovereign Base Areas Administration (SBAA) designated five sites as Special Areas of Conservation (SAC) to reflect the European Habitats Directive. This has been done to mirror MOD policy and the treaty agreed with the Republic of Cyprus to ensure the state laws are similar to those of the British administration areas.

These SACs have been designated after several years of scientific research and wide consultation with local communities. The Special Protection Areas (SPA) for birds were designated earlier (2010) demonstrating that it is easier to collect and collate data on birds. The data required to designate SACs is more complex to collect, requiring much more survey information. Equally the habitats and species occurring on the expanding edges of the EU have not been clearly defined in existing guidance. Cyprus has species of plants not occurring elsewhere in Europe but more akin to the Middle-East or are endemics to Cyprus e.g. Cyprus bee orchid.

> More than 900 plant species have been recorded within the Bases representing almost 50% of the total species recorded in Cyprus... many of the species are rare, in particular 35 endangered plants...

A total area of just over 12,000ha (30,000ac) has been designated including 8,000ha in Akrotiri, 2,250ha in Episkopi plus smaller areas in Dhakelia,

though still not insignificant parts of the SBA in eastern Cyprus. This scale of designation equates to some of MOD's largest sites in the UK.

These SACs will support the conservation of internationally important natural habitats and species of fauna and flora within the SBAs and complement the existing SPA for birds. They will also support the existing network of European protected sites in the Republic of Cyprus and across Europe.

Each of the new SACs have been selected following lengthy local community consultation and have all been selected using rigorous scientific criteria. Although the SBA's are not technically in the European Union.

The endemic Cyprus bee orchid *Ophrys kotschyi* © Crown

These SACs cover some of the most important environmental areas in Cyprus that include diverse habitats and species of flora and fauna, especially in the lowlands and coastal areas where the British use has been less intensive. Examples include some of Cyprus's most endangered mammals such as monk seals, reptiles and various bat species, including the fruit bat and the green and loggerhead turtles.

A colourful 'meadow' dominated by turban buttercup *Ranunculus asiaticus* represents a rare habitat in Cyprus © Crown

More than 900 plant species have been recorded within the bases representing almost 50% of the total species recorded in Cyprus. Many of these species are rare, in particular 35 endangered plants and are included in the Red Data Book of the Flora of Cyprus. Some of the best examples of 'Cyprus Forest' and wetlands occur on the designated areas.

David Reynolds, head of the Bases Environment Department said *"This is an important chapter in the bases efforts to protect and manage these sites of European significance. The designation of this network of important high-quality conservation sites will make a significant contribution to conserving the natural habitat types and associated species".*

Chief Officer of the bases Dr. Philip Rushbrook said *"Now that the designation of the SACs has been completed it is important we all ensure the areas are properly managed and protected".*

The next stage now is for management plans to be prepared to safeguard the conservation status of the areas. Several measures have already been implemented such as the protection of turtle nesting beaches with barriers, the reinstatement of Akrotiri Marsh, and the management of rare plants at Pyla Beach. Defence Infrastructure Organisation will match this by producing an Integrated Rural Management Plan (IRMP) to ensure military use is compatible with maintaining the conservation interest and enhancing these special areas.

Dr. Rushbrook added *"The Bases are determined to safeguard the threatened habitats for future generations; this is why we have designated these areas. They complement our investment in improving environmental education by the building of our new Akrotiri Environmental Education Centre, I encourage everyone to visit".* This centre is open to schools and the public from all over Cyprus.

David Reynolds
Environmental Policy Officer
Sovereign Base Areas Administration

Public safety on the Defence Estate and the MOD Access Forum

Attendees at the 2016 Access Forum getting a close up view of military training on Salisbury Plain © Crown

The changing face of military training, moving back from operational-focused training such as that for Afghanistan, to core training, combined with the added pressures of troops returning from Germany, including mechanized brigades and their associated vehicles and equipment, mean that the training estate is evolving once again and public safety has to be paramount in the day to day operation of the training estate.

Recent evidence has started to show that operational and military training is being compromised by a growing number of incursions onto the estate by the public while training is actually taking place. This obviously has very serious implications on the safety of troops and members of the public.

As a result of the evidence of these incursions, Defence Infrastructure Organisation Service Delivery Training (DIO SD Trg), who are responsible for managing the MOD Training Estate, made the decision to roll out a Training Estate Public Safety (TEPS) programme.

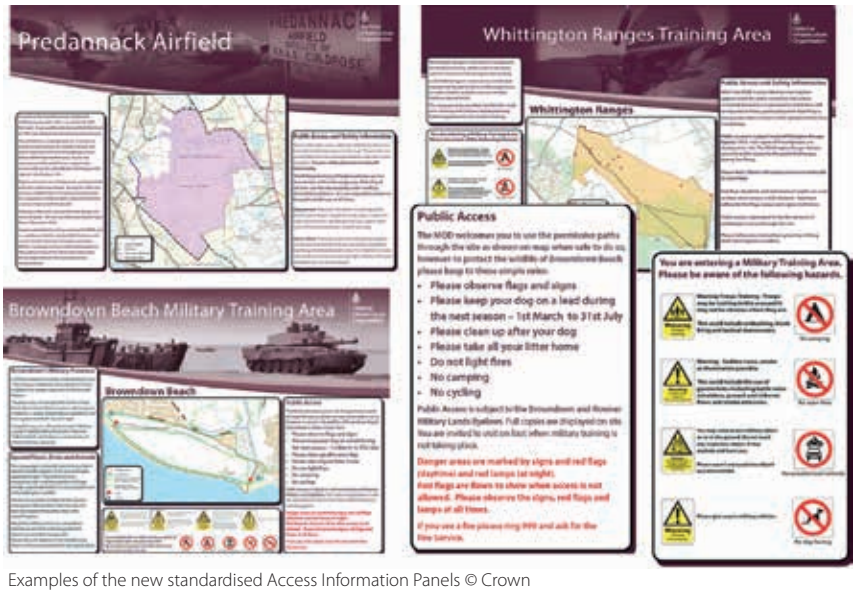
The aims of TEPS are:

- To safeguard defence training whilst, where possible, permitting safe public access
- Provide public safety across the training estate
- Identify existing control measures and evaluate their effectiveness
- Look to the future and how control measures might evolve with new technology

An initial data gathering exercise for TEPS covered flags, beacons and signage and it was fairly apparent that in many locations these were being largely ignored, or their effectiveness as control measures has diminished. Whether this is a generational issue is not known, but it is recognised that a process of re-education must be explored to try and increase the levels of public understanding.

Working with the DIO Media and Communications team, the DIO Access and Recreation team (ART) are seeking to increasingly use social media to get the necessary safety messages out to the public. ART have also developed a standardised Access Information Signage template to be rolled out across all sites, displaying the relevant safety information in a way that promotes the 3 Cs' ethos, that of Clarity, Certainty and Consistency.

Another approach that ART adopt to get the relevant safety messages out to the wider audience is by hosting with FMC and delivering the annual MOD Access Forum. The aim of the Forum is



Examples of the new standardised Access Information Panels © Crown

to provide an opportunity for relevant MOD staff to meet with external stakeholders from Statutory Bodies like Natural England and Defra, and user groups like the Ramblers and British Horse Society. It is an essential engagement opportunity enabling relevant access and recreation issues to be discussed, not only directly related to the MOD Estate, but also in terms of national policy.

ART have adapted the format of the forum to include a site visit, where attendees can see some of the military activity that takes place on the estate, and develop a better understanding of issues that may arise when military activity and access and recreation are carried out in close proximity. This also provides an opportunity to explain and reinforce why the MOD need Military Byelaws to manage access.

The annual forum was held at Westdown Camp. ART took the opportunity to get the attendees out onto Salisbury Plain, and immerse them in the middle of a simulated armoured platoon attack on a tactical location on the Plain that was taking place as part of a large scale military exercise. This was a really effective and experiential way of being able to explain how military training worked, but also gave the opportunity for the Training Area Marshal, WOI Elson, to explain some of the day to day issues that they have on a site like Salisbury Plain arising from illegal incursions by members of the public.

It has been found that in many locations, traditional safety methods such as red flags are often ignored © Crown

This then tied in neatly to the more formal meeting element of the forum, where the issues of increasing incursion were discussed, particularly across the Training Estate, and to look at possible solutions that can be found by working with the external stakeholders.

There was a big push for the user groups to take away the main messages about public safety on military lands, and promote them to their membership, either through their own publications or by promoting the MOD's own resources that are available.

Again, the Media and Communications team were involved at the forum and recorded short 'soundbite' videos with representatives of the stakeholder organisations which discussed the messages they would be taking away to their members. These were then posted on the DIO Twitter account – www.twitter.com@mod_dio

A 'Back to Basics' guide to public safety on the Training Estate has also been developed, which, in conjunction with all the other avenues ART are exploring, and the continued liaison with stakeholders, will hopefully help tackle the perceived lack or loss of understanding by the public of the hazards that illegal access on the MOD estate can create, and then move forward to provide a safe place for all users.

Scott Ashworth
Access and Recreation Advisor
Defence Infrastructure Organisation

Goshawks on the Stanford Training Area (STANTA)

A young STANTA goshawk *Accipiter gentilis* provides valuable biometric data © Peter Feakes

MOD's Stanford Training Area (STANTA) forms part of the wider area described as 'The Brecks'. The Brecks extends over a significant part of South Norfolk and North Suffolk. With the land historically having low agricultural value and the desire to build up a national timber supply in the early 20th century, significant areas were planted with conifers and this today forms the bulk of the Forestry Commission's Breckland Forest Estate. The Stanford Training Area, which was established during World War II, is a mixed landscape of forestry and open grass heath but is integral to the Breckland Forest.

In the last five to six years goshawk have colonised STANTA and numbers have built up rapidly.

The creation of the Forestry Commission's Breckland Forest made up primarily of conifer plantations created habitat that would ultimately be ideal for one of our most elusive birds of prey, the goshawk. The population of goshawk in the UK is thought largely to have been derived from larger northern European escaped and released falconers birds and in part this is true based on bird biometrics (measurements). Once established, populations can interact with naturally arriving migrants which might be smaller.

In the 1980s there was a small population of goshawk established in the forest though the build up in numbers has taken a long time and were not thought to be breeding on STANTA as recently as 10 years ago. However, in the last five to six years goshawk have colonised STANTA and numbers have built up rapidly. This

A goshawk nest with four healthy chicks © John Black

process has been monitored by the STANTA Conservation Group that has been collecting data on this colonisation through nest finding and assessing productivity. The rapid colonisation would appear to be filling the potential of the training area such that approximately 11 to 12 territories have been established. At present it would appear that the density of goshawk is now higher on STANTA than in the wider forest.

In 2013 the conservation group started researching the prey items that the goshawk pairs were catching to feed their chicks. Goshawk are what is described as sexually dimorphic and this is especially true in terms of size. Male goshawk weigh between 800-850gms while females are around 1300gms. This difference allows a breeding pair to exploit different food sources. Males take smaller and more agile prey while females can take larger prey items and more importantly carry them to the nest. Early on while the female is incubating eggs or feeding young and not doing much hunting, males can support the female and small chicks. As the chicks grow and can look after themselves the female must help to bring in enough food.

The STANTA Conservation Group have identified 14 different species of prey items within 100m of the nests they have monitored. The majority of the prey caught are woodpigeons with 33 found, corvids e.g. jackdaws 11, perhaps surprisingly woodcock 9, grey squirrel 8, and 3 young rabbits. This accounts for 86% of the prey items found.

Clearly, although goshawk can take mammals it is primarily birds that make up most of their food. Woodpigeon are abundant in and around STANTA as are corvids and grey squirrels.
The woodcock numbers found indicate opportunistic exploitation of higher densities of migrant birds that arrived from the continent. The interesting aspect now is to see how the population of goshawk territories stabilise. With 11 territories, though not all successful, is there enough food to support them?

The productivity from an albeit small sample suggests a normal one, but there is a feeling that STANTA is very good with nests of three to four healthy chicks. This may reflect the recent colonisation with an abundance of prey species available. However, over time will the territories need to be more widely spaced to enable the pairs of goshawk to rear such good numbers of chicks or will productivity fail? Only time and close monitoring will tell.

As the goshawk colonisation of STANTA is monitored, which has taken several decades, the next new colonist has also arrived with red kite nesting successfully in the last five years, though not always on the right side of the military estate boundary. It will be interesting to see how these two species interact, and hopefully support two more fascinating birds of prey on the estate.

Peter Feakes and Bernard Pleasance
STANTA Conservation Group

Red kite *Milvus milvus* have also nested successfully at STANTA in the last five years © Helen Olive

Archaeology spotlight
Marne Barracks, North Yorkshire

Members of the public visit the Operation Nightingale trench on open day © Crown

Marne Barracks (formerly known as RAF Catterick), is situated alongside the A1 just to the south of Scotch Corner in North Yorkshire. The base was founded in 1915 as a Royal Flying Corps (RFC) aerodrome and was subsequently taken on by the newly-formed RAF in July 1918 to train newly-qualified pilots in day bombing. Almost 100 years of military use has left its mark on the landscape... but, as we shall see, Marne's origins were conceived hundreds of years before the age of flight.

A few entries from the Station records should convince anyone of what remarkable actions took place from this historic base:

17th October 1939 Just six weeks after the outbreak of war, 41 Squadron based at RAF Catterick scored its first success when it shot down a Heinkel 111 over the sea off Whitby.

15 August 1940 Midday, two large raids were detected en-route to the northeast; a force of Heinkel 111s with Messerschmitt Me110 escort fighters from bases in Norway seemingly aiming for Tyneside and about 50 Junkers 88s from Denmark heading for Hull. At 12.38hrs, 13 Spitfires of 41 Squadron took off from Catterick and headed straight for Sunderland, where they helped to beat an enemy force which were surprised by the strength of the RAF in this area and were forced out over the sea. Such was the success of the fighters on this occasion that the Luftwaffe never again tried to bomb inland targets in the northeast in daylight.

1st May 1941 Three aircraft left RAF Catterick at 15.25hrs to intercept Raid 23. Flying Officer Lovell sighted one Heinkel 111 about one mile northwest of Leeming flying due east and gave chase. He made his attack, firing 740 rounds from dead astern dislodging debris from the aircraft but was prevented from continuing as another Spitfire was too close. Sergeant Palmer also made three attacks firing 1760 rounds. In his third attack, he closed in to 20 yards, causing an explosion in the port engine and from this, oil and debris hit his own windscreen. The Heinkel 111 gained cloud and was not seen again.

20th October 1942 Much to the disappointment of everyone, the station band 'The Spitcats' were posted to RAF Benson after a stay lasting 2.5 years.

After the departure of the RAF the Base became part of the army's Catterick Garrison and was renamed Marne Barracks.

Operation Nightingale In the summer of 2015 the military history of Marne Barracks was brought into sharp focus by an archaeological investigation on

Members of the Operation Nightingale team excavating the Roman building at Marne Barracks © Crown

the Base. In a field to the south of the runway, the excavation of an archaeology trench was preceded by an ordnance sweep undertaken by Keri Thomas of the DIO Environment and Planning Support Explosive Ordnance Clearance (EOC) team. More than fifteen 2" smoke mortars were recovered, probably fired during training exercises during World War II, and clearly demonstrating the importance of the EOC search prior to an archaeological excavation.

In 1939 workmen digging foundation trenches for a new ammunition store discovered building remains and a skeleton buried with a large Anglian cruciform brooch of 5th – 6th century AD date. Subsequent rescue excavation revealed evidence for a total of three rooms, pottery from the end of the 3rd century AD and first half of the 4th century and three skeletons. The rooms may have formed a block of buildings associated with a possible Roman villa. A further archaeological intervention was carried out on almost the same spot in 1966 after a burial with grave goods had been discovered whilst digging the footings for a signpost immediately west of the Catholic Chapel. Although the police originally removed the body and grave goods, these were later returned for study. The attitude of the skeleton and the grave goods (including 24 amber and paste beads, 2 pairs of copper alloy sleeve clasps and a copper alloy swastika brooch) all indicated an Anglian date for the burial. Permission was subsequently granted for a small trench to be excavated by Professor Rosemary Cramp in order to see if the burial was part of a larger cemetery.

Mortars recovered by the EOC team prior to the archaeological investigation © Crown

What goes round…comes round and 49 years later Dame Rosemary Cramp came back to the site... only this time at the invitation of the Operation Nightingale Team who were working at Marne Barracks in summer 2015. Operation Nightingale is an initiative established by DIO and the Defence Archaeology Group (DAG) to use archaeological fieldwork to help the recovery and wellbeing of wounded injured and sick military personnel and veterans. At Marne Barracks part of Rosemary Cramp's original trench was enlarged and produced further Anglo-Saxon burials and an additional room of the Roman building. The Operation Nightingale Exercise was supported by CarillionAmey/Morgan Sindall the Joint Venture responsible for upgrading the A1 in the area adjacent to Marne and by 5th Regiment the Royal Artillery (the Yorkshire Gunners) who hosted a curry night in the Officer's Mess at the start of the dig. The Commanding Officer, the Quartermaster and other officers attended together with Karl Poole, a former RAF Regiment Sergeant who gave a keynote speech about his positive experiences on Operation Nightingale excavations. After the dig had finished the site director, Dr Stephen Sherlock, and members of the Operation Nightingale team, put together a booklet which included personal recollections of the participants and highlights of the Exercise. By their account it was a great success. DIO and DAG can make it happen, but only the participants can make it a triumph!

Phil Abramson
Archaeology Advisor
Defence Infrastructure Organisation

Worthy Down protecting the past and the environment for future generations

Roman remains are uncovered at Worthy Down © Skanska

Saving Roman skeletons, relocating amphibian infrastructure (pond and plants) and protecting nesting birds is all in a day's work for the Skanska team transforming Hampshire's Worthy Down Base for the Defence Infrastructure Organisation (DIO), on behalf of the Ministry of Defence (MOD).

Community involvement is equally important for the award-winning project team, which is passionately demonstrating the positive impact that construction can have in helping to build a better society.

At Worthy Down, world-class training facilities will be delivered for key support personnel from the Royal Navy, Army and Royal Air Force. Along with new world-class accommodation and recreational buildings, the Defence College of Logistics, Policing and Administration will relocate to the site, providing specialist training in areas including catering, supply, transport and military human resources. The new college will enable the armed forces to train personnel more efficiently and effectively so that they can provide the best possible support for military operations.

The Worthy Down site is part of Project Wellesley, which will also see the Princess Royal Barracks in Deepcut, Surrey, being redeveloped to create a new village community.

Finding a skull when digging the foundations for the new accommodation at Worthy Down could have delayed construction, but thankfully the team knew the procedure, called the police and, after investigations concluded, the Oxford Archaeology team arrived.

An extensive investigation revealed an ancient Roman burial site containing 18 skeletons. Artefacts found included a coin of the Roman emperor Valens, who reigned between 364-378AD, which indicated that they were from the late Roman period in Britain.

Tracy Matthews, Archaeology Officer, Winchester City Council, said: *"This is a really exciting discovery and has given us the first extensive remains of the Roman period in this area. Analysis... will provide a fascinating insight into the lives and deaths of some of the area's early inhabitants."*

Stuart Adamson, Project Manager, DIO, said: *"The contrast between how these Romans lived and how modern service personnel will live in the new facilities we're providing is stark, but it's been fascinating for all of us to see history coming to life around us as the project progresses."*

Seven of the bodies excavated were buried wearing hobnailed shoes or boots, while the choice of location suggests that the burials represent a rural community whose cultural identity was more rooted in local tribal, rather than Roman, tradition.

Items will be displayed, after project completion, within Worthy Down, while some will also be donated to Winchester City Council.

When over 80 newts and frogs were discovered on the old obstacle course, a temporary pond was created and the creatures were moved.

One of the relocated newts © Skanska

The new college building currently under construction © Skanska

Their new home offers a more diverse aquatic habitat, with the relocation also helping to educate employees who can view the amphibians up close. A more permanent pond will form part of the landscaping scheme, once construction has been completed.

The creative nesting habits of local birds have required construction work to occasionally accommodate nature too. Inventive woodpigeons built their nest in a wire cable tray, used to hold electrical services, in the ceiling of the college building so the area was sealed off to avoid disturbance.

Tree removals were also delayed when rooks began nesting early, while a dumper truck was put out of action when a blackbird nested inside it by the engine – suggesting that birds may like our construction project even more than the beautiful countryside!

The protection also extends to the erection of 30 bat boxes, 28 bird boxes, two little owl boxes, 15 dormouse boxes and several log piles, creating bug hotels for invertebrates.

Local people benefit from the major construction project being part of the community too. From providing employment for many, including ex-services personnel and their families, to educating the next generation, the work can raise awareness and enhance understanding.

Close relationships have been developed with several local schools, to inspire young people, with project team members taking assemblies. A competition for local children was also held to design an environment and health and safety poster for the site's bus, with the winning class enjoying a site visit, plus a goody bag each.

The bus now displays the artwork and workers see the children's perspective on working safely and protecting the environment, which inspires them.

Engineering and secondary school students have enjoyed onsite work experience placements too, adding practical knowledge to theoretical understanding. The team is also actively engaged with the careers department of the local sixth form college.

Paul Weale, Project Director, Skanska, said: *"The project team has embraced the opportunity to engage with schools and the local community. It has been really satisfying and refreshing to witness the enthusiasm that children have shown in learning about Skanska's way of working and our construction activities. The industry's future should be in good hands."*

Skanska considers its local community role at every opportunity. This extends to supporting the local Worthy's festival, where they shared project information and engaged with old and young alike. They take the safety, health and wellbeing of employees, suppliers, customers, community and the environment very seriously. This was recognised at the Considerate Constructors Scheme National Site Awards – an industry scheme where the project scooped runner-up in the most considerate site category, plus an overall gold.

Julia Lanchbery
Senior Environmental Advisor
Skanska

Installing a dormouse box © Skanska

Engaging with local schools to encourage understanding of the construction industry © Skanska

Covenanter's Wood
Reversing decline

Parkland restoration at Covenanter's Wood © Mark Hamilton

Covenanter's Wood forms part of the Ministry of Defence's (MOD) landholding at Dreghorn Barracks, located in the historic village of Colinton on the edge of Edinburgh. The wood formed part of Dreghorn Castle estate which was acquired by the MOD in the late 19th century.

The woods comprise of an attractive mixture of broadleaved and coniferous trees, growing around two small burns, and covering 18ha. As part of the designed landscape established around the now demolished Dreghorn Castle, the woods have great historic significance, incorporating a parkland, a curling pond, a carriage drive, and impressive specimen trees, including giant redwoods (one planted by the Prince of Siam).

When military training use of the woods ceased, positive management fell into abeyance, and the woods become heavily overgrown by exotic invasive species, including rhododendron, laurel, giant hogweed, snowberry, Japanese knotweed, and salmonberry (a highly invasive plant similar to raspberry). This unchecked vegetation growth, coupled with drainage problems, resulted in a steep decline in public use, and the paths through the woods became all but impassable.

Following the MOD's disposal of nearby land to Miller Homes for housing, a planning condition required that the woodlands be brought into sound management.

Miller Homes employed Mark Hamilton Landscape Services (a local forestry consultancy) to draw up and implement a five-year woodland management plan, involving input from MOD foresters, archaeologist, and access staff, and input from the local community, directed through the Colinton Amenity Association (CAA). The Defence Infrastructure Organisation (DIO) Regional Head Forester, Keith Anderson provided subject matter expertise along with undertaking a compliance role. This audit programme was to ensure that the planning conditions were fully discharged and the longevity of the now actively managed woodland were secured. In tandem with this Keith also carried out tree safety assurance, essential now the woods are being used more and more.

Two years into the programme, completed management operations include the felling of unstable stands of inappropriate conifers, coupled with replanting of a policy woodland mix in keeping with the historic setting.

Elsewhere, tree safety work, thinning and enrichment planting were undertaken, and work commenced on eradication of invasive shrubs, although this feat will require continued vigilance.

In tandem with the opening-up of the woodland, the once obscured path network has been revamped. A surfaced route of 2km was constructed, based on the historic carriage route, and two pedestrian bridges rebuilt.

The parkland, which was untended and overgrown, is now managed meadow. Tree surgery was undertaken on the historic specimen trees, and new feature trees planted.

Close contact and liaison with CAA, neighbours, and users has been maintained, with guided walks being held. The CAA has a keen interest in the estates heritage, and they participated in an archaeological investigation undertaken on the once forgotten and obscured World War I training trenches located in the woodland. The local scout groups will shortly be completing woodland crafts courses in the woods.

In a remarkably short period of time the woods have been transformed to provide a more sustainable, accessible, biodiverse and attractive habitat. The numbers of visitors has increased dramatically, with the cleared and surfaced paths now open to all.

Mark Hamilton
Mark Hamilton Landscape Services

Armoured Support for Grassland Management at Lulworth Ranges

The Armtrac 100-350, a formidable piece of equipment that can spin seventy chains at 800rpm © A. Cheeseman

In January 2016 Landmarc Support Services procured the specialist services of Armtrac Limited to assist in the clearance of dense areas of mature western gorse *Ulex gallii,* as part of ongoing Site of Special Scientific Interest (SSSI) management of the unimproved grassland at Lulworth ranges. As well as a SSSI, this area is also part of the Jurassic Coast World Heritage Site.

Armtrac Ltd design, build and supply armoured de-mining equipment for the clearance of mines and unexploded ordnance (UXO) throughout the world. They also provide a service to Landmarc and the MOD clearing dense scrub for biodiversity and ecological management on sites where there is a high risk of UXO, (including Salisbury Plain and Castlemartin), but had not been employed at Lulworth before.

The site, above Mupe Bay and close to Lulworth Cove, was identified for clearance by DIO and funded as part of the MOD SSSI Condition Improvement Project. Previous management had been carried out by swaling (burning), which in itself brought many problems such as removing livestock prior to operations, close liaison with adjacent estates and the emergency services, the potential for fire to spread out of control and the risk of injury to operatives from burns and UXO burn-off. Fitting swaling around military training, public access and ideal weather conditions was also challenging. Once the controlled burning was complete the gorse had to be left to break down naturally, taking up to a year before any new growth could be treated by chemical application. Grazing using ponies and cattle in penned areas was also used, but the extent and depth of the gorse in this area required a more efficient mechanical fix to allow easier, sustainable future management of the site.

The machine provided was the Armtrac 100-350, based on an agricultural New Holland tractor, and fully armoured to protect the operator. Fitted with a 3-metre wide front-mounted flail spinning seventy chains at 800rpm, each with a hammerhead end, it is a formidable piece of equipment.

Access to the site required the removal of some gates and stiles to accommodate the 3.6-metre wide flail header unit, the permission of DIO and the assistance of Lulworth Range Control. Day to day liaison with the operator was controlled by the Rural Estates Team based at Bovington.

Natural England assent was granted and in just four days over 4ha of gorse was cleared – a significant achievement considering the time constraints associated with live firing and seasonal restrictions. Given the nature of the operation, because of UXO, an exclusion zone had to be applied to the whole area whilst the machine was working to safeguard other users of the Estate, but no explosive incidents occurred. The flail very effectively devoured the gorse, breaking it up into a layer of loose mulched material.

Natural England were particularly impressed with the results and this area can now be safely managed using the more conventional methods of topping and grazing, helping to return this part of the SSSI to species-rich open grassland.

Nick Dobbins
Rural Estates Supervisor
Landmarc Support Services Bovington

In loving memory of Nick, who sadly passed away this summer and is greatly missed by all his friends and colleagues.

Red alert! Studying colour signals and predation risk in burnet moths

The six-spot burnet *Zygaena filipendulae* on a pyramidal orchid *Anacamptis pyramidalis* © Emmanuelle Briolat

Walk along the Cornish coast on a sunny day in spring or early summer, and you cannot fail to spot them – with their plump spotted caterpillars, papery cocoons clinging to tall grasses and strikingly-coloured adults, burnet moths are a familiar sight among dunes and coastal meadows. The most commonly found species is the six-spot burnet *Zygaena filipendulae*, one of seven UK species in the genus Zygaena, some of which are by contrast vanishingly rare. All share a distinctive wing pattern – iridescent black forewings with bright red markings, red hindwings with a black border – and equally conspicuous behaviour. Active during the day and singularly easy to approach, adult burnet moths can be seen searching for mates with a slow buzzing flight, or feeding in the open on flower heads, the pink and purple blooms of field scabious, red valerian and orchids being particular favourites. Such a brazen attitude reflects their confidence in a potent defence: their eggs, larvae, pupae and adults all contain high levels of cyanogenic glucosides, bitter-tasting compounds that release cyanide when broken down in the gut of predators. Burnet moths are truly extraordinary insects, able not only to cope with feeding on plants loaded with toxins as caterpillars, but also to hoard these defensive molecules to use for their own protection and to produce their own if necessary. Advertising these defences to potential hungry predators, their striking red and black wings serve as a stark warning: I am dangerous to eat, do not attack. This strategy, known as warning colouration, or aposematism, is the focus of a PhD thesis at the University of Exeter's Penryn campus.

Being in Cornwall provides many opportunities to work on some spectacular field sites abuzz with burnet moths, particularly Penhale Training Areas dunes and Holywell Bay on the north coast. The research project focuses on testing the relationship between colour and defence in burnet moths, trying to establish whether slight differences in colour between individuals might indicate variation in the strength of the moths' chemical defences. Colour might thus provide a useful signal of quality, whether for members of the opposite sex, to whom high levels of toxins would be profitable, or for foraging predators, primarily birds, hoping to minimise the side-effects of burnets for breakfast. To test the latter, it is not enough to find correlations between measures of colour and toxicity; it is also important to understand how colour signals affect the predators' decisions. With the support of Cornwall Wildlife Trust and the MOD field experiments designed to address this question have been running on Penhale Training Area.

Predation experiments using artificial models in the field are a phenomenally versatile means of testing how whole communities of predators respond to different colours and patterns, from the number of stripes on wasps and the colour of poison dart frogs to the presence and shape of eyespots on butterfly wings. The goal here was to test the effect of different spot sizes and colours, as well as wing iridescence, on the survival of prey designed to mimic burnet moths. To create the baits, waterproof paper 'wings' featuring different patterns and non-toxic plasticine 'bodies' were assembled onto lengths of floral wire; each one could then be pushed into the ground, so that the models would resemble moths at rest on low-growing vegetation. The grassy dunes of Penhale Training Area, home to a large colony of burnets, provided the perfect backdrop for this experiment. Restricted public access to the training area means that the fragile baits would be undisturbed by all but

A frosty morning on Penhale dunes, north coast of Cornwall © Emmanuelle Briolat

their intended avian predators – though plasticine proved surprisingly appealing to small rodents too – and the rich avian fauna provided plenty of potential predators for the artificial prey.

Between March and April 2016, before any adult burnets had emerged, 3,000 artificial prey were put out across the training area. Each one was monitored every 24 hours over three days, and any beak marks in the plasticine or moths pulled out of the ground were taken as evidence of predation by birds. Notwithstanding the occasional rainstorm or frosty morning, transforming the baits into crystallised ice moths, the experiment worked: on average 8% of the fake prey were taken, numbers similar to past experiments of this nature. The results themselves were somewhat surprising. Based on warning signal theory, and comparable experiments using ladybird models, it was expected the brighter, redder, most conspicuous baits, effectively 'shouting loudest' about their potential toxicity, were expected to be avoided by predators. On the contrary, prey with redder spots were attacked more, and similarly, though this particular trend was not quite significant, prey with larger spots also tended to survive less well. Meanwhile, iridescence appeared to have no impact on predation, a finding consistent with research on other iridescent and toxic prey, such as the pipevine swallowtail *Battus philenor* butterfly.

Examples of avian attacks on prey placed on the dunes © Emmanuelle Briolat

Overall, in this set of experiments detectability seems most critical to determining predation rates, with little consideration for warning colours. This raises interesting questions about how the visual signals of burnet moths operate, which will hopefully be explored with some additional experiments. Previous work, in particular on another warningly-coloured moth species, the wood tiger *Arctia plantaginis*, has demonstrated that a multitude of factors external to the prey themselves affect predation. The type of predators, their experience and motivation, as well as the abundance of alternative prey, are all especially important, and will vary with the time of year. Perhaps the pattern of predation would change later in the season, as nesting birds feel the pressure to feed their chicks, or later still, when burnet moths are on site and the memory of their bitter taste is fresh in the predators' minds. The combination of visual signals with other close-up cues, such as the smell of cyanide emanating from the burnet moths' pheromone plumes, might also be critical for predators to learn to avoid these toxic prey.

Access to Penhale Training Area provided a unique opportunity to perform large-scale predation experiments, in the typical habitat of burnet moths and with relevant predators, making the investigations as realistic and pertinent as possible. It was also a privilege to roam the dunes in the privacy of the early morning, watching spring awaken the landscape day by day, treated to the dawn chorus, a front row seat as the swallows returned to the UK, and even a thrilling encounter with an adder. A haven for insects and other wildlife, such protected areas are an invaluable resource for conservation and research alike.

Emmanuelle Briolat
PhD student
University of Exeter (Penryn)

Public Access at Tain Training Centre, Dornoch Firth, Scotland

A view of the special heathland found at Tain Training Centre © Crown

Tain Training Centre, situated on the Dornoch Firth near the town of Tain, is operated and managed by Defence Infrastructure Organisation Service Delivery Training (DIO SD Trg) and is the largest of four Air Weapons Ranges (AWR) in the UK. Tain AWR is utilised by tri-service, USAF and other NATO Air Forces for academic bombing and strafing practice.

Public access has been largely restricted for a number of years due to the nature of the military activity at Tain. However, recently it was recognised that public access may be a possibility when the area is not being used by the military; providing that it was managed in such a way that it did not impact on the primary use of the site for military training, and the safety of both MOD personnel and the public.

Using the DIO Conservation Stewardship Fund (CSF), a proposal was put together to finance some access infrastructure, such as waymarkers and new public access information panels, that would enable a public access route to be promoted on the ground. This route would allow the public to complete a circular walk from the town of Tain, along the beach to the MOD boundary and then across the Southern section of the training area, and back along the road to Tain itself.

Tain Air Weapons Range © Crown

The public access information panels follow the same design as those used across most other Scottish sites, thereby ensuring that the DIO Access & Recreation team '3Cs' mantra of Certainty, Clarity and Consistency is followed. These panels have been placed at the main entry and exit points at both ends of the route to ensure the correct safety information is delivered to the public and they are made are aware of the potential hazards that may arise when taking access on any area of the MOD estate.

It is hoped that further access routes may be created at DIO SD Tain through the CSF, and enabling, where possible, further links into surrounding path networks outside of the MOD boundary.

Scott Ashworth
Access and Recreation Advisor
Defence Infrastructure Organisation

Releasing **red squirrels** in the Ballykinler Training Area, Northern Ireland

The red squirrel *Sciurus vulgaris* showing off its rather impressive tail © Iain Perkins

Red squirrels have been part of working life here on the MOD Training Estate NI for the past year and watching them disappear into tree tops was one of the more unusual experiences for the Senior Training Safety Officer during his military and Defence Infrastructure Organisation (DIO) career. It has made a nice change from the usual role of making sure that a safe place is maintained and training is running smoothly.

As most people know, red squirrels *Sciurus vulgaris* struggle in this country because of grey squirrels *Sciurus carolinensis*, who force them out of their home territory and carry a virus which can be fatal to the reds. This means that they are only really found in limited wooded rural areas, such as the highlands of Scotland, Anglesey, Wales and Northern Ireland. The training team NI are doing their bit by supporting a Belfast Zoo programme to breed and release red squirrels into the local woods and forests.

They were approached by the Northern Ireland Environmental Agency and Belfast Zoo in April 2015 and readily agreed to help if possible. They were keen as there are no grey squirrels on the training estate in Northern Ireland and they were looking for a nursery site to support the breeding programme for red squirrels. The plan for the young reds was to spend twelve months or so at Ballykinler before being released out to other larger locations to supplement the wild population. After a medical check-up, the zoo staff brought two young male reds, which were released into a specially built soft release pen in the woods of the training area.

After a week or so they were released into the woods and two days later the zoo rang and asked if they could bring another three males down to the pen. All five are now living in the woods at Ballykinler with support from supplementary feeding stations and shelter being provided by a number of nesting boxes. The squirrels have been seen and seem to be doing well.

Ballykinler has numerous wooded areas which divide the firing ranges to prevent troops accidently straying into potentially dangerous areas, so there are plenty of trees for the squirrels. Because the woods divide the ranges, they are in the safety buffer between ranges and not targeted during the firing, so they are perfectly safe.

Ballykinler has water on three sides and this helps prevent the grey squirrels getting onto the site which makes a big difference to the reds' chances. The woods also reduce the noise of the firing and it certainly hasn't seemed to bother the reds so far; also two hundred seals live behind the ranges and feel safer on this side of the bay and away from humans.

The programme is being overseen by the Department Agriculture, Environment & Rural Affairs (DAERA) and the team are working closely with them and staff from Belfast Zoo to ensure the success of the project. After a year, by which time they should be well and truly adjusted to living in the wild, they will be recaptured and relocated elsewhere in Northern Ireland.

With luck, Ballykinler will play an active part of increasing the population of red squirrels here in Northern Ireland and showing how the MOD and local conservation organisations can work together. The MOD are the stewards of this site for as long as the MOD remain, which brings its own responsibilities for the stewardship of the land and its wildlife whilst still delivering training to the wider user.

Maj Tony Canniford
Senior Training Safety Officer NI
Defence Infrastructure Organisation

Roman River valley removing invasives to encourage the return of 'Ratty'

A young water vole *Arvicola amphibius*. 'Ratty' is a reference to the water vole in the 1908 children's book *Wind in the Willows* by Kenneth Grahame © Darren Tansley

The MOD occupies a wide range of habitats in the Colchester area and, being used for active training, many areas are either completely inaccessible to the general public or open only at certain times. Roman River valley is one such area and it is the combination of Sites of Special Scientific Interest, local wildlife sites and MOD land that has allowed this valley to retain its wildlife interest in the face of overwhelming development pressure in the borough.

Essex Wildlife Trust (EWT) has been working in partnership with the MOD for a number of years now, focussing mainly on the removal of non-native invasive species, such as cherry laurel, North American mink and Himalayan balsam. Improving habitat and monitoring species has also been a priority. In 2009 a major recording project began with teams of surveyors from Colchester Natural History Society and EWT recording the biodiversity and habitats along the whole valley. The fieldwork was completed in 2015 and is now being compiled into a full report, updating the previous survey published in 1983.

It is fascinating to see how some species are doing much better in the valley, and others are declining. One species that has declined sharply over the years is the water vole *Arvicola amphibius*; although it is doing well across North East Essex as a whole, the species has suffered from habitat decline in the valley and predation by North American mink *Neovison vison*. Water voles are also known to suffer dramatic declines when their bank side burrows are trampled and poached by the activity of livestock.

Cattle and sheep are an important feature of the grazing marshes and pastures that line the river but in certain areas the banks were so trampled and degraded that it was no longer possible to see the original river channel. With no banks, the water voles had nowhere to burrow so EWT and the MOD, in conjunction with the grazier Edward Hull looked at the possibility of fencing off one bank to allow the river to recover.

Mink footprints on a floating river raft © Darren Tansley

Some of the extensive poaching damage previously caused by livestock © Darren Tansley

In addition to the obvious habitat issues for water voles, the poaching also liberated considerable amounts of silt and nutrients which are a serious threat to water quality and the aquatic habitat for insects and fish. In tackling this problem it was possible for EWT to apply for a grant from the Environment Agency to undertake the work. Unfortunately flooding of the valley delayed the project for a year, but finally in November 2013 the fencing was complete with approximately 700m of threatened river bank protected.

There has also been considerable effort to monitor mink presence using floating rafts that can track their footprints; a new initiative has been set up to continue this and EWT now has a network of volunteer river wardens covering nearly 30% of the river corridors of Essex. With permission from the MOD, the Roman River wardens will now be given access to sections of the river to set and monitor these rafts in the coming years. The hope is that with mink controlled as they are elsewhere in North Essex, water voles will return.

The river wardens will also have a role continuing the work started by the Essex Biodiversity Project to monitor and remove Himalayan balsam *Impatiens glandulifera* from the river corridor. Over the last four years the river banks have been surveyed for this invasive species, the locations were plotted and groups of volunteers came back and pulled the plants by hand before they set seed.

Approximately 700m of the river has now been protected with fencing © Darren Tansley

Another invasive species that EWT and the MOD have been tackling in Friday Woods is cherry laurel *Prunus laurocerasus*. This garden shrub has spread rapidly through the northern part of woodland and suppressed ground flora and natural woodland regeneration. Over the last four winters EWT staff and volunteers have been working to clear the laurel assisted by volunteers from the local community, Essex University and more recently by staff from Network Rail. The laurel is cut by hand using chainsaws, bowsaws and loppers; the cut material is burnt, with any logs left in habitat piles. Care has to be taken when working with laurel as the leaves and fruit pips contain cyanolipids that are capable of releasing cyanide and benzaldehyde during maceration; chipping was therefore not advised.

Clearing the laurel is just the first step and will take many years to achieve; this clearance will be followed-up by stump treatment and treatment of any new growth from the seed bank, which has been prolific in some areas. This is due to be spot sprayed using a knapsack sprayer in late summer/early autumn. Once the laurel has been cleared natural regeneration will be able to occur more successfully, although deer browsing will need to be monitored closely.

Darren Tansley
Water for Wildlife Officer
Essex Wildlife Trust

John More
Local Wildlife Sites Officer
Essex Wildlife Trust

Members of MOD Colchester Conservation Group

Ogof Gofan balancing recreational caving with protecting bats and archaeology

The Ogof Gofan cave network can only be accessed via ropes down the sheer cliffs of Saddle Head © Stuart France

Castlemartin Range, located in the Pembrokeshire Coast National Park (PCNP), is the premier Armoured Fighting Vehicle (AFV) live firing range in the United Kingdom. Visitors to Warren Tower viewing point can watch tracked vehicles such as the Challenger 2 and Warrior as well as the current fleet of wheeled Amphibious Fighting Vehicles, helicopters and fast jets.

Its location in the National Park also makes it a prime location for the visiting public to enjoy a variety of different outdoor activities. Walking is well catered for and the landscape is blessed with an abundance of different wildlife. History can be experienced in the form of St. Govan's Chapel and the cliffs are world renowned for the vast number of climbing routes.

Over the last year formal arrangements for a new area of recreational interest have begun to take shape; caving. The presence of caves at Castlemartin is not a recent discovery. The Ogof Gofan (ogof being welsh for cave) network was unearthed in 1966 by Melvyn Davies. The caves nestle within the dramatic cliffs of Saddle Head, just ten minutes from the St Govan's Chapel car park. Access into the mouth of the cave is only achieved via ropes by abseiling down the sheer cliff face.

As well as the impressive underground formations, Melvyn discovered hearths, animal and human bone and Neolithic pottery (circa 3400–2500BC). In 1989, ecological discoveries were added when Tom McOwat recorded a siting of one lesser horseshoe bat.

The presence of bats has been further supported by work undertaken in 2003 by the Countryside Council for Wales (CCW – now Natural Resources Wales) The CCW report highlighted the discovery of both greater and lesser horseshoe bat droppings, confirming the Ogof Gofan cave network to be a significant bat roosting site.

Lynne Houlston, Castlemartin and PCNP Ranger (a post joint funded by DIO), has been keen to facilitate a formalised process for recreational cavers for many years but, conscious of the potentially sensitive historical and ecological factors, wanted to ensure that the correct steps were taken to protect the site and mitigate against any potential negative impacts.

Abseiling into the mouth of Ogof Gofan © Stuart France

The Cambrian Caving Society (CCS), local to Castlemartin has had a long standing interest in the caves. CCS representatives have sought permission to further investigate the site and provide their members the opportunity to visit on a regular basis.

Establishing a close working relationship with a registered caving club has been essential in developing an understanding of what caving is about and ensuring a balance is met between the sensitivities of the site and the expectations of the cavers. Liaising closely with the CCS, Lynne highlighted the issues of visiting a military training site and concerns over potential damage to archaeological remains and the effect of potential disturbance on bats.

Stuart France, CCS Conservation Officer responded to Lynne's concerns, highlighting how the CCS and the caving community take a responsible approach to visiting caves and compiled a series of site specific guidelines to share with CCS members and other caving groups. Stuart kindly arranged a visit to the caves for Lynne and James Nevitt, DIO Access Advisor, providing some first-hand experience on which to base their understanding. This was fundamental in highlighting that only well prepared cavers would venture into the site and that Ogof Gofan would not fall prey to frequent curious visitors.

Ecology, Archaeological and Access Advisors from DIO's Environmental Support and Compliance Team all saw the provision of access to the caves as a positive opportunity to carry out investigative research on an otherwise secret environment. Through the MOD Conservation Stewardship Fund (CSF) DIO funded research to provide baseline bat information to enable DIO to monitor the condition of the caves and its' inhabitants if and when cavers begin to visit on a more regular basis.

With the aid of CCS, specialist consultants were identified to carry out the ecological research. The research will cover at least one year, with a view that promising results may warrant further investigation. This work is intended to assist in de-conflicting potential impacts of recreational access to the caves with the presence of bats and archaeological interests.

To monitor bats, loggers have been installed in strategic spots through the caves. Light sensitive people counters have also been installed to record caver presence. This data will be compared against the booking calendar to identify what caving activity is taking place.

Initial reports support earlier CCW findings that Ogof Gofan is well used as a night roost by greater horseshoe bats and also on occasion by lesser horseshoe bats. Evidence indicates that during the summer months the cave is visited by many more bats and that in the main these would be greater horseshoe bats. Visits by cavers are currently restricted to those few arranged through the booking system.

As the bat surveying continues to unfold the next stage will be to undertake a survey on the archaeology of the site to provide baseline data for monitoring purposes. This work is to be undertaken late Summer/Autumn 2016.

Thanks to the relationships formed by Lynne and the support of the CSF there is positive expectation that recreational access to the caves, under a booking system and the CCS guidelines will become a permanent fixture amongst the other recreation opportunities available at Castlemartin. With a working partnership formed, additional caves may be located which may prompt further ecological and archaeological discoveries and in turn offer more access opportunities. Who knows what surprises may be uncovered!

James Nevitt
Senior Access and Recreation Advisor
Defence Infrastructure Organisation

Ballykinler Observing the Sons of Ulster as they marched towards the Somme

One of the World War I training trenches being excavated at Ballykinler © Crown

Frank McGuiness's iconic play 'Observe the Sons of Ulster Marching Towards the Somme' deals with issues such as Unionist identity and the horrors of World War I through the lens of Ulster soldiers' experiences of the Battle of the Somme. The main character of the play, Kenneth Pyper, acts as a vehicle to guide the audience as he remembers his fallen comrades of that titanic battle, which took place 100 years ago this year. The men who are the subject of McGuiness's play would have trained for war at Ballykinler Military Training Estate (BMTE) in County Down, Northern Ireland. As part of our modern remembrance, it is important that the military remains of the period – which represent fundamental elements of our military and social heritage – are identified and, where appropriate, protected for future generations. During April 2016, an archaeological evaluation dig was undertaken as a joint initiative between the Defence Infrastructure Organisation (DIO), Queen's University Belfast Living Legacies 1914-1918 Engagement Centre and the Northern Ireland Department for Communities.
The dig targeted a number of what were believed to be WWI features, predominantly training trenches, and successfully uncovered remains that would have been used to train soldiers like those represented in fiction by Pyper and his pals.

The BMTE lies on the County Down coast, bounded to the south and west by extensive dune systems, where the picturesque Mountains of Mourne literally do sweep down to the sea. Ballykinler estate is part of a larger historic landscape, with a complex background going back thousands of years into prehistoric times. The origins of the place name Ballykinler seem to derive from the Irish *Baile Coinnleora*, meaning 'townland of the candlestick', probably coming from a medieval bequest made of these lands by the local Norman lord, John de Courcy, for the upkeep of a perpetual light before the altar of Christchurch Cathedral, Dublin. The 19th century Ordnance Survey maps mark the presence of extensive rabbit warrens in the dune systems, and it is likely that the practice of rabbit farming for meat and skins extends back to the days of the Norman manor here.

The earliest known cartographic reference to the use of Ballykinler for the purpose of military training appears on the 1st edition Ordnance Survey six-inch map sheet of 1834 which details a 100-yard rifle range and 'camping area'. By the later 19th century, Ireland had many local volunteer corps regularly drilling at locations such as Ballykinler and, as the need for British troops intensified following the outbreak of the Second Boer War

The original sandbag revetment of the communication trench wall still in-situ after 100 years © Crown

(1899-1902), the expansion of these camping grounds and range areas became essential. That period saw conversion of Ballykinler camp into a year-round training facility. Camp infrastructure was developed and expanded, and a permanent body of the Army Service Corps was posted there to support resident troops and contractors. By 1914, the estate was capable of supporting the implementation of the considerable revisions that were then taking place within the British Army's training regime.

By early 1915, the camp could facilitate the billeting of around 4,500 men, including an auxiliary workforce, training officers and NCOs. Ballykinler became a major training hub for the British Army throughout WWI. After the departure of the volunteer army to the Western Front in 1915, Ballykinler continued as a training ground for reserve battalions and, by 1917, was also a centre for re-training and recuperation. In the aftermath of the War, the camp retained its function as a major training facility for the British Army, a role that it continues to perform to the present day.

Of the four trenches excavated, Trench One showed that extensive damage was caused to the WWI training features by the construction of a camp golf course in the 1980s and Trench Three revealed what may be the vestiges of an early 'S-type' training trench, likely to date to the initial months of the war. The remains uncovered in Trench Four, a narrow slot trench covered over by a pre-WW1 soil layer, correspond well with the 'final assault practice course' features described in the Musketry Regulations Handbook of 1909. The slot trench and some nearby similar features may have been created by the Royal Irish Rifles training camp of 1911 and most likely serve as testimony to the modification and restructuring of infantry training that was implemented as a direct consequence of the British Army's experiences during the Second Boer War.

Trench Two, which targeted the remains of a communication trench just behind a facsimile front line, provided the most illuminating remains of WWI training at Ballykinler. There the excavation revealed the original sandbag revetment of the communication trench wall still in-situ after 100 years. Preliminary results suggest that the original communication trench had been subsequently modified by being widened out to create a dugout position in the direction of the front line. From the dugout, a set of steps cut into the sandy subsoil led up to a slot trench with a parapet to its front and sides; the feature has been interpreted as the remains of a machine-gun position. It seems likely that the original communication trench was modified in order to facilitate the training of soldiers in the use of machine guns within the trench system, with the dugout acting as a base for the machine gun crew who could then readily access the machine-gun position via the steps leading from the dugout. This process of modification would have been made necessary as the realities of the war on the Western Front became readily apparent to the training officers. By 1916 the dominant role of the machine-gun in trench warfare would have been well realised and this would have necessitated its incorporation into the training regime at Ballykinler.

That the facsimile trench system studied in Trench Two contains in-situ WWI sandbags is a significant archaeological discovery and indicates a higher level of preservation of organic materials in the site's sandy soil than had previously been considered. The dig also strongly suggests that the training provided to the WWI Irish regiments at Ballykinler was professional, relevant, and based on actual combat experience.

For all those who took part in the dig, it was hard to escape the feeling that they were indeed observing McGuiness's 'Sons of Ulster' as they marched towards the Somme. Further excavation, scheduled for the late summer of 2016, is keenly awaited.

Heather Montgomery
Queen's University Belfast

Paul Logue
Department for Communities

Ditching for dragonflies at Foxlease Meadows and Ancells Farm

Small red damselfly *Ceriagrion tenellum* © Mark Heighes

Foxlease Meadows and Ancells Farm form part of the MOD Training Estate near Fleet, and are currently managed by Hampshire and Isle of Wight Wildlife Trust. The sites are wet acid grassland, with a series of ditches criss-crossing both reserves. These ditches were historically dug to drain the land for farming purposes, but have remained unmanaged for the last 30 years, becoming more like subtle indentations in the ground as opposed to ditches. Both reserves host small populations of small red damselfly, and although the reserves are connected in the landscape and linked by the network of ditches, because of the lack of management on the ditches, the populations have become very isolated.

The small red damselfly *Ceriagrion tenellum* is one of our smallest damselflies, and one of only two red species of damselfly in the UK. They are quite rare, restricted to heathlands in southern England and west Wales. They live in shallow pools, and streams in heathland bogs.

In 2012, diggers got to work after the Wildlife Trust managed to secure funding to re-dig short stretches of these ditches, creating a series of linear ponds across the landscape to act as stepping stones, reconnecting the two small red damselfly populations, as well as benefiting a host of other species. The project was phased over two years, and a total of 75 ponds were created.

The work was completed by contractors using heavy machinery. The shape and depth of the ditches were critical. If they were too shallow, the ditch would spend most of the year dry, meaning that they would not be able to support the target plants that like soft and muddy ground. If they were dug too deep, then they would retain water all year round, meaning that the substrate would not be exposed to allow the seeds to germinate.

Within months of the ditches being created, they were heaving with life. One scrape on its own had 38 plant species recorded, 30 of which were classified as target plants, including species such as bog pimpernel, marsh St. John's wort, water pennywort and two species of sundew. As hoped, Dragonfly species have been faring well too. Broad-bodied chasers, four-spotted chasers, large red damselflies and common blue damselflies have all been found to have a much wider distribution following the ditch restoration, where as before they were restricted to the two existing ponds and some minor ditches. Most importantly of all, a new population of small red damselflies has been recorded which is excellent news.

The ditches and ponds are continuing to be monitored, as new species are recorded. It is hoped that the ditches will provide wildlife with good opportunities to colonise and spread further across the site, making the population of small red damselflies, amongst other species, a lot more robust.

Sarah Boswell
Conservation Projects Officer
Hampshire and Isle of Wight Wildlife Trust

Creating the ponds in 2013 © Elliott Fairs

The end result, three years later © Richard Hennessey

Whittington Ranges reinstated after a ten year closure

The range after extensive refurbishment © Heidi Waggett

Whittington Ranges, Staffordshire, have re-opened, after extensive refurbishment. Defence Infrastructure Organisation, Service Delivery Training (DIO SD Trg) with their industry partner Landmarc have achieved this despite project difficulties reinstating a high value range complex after ten years of closure.

Whittington ranges have been used since World War I but were closed in 2006 as a result of safety concerns. The site, which includes two gallery ranges and extensive woodlands, became overgrown and access tracks had deteriorated. During the closure, the public increasingly used the area for dog walking, jogging and cycling.

When funding was approved in 2013, planning permission was sought and the project moved forward to bring the ranges and facilities up to modern day standards.

Work began in 2014 starting with the re-profiling of the ground, repairing buildings and installing new targetry equipment. For public safety, the byelaw route was subject to a temporary closure notice, allowing machinery to access all work areas. Through negotiations by the Training Safety Officer (TSO), Jim Salisbury, one path remained open to allow the public to safely move through the site. This helped maintain public support during the works.

The project was not completed without its challenges. The rural elements of the work were managed by Landmarc and White Young Green (WYG) providing the ecological survey. The survey showed a number of badgers had taken up residence since the closure; with one sett straddling the fence line requiring very exact re-fencing, minimising the ground intrusion and extending posts wider than usual.

There was also a rare apple tree on site, and though not protected, was marked out of bounds to avoid any damage. A significant amount of buried asbestos was also found by the main grounds contractor (Interserve) which needed specialist removal, at a significant cost. The byelaw access tracks throughout the woods have been improved considerably, ensuring the public can walk on firm ground through the woods and the perimeter of the range can easily be maintained.

The tracks after refurbishment © Heidi Waggett

The challenges have been overcome by utilising specialist knowledge from teams within DIO e.g. SD Trg, Ecology, Access and Recreation, Technical Advisory Section and also through wider collaboration with external organisations, including Landmarc, Interserve, WYG, Litchfield Council and Hopwas Wood Community Group. This was a great project between SD Trg and Landmarc ensuring that a world class range fitted with the latest Small Arms Range Targetry System is available for our Armed Forces in the heart of the country.

Heidi Waggett
Regional Project Manager & Logistics and Contracts Officer
Defence Infrastructure Organisation

Early engagement is key to planning a successful military exercise

Grey seal population on a sandbank © Crown

The capability of British forces is underpinned by the provision of high quality training in realistic conditions. The outside world may be surprised to know that training is subject to assessment and monitoring to identify and mitigate possible adverse environmental impacts. The MOD's Defence Infrastructure Organisation (DIO) brings together military and environmental expertise to navigate the complex and challenging route of environmental assessment, mitigation, and monitoring, and an example of this is a recent exercise focused on the east coast of Scotland.

Leuchars Station, in Fife, South-east of Dundee, has been in military service for more than a century, and after decades of use by the RAF the site transitioned to Army control in 2015. It remains a busy military airfield, nestled between rolling farmland and coastal mudflats and dunes. It is surrounded by a wealth of protected sites and species, including the Eden Estuary Local Nature Reserve and Site of Special Scientific Interest (SSSI), Earlshall Muir SSSI, Firth of Tay and Eden Estuary Special Area of Conservation (SAC), Special Protection Area (SPA) and Ramsar site, and the Outer Firth of Forth and St Andrews Bay Complex proposed SPA. Specialist species protection concerning the 'harassment' of seals at haul out sites and added protection of white-tailed eagle breeding sites were other legal considerations in the assessment. These two species protection measures are specific to Scotland. The statutory designations reflect the international importance for wildlife of the area surrounding the station, particularly the coastal habitats that support significant breeding populations of seals and tens of thousands of wintering birds.

When new activities are proposed that may affect the integrity of protected sites the DIO Environmental Support and Compliance team, are on hand to manage the process of helping the military achieve their goals where possible while avoiding negative effects on the environment.

White-tailed eagle *Haliaeetus albicilla*, often described as 'the flying barn door' © David Kjaer

Wildlife around the airfield is largely habituated to conventional day to day activity, but when novel proposals have potential to affect areas with statutory designations a robust process exists to screen for potential impacts and, where needed, identify options to mitigate those impacts. One such proposal occurred in 2016, when a study of available options around the UK found that the logistical and training assets in and around Leuchars Station made it the most suitable site available as a base for a multi-service exercise required to provide specialist training in a variety of testing environments using air, land, and sea. An exercise of this scale had not been carried out from Leuchars before, and the proximity to designated areas with sensitive environmental features was identified as a possible constraint, particularly the high level designations of the SAC, SPA and Ramsar sites which are part of the European Natura 2000 network. Initial screening of impacts in these circumstances involves military exercise planners and DIO environmental specialists looking at broad details of the proposal to assess whether there are any suitable alternatives or obvious 'showstoppers', and if this stage is passed consultation moves on to the relevant Statutory Nature Conservation Organisation, in this case Scottish Natural Heritage (SNH).

MOD, like other public bodies, acts as a 'Competent Authority' under the Habitats Regulations and has a responsibility to avoid damage and significant disturbance to habitats and species at Natura 2000 sites as well as a legal obligation to make judgements regarding the likelihood of plans or projects to have a significant effect on the designated features that are present. As a major landowner managing nearly 80,000ha of Natura 2000 designated habitat within the UK estate, plus responsibilities for training on private land with designations, MOD is experienced with managing Habitats Regulations Assessments (HRAs) for a wide variety of projects.

A crucial part of the process is early involvement with a project as HRA can be a long process, and a key factor in whether it is feasible or not is timing and duration. In this case the exercise planner had already chosen five days in late summer for the core training activities which fortunately coincided with the end of both the bird nesting season and the harbour seal breeding season, and would be before the main build-up of migratory wintering birds and the onset of grey seal pupping, therefore a window of opportunity for this site where negative impacts were likely to be less significant. Discussion with SNH and other local stakeholders helped screen out likely effects on many protected features, and the HRA identified three remaining receptors that, without mitigation, could be adversely impacted by the exercise, namely rafts of seabirds off-shore that could be affected by parachute drops and fast boat transits, harbour seals completing their post breeding moult at haul out sites that could be affected by boat recovery or low flying aircraft, and damage to the sand dunes by vehicle movements.

The military exercise planner was fully engaged with devising suitable mitigation for the exercise, and agreed to incorporate restrictions on where boats could be recovered from, what speed they could travel inshore, and what routes vehicles could use, as well as including instructions to personnel to observe and avoid seals or seabirds that might be present in open water. Another consideration, although not included as part of local site designations, was the presence of white-tailed eagles nearby which have the highest level of legal protection in the UK, and airfield records confirmed that they were observed once or twice per month so could potentially be at risk from aircraft movements as well as posing a risk to aircraft themselves. Awareness would be raised for visiting aircrew but no special considerations required, as avoidance of birdstrike is

Exercise Chinooks over seal haul out © Crown

fundamental to safe operation of aircraft and many RAF crew are experienced with operations outside the UK where large raptors are widespread.

DIO concluded that there would be 'no likely significant effect' with suitable mitigation in place, and after further discussions with SNH agreement was reached and statutory consent issued for operations on the SSSI habitats, giving the green light for the exercise to go ahead with commitment to carry out monitoring of features noted in the HRA as well as protected species. When the time came the military planners were accommodating and transparent with regard to undertaking the monitoring, and despite the pressures of managing a very dynamic exercise were able to demonstrate that environmental responsibilities had been understood, communicated, and enforced.

Main grey seals haul out aerial count © Crown

One of the features closely monitored was the seal haul out on a sand bank under the approach to the main runway, and the species, number, and behaviour of seals was recorded two hours either side of low tide each morning in accordance with standard survey techniques, and observations were made during boat and aircraft activity nearby. Although the seals showed awareness of movements they generally did not demonstrate alarm, and the number choosing to haul out in the same area at the end of the exercise was the same as at the beginning which provided assurance that the mitigation had been successful. This casework monitoring is adding to our understanding of potential military impacts that can then be applied to other training scenarios.

Maintaining a positive relationship with other government bodies is fundamental to how DIO work when providing environmental support for military projects, using in-house experience and capability to ensure compliance with statutory responsibilities. Liz McLachlan, Area Officer for SNH who acts as the main liaison with MOD, said: *"In SNH we recognise the importance of providing good quality training for our armed forces and so throughout the country our operations officers provide advice to colleagues in DIO to enable their training exercises to be undertaken in accordance with environmental legislation and ensure that the impacts on the environment are minimised".*

John Black
Ecologist (North)
Defence Infrastructure Organisation

MOD hitting favourable targets on Salisbury Plain Training Area

Natural England field surveyor on Salisbury Plain SSSI in 2016 © Crown

Salisbury Plain Site of Special Scientific Interest (SSSI) remains a high priority for the MOD SSSI Condition Improvement Project. Defence Infrastructure Organisation (DIO) has funded over £0.8m of work on the SSSI in the last six years and in 2014 and 2015 Natural England undertook an intensive condition assessment exercise across the Salisbury Plain Training Area to see if this investment was paying dividends.

The SSSI is important for chalk grassland but includes a long list of interest features including rare plants, mosses, invertebrates, birds, juniper, great crested newts, a winterbourne and many more. In the Favourable Condition Tables (FCT) there are attributes and targets set for each feature, which are the basis for periodic assessment.

The recent assessment focussed on the chalk grassland and many hours of fieldwork were carried out by staff from Natural England. In total 282 grassland 'parcels' across 73 SSSI units (with an average size of 165ha) were surveyed. The extent of scrub and bare ground was recorded along with the abundance of positive indicator species (e.g. fairy flax *Linum catharticum*) and the amount of dead vegetation (known as litter) that was present.

Of the 73 SSSI units assessed, 43 were in Favourable condition and 29 were Unfavourable Recovering. Since the previous assessment in 2008 32 units have improved and four have declined with an overall increase of 5,170ha in Favourable condition. The main reason was a reduction in scrub cover ensuring a better balance between open grassland and scrub to cater for the varying demands of chalk grassland, breeding birds and species such as the duke of burgundy *Hamearis lucina* butterfly. This change is a direct result of scrub clearance work funded by DIO and undertaken by farm tenants as part of Environmental Stewardship agreements or MOD licence conditions.

Adonis blue *Polyommatus bellargus* © Marc Arbuckle

The main reason some units remain Unfavourable Recovering was that some areas appeared to be undergrazed. This is due to the complexities of grazing all parts of the SSSI (19,690ha) within the constraints of military training. A lack of regular grazing can result in a build-up of litter that shades out positive indicator species.

A large number of species features were also assessed in 2014 and 2015. The breeding bird assemblage was assessed as Favourable. This followed a survey of 100 x 1km squares to allow direct comparison with surveys in 2000 and 2005. The population trends showed an increase in populations of corn bunting *Emberiza calandra* and yellowhammer *Emberiza citrinella*. Three of the SSSI butterfly species adonis blue *Polyomattus bellargus*, brown hairstreak *Thecla betulae* and the duke of burgundy *Hamearis lucina* were also assessed in this period and all were in Favourable condition.

The Salisbury Plain assessment has helped take the proportion of SSSIs in Favourable condition on the MOD estate from 36.03% to 43.6%. It also made a very significant contribution to the government's Biodiversity 2020 target for all SSSIs in England, which aims to have 50% Favourable by 2020.

Further work is planned on Salisbury Plain to include the very large SSSI unit in the Central Impact Area (over 3000ha). This will include a detailed assessment of the marsh fritillary *Euphydryas aurinia* butterfly which is just one of the treasures that inhabit this remarkable place.

Oliver Howells
Senior Ecologist
Defence Infrastructure Organisation

Sarah Grinsted
Lead Advisor, Wiltshire Conservation Team
Natural England

Ballykinler Training Centre
Conservation below the radar

Galloway cattle have eaten off much of the rank grass from the dune systems © Antony Canniford

'Ballykinler is a place where the foxes walk past rabbits on their way to the shore for shellfish,' smiles Oisin Murnion. *'It's simply unique.'* Ballykinler Training Centre in Northern Ireland is certainly that. This Area of Outstanding Natural Beauty (AONB) is overlooked by the Mourne Mountains and it comprises part of a 6,000-year-old dune system, which is designated as an Area of Special Scientific Interest and Special Area of Conservation under both national and European legislation.

But all the environmental designations in the world would not protect the delicately balanced ecosystem at Ballykinler, unless the MOD's Defence Infrastructure Organisation had not embarked on an imaginative partnership with their tenant farmer.

This is where Oisin Murnion, his wife Anne-Marie, daughter Jolene and their hardy herd of Galloway cattle come in. The use of traditional breeds of livestock for conservation grazing is a well-established concept in the British Isles and the Murnion's have been using their Galloway cattle to improve the condition of the dune grassland and dune heath at Ballykinler for the last nine years.

The low intensity grazing has allowed native plants to flourish, which in turn has supported endangered species of insects and birds. This includes the rare marsh fritillary *Euphydryas aurinia*, as well as more common butterflies such as the dark green fritillary *Argynnis aglaja* and small copper *Lycaena phlaeas*. The hardiness and less selective grazing of the Galloways has also helped keep less desirable scrub and ragwort in check.

Alongside the grazing DIO has carried out large scale scrub removal and other management to tackle bracken, gorse and sea buckthorn that the cattle will not touch. Work is also done to protect the large seal colony on the sheltered beaches along with a red squirrel reintroduction programme. Between them these projects provide a safe haven for two of the most iconic mammals found in Northern Ireland.

Ballykinler camp was built around 1900, which means the unique natural landscape has been protected from the changing fashions in agricultural techniques. Much of its 1350 acres has remained untouched, unploughed and without chemical fertilisers in all that time.

Throughout the Troubles era conservation and ecological concerns have been far from anyone's priority. However, in the post-conflict era attitudes to conservation have slowly changed and today the Murnion's are working closely with DIO to be at the forefront of that change. Conservation grazing in the midst of a huge MOD training facility requires an enormous amount of patience, skill and co-operation.

As Jolene says, *'It has taken time to integrate the farming operation with military training. For example, we work around firing ranges and we have to respond quickly if cattle need to be moved from an area for operational reasons. There are advantages to having lots of soldiers around too. When our animals are calving we will often get a phone call during the night to let us know. It is a great partnership and a great adventure in conservation.'*

Sinead McAleavey
Independent Journalist

Merville Barracks Energy Consortium achieves a new energy first for MOD

ISO 50001 presentation to Merville Barracks Energy Consortium representatives © Crown

Merville Barracks Energy Consortium (MBEC) has been awarded ISO 50001 Certification, making Merville Barracks the first MOD establishment and the first Business Unit within Sodexo UK & Ireland to attain this Standard and lead the way in providing an energy efficient site. This is a considerable accomplishment, that has been achieved through the introduction of a joint Energy Policy which identified the Who, What, Why, When and How to help the consortium secure these aims. Underpinned by an Energy Management System that will guide activities and monitor how well MBEC is doing against the energy efficiency targets.

MBEC was set up in late 2014 in response to the introduction of ISO 50001:2011, which is an International Standard that has guided efforts to improve energy performance management and achieve reductions in greenhouse gas emissions.
The membership consists of Defence Infrastructure Organisation PFI Contract Management Team (CMT), RMPA (Services Provider) and Sodexo Defence (Key Contractor to RMPA).

Energy initiatives have and will be driven by personnel from all departments and this includes military, civilian and contractor staff. What we do as individuals affects the environment both locally and globally, and the MBEC support staff in their efforts by investing in and supporting the design and purchase of energy-efficient products and services wherever possible across Merville Barracks.

Through this certification it is possible to change behaviour and influence those around us. Everyone can play their part, by turning things off rather than leaving them on stand-by, by turning heating down rather than opening windows or by adjusting building heating timings and settings. This was achieved by members of the consortium who ensured all staff new to Merville Barracks were fully briefed on energy use awareness and the meaningful contributions they could make to produce savings. Relevant items being put on standing orders, posters displayed on notice boards in more than 100 buildings encouraging changes in behaviour, reminders are issued before periods of block leave to turn off electrical items, a 'Waste Less' week promoting and sharing energy saving tips together with a quiz entry. Targeting energy in kitchens, messes and retail areas, and over 500 colleagues were engaged in the energy awareness and driving tips campaigns.

MBEC members are fully aware of their responsibilities towards energy conservation, and through best practice, innovation and collaborative working they have not only maintained the standard but strive to exceed expectations.

Merville Barracks is operated through a Private Finance Initiative, and became fully operational in 2008. Although existing energy and water performance requirements are complied with, there have been numerous advances in technology which means there is more that can be done to improve the usage of energy and water. So the repairs and lifecycle process now includes procedures to ensure consideration for energy efficiency prior to purchase decisions and the design phase of projects and operations. For example, the Junior Ranks Single Living Accommodation lights have now been replaced with LEDs.

It is everybody's responsibility to manage utilities at work and home efficiently. The easiest solution is to think about when energy is used and aspire to use less. This is important with a growing world population, decreasing fossil fuels and the impact on the world's environmental, economy and security future. These behaviours are key to energy efficiency success.

Genise Heddell
Authority Services Adviser
CMT PFI Colchester
Defence Infrastructure Organisation

Could the **Salisbury Plain** whinchats help us understand migrant bird declines?

A male whinchat with a geolocator attached © Ian Henderson

In the last 30 years, populations of Afro-Palearctic migrants (birds that winter in sub-Saharan Africa and breed in Europe) have declined. Despite much research into this area, the reasons for this decline are still not well understood. Part of the problem is that migrants spend time in several different areas: their breeding grounds, their wintering grounds and any places they stop at on their migratory route. This means they are vulnerable to habitat change, hunting or other negative human influences in any of these areas, but it is difficult to follow the birds year round to determine where their mortality is highest. For many species, migratory routes are still poorly known and very little work has so far been conducted on these species in their wintering grounds in sub-Saharan Africa – due to the difficulty and expense of working there. This makes it more complicated and difficult to legislate to protect migrant species than it is for non-migrants.

To try to better understand what might be causing the decline, the whinchat *Saxicola rubetra* was chosen as a study species for a recent PhD project on the MOD's Salisbury Plain Training Area (SPTA). Whinchats are ground nesting, grassland, insectivorous, Afro-Palearctic migrants. They have declined by about 60% in the UK since 1994 and are now mostly restricted to marginal upland habitats. Whinchats are a good study species: they are territorial and only raise one brood of offspring each year making it easier to follow the same pair for a season and to calculate their breeding success. They are also relatively site faithful (meaning the same birds can be followed year after year) and are becoming increasingly well studied across Europe. This means we can make broad scale comparisons between whinchat populations from different habitats and get a better understanding of what is limiting their population. SPTA is a particularly good area for whinchats –it contains roughly 2% of the entire UK whinchat population and boasts one of the few remaining lowland whinchat populations in Europe.

Each summer from 2012 to 2014, the whinchats on the west of SPTA were monitored. Nests were found for all pairs in the study area and followed to determine breeding success. The whinchats were marked with colour rings (see photo, bottom right) and re-sighted via regular surveys to measure the survival of adults and young birds. Additionally, the habitat structure and food availability was measured in whinchat territories and in non-territory areas. The results of this work when compared to studies of other migrant birds with similar life histories and other whinchat populations in Europe revealed some interesting differences in the Salisbury Plain whinchat population.

The SPTA whinchat population appeared to have stayed relatively stable over the last 10 years compared to the declining UK whinchat population. However, looking at the

A whinchat nest © Andrew Bray

population trend in more detail and measuring the rate of reproduction, death and survival, revealed that it is actually not self-sustaining and is maintained purely by high immigration from whinchats originating elsewhere.

The invertebrate food supply on SPTA was plentiful with whinchats producing nestlings in good condition and very few nestlings starving to death. However, compared to other whinchat populations, fewer offspring were produced per pair than would be expected. Out of the 199 nests monitored over three years, 69% failed to fledge any nestlings, and on average only about two fledgling whinchats were produced per breeding pair. This low productivity is mainly due to the large number of predators on SPTA – 89% of the failed nests were predated. From temperature recorders placed in the nests it was possible to determine the time each nest was predated. These sensors revealed that most nests were predated at night, which suggests the nestlings are being predated by nocturnal mammals such as foxes, badgers, stoats and weasels. So despite the high quality of the habitat on SPTA the whinchat population is still struggling due to high predation.

Another factor that might be influencing whinchat population trends is overwinter survival. Survival of fledglings into their first breeding year was found to be low relative to other similar species. However, as survival rate calculations cannot distinguish between the death of a bird or the bird simply moving outside the survey area, it is not possible to be sure that first-year survival was really as low as it seems. Adult survival was about 50% for a SPTA whinchat, which is similar to other Afro-Palearctic migrant birds, but as these species are also declining it may still be too low.

A colour ringed male whinchat about to feed his nestlings © Jennifer Taylor

Despite the detail of this whinchat study, more information is needed on the other half of the whinchats life-cycle – in particular where they migrate too in Africa and what route they take. This information can help to guide conservation action aimed at reversing the decline in whinchats by determining if low first-year survival really is a problem and if adult survival could be improved by making changes to wintering grounds or stop over sites on route. This year the British Trust for Ornithology is aiming to track a sample of whinchats using geolocators, small electronic devices weighing about 3% of the birds body weight.
The geolocators can be harmlessly attached to the back of the birds like a small backpack and store information about where they go in the winter (see main picture).

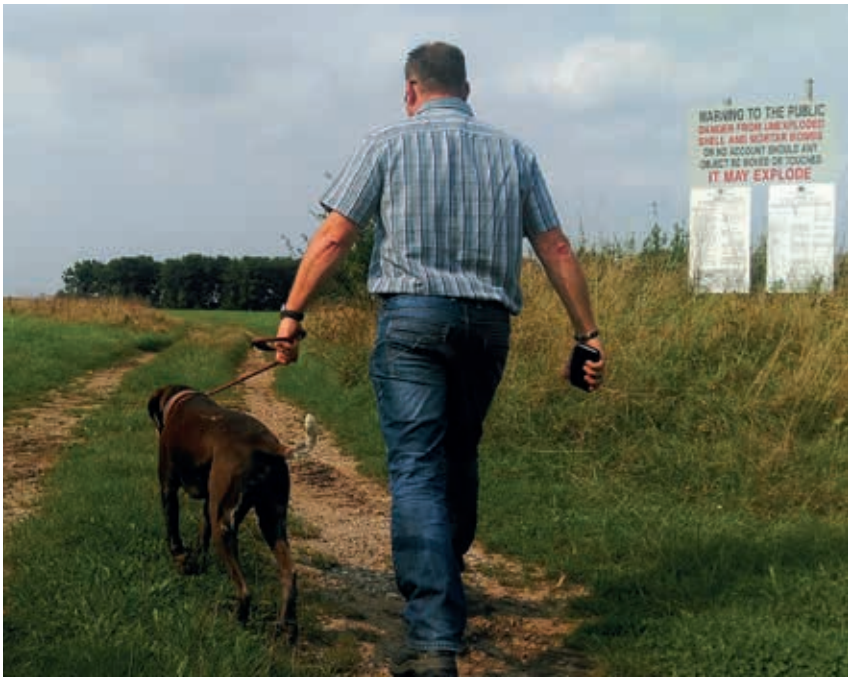
The project is run as a partnership with funding from, the Wiltshire Ornithological Society, BTO and MOD with support in the field from the Larkhill Conservation Group.

Thanks to the MOD for enabling access to collect data, especially WOI Elson who was extremely helpful during times of busy military activity. Also, thanks to the DIO ecologists for information on the Plain management and the MOD conservation group for helping with surveys and fieldwork.

Dr Jennifer Taylor
Spatial Ecologist
British Trust for Ornithology

Dr Ian Henderson
Senior Research Ecologist
British Trust for Ornithology

DIO advisory leaflet invites dog walkers to paws for thought



There has been a lack of understanding as to what you can and can't do with your dog across the estate © Crown

Traditionally dog walking is considered one of the most intensive recreational uses of the countryside. It is estimated that nationally the number of pet dogs has increased from 6.5m in 2000 to 8.5m in 2016 (Pet Food Manufacturing Association). In recent years, in parallel to a rise in dog ownership, DIO has seen an increase in both recreational and commercial dog walking, along with the challenges they create. DIO recognise that these challenges are not specific to the MOD, and wanted to try and address the issue with a focus on the training estate as a whole.

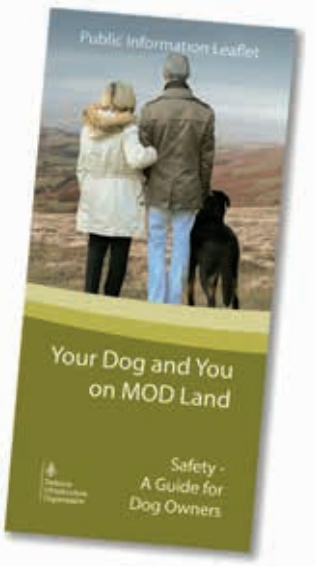
Across the estate there has been a noted increase in dog mess and dog walkers straying from public rights of way or ignoring restrictions within managed access areas. The reasons for this increase are varied, including new housing development and an increased use of commercial dog walkers. From an MOD perspective at the core is also a lack of understanding as to what you can and cannot do with your dog across the estate.

The MOD estate is used for a variety of military training, ranging from heavy armoured vehicle manoeuvres, to simulated land battles, to more covert, tactical training. All pose a risk to the unaware dog walker.

Additionally, there is often a risk from unexploded ordnance, smoke flares and battle simulators which could all cause injury to a dog or their owner. It is therefore essential dog owners are informed of these threats and how best to avoid them.

It is not just the risk to themselves that dog walkers need to be aware of. There is also a risk to training troops, staff and the wider public, particularly children, from dog faeces. A host for *Toxicara Canis,* commonly known as roundworm, exposure can lead to Toxocariasis in humans. This can cause serious illness and even blindness in children. For the benefit of everyone, it is extremely important that dog faeces is picked up and disposed of appropriately.

Following a long-term aspiration to develop material promoting responsible dog owner behaviour across the estate the DIO ART Team will be publishing a new advisory leaflet. Not only does it recognise and promote responsible dog walking, it also clearly explains when access can be restricted or prohibited. Not wishing to reinvent the wheel, it incorporates important guidance seen in the Natural England Countryside Code, broadened to make it bespoke to the MOD requirement. Working closely with key stakeholders, including DIO SD Training and the Kennel Club, DIO ART have ensured that the message is targeted appropriately and complement other best practice leaflets that are available.



Once published, it will form part of the ongoing campaign to raise awareness of safety across the rural training estate. Copies will be produced and shared amongst sites where dog walkers have a strong presence and will also be available online.

This information can be used by the public to manage their walks on the Defence Estate accordingly, making sure that visitors are not putting themselves, their dogs and training troops at risk.

Mark Sumner
Access and Recreation Advisor
Defence Infrastructure Organisation

Secondments Developing staff and working with partners

Bog myrtle *Myrica gale* found on wet, acidic, peaty soil at Shapwick Heath © Steve Parker

The Defence Infrastructure Organisation (DIO) has a team of ten ecologists with a broad range of skills and experience. However, DIO is always seeking ways to develop staff and a secondment to Natural England (NE) was recently undertaken by Hanna Etherington. This was a reciprocal arrangement, with Paul Edgar (NE Senior Environmental Specialist) joining the DIO team. This proved to be a valuable opportunity for both organisations to share skills and develop stronger links.

The secondment was for three months and Hanna joined the NE Field Unit (NEFU). NEFU was formed relatively recently as an in-house resource to develop technical skills, particularly in field ecology. The unit supports the work of NE Area teams by carrying out surveys, providing management advice, undertaking Integrated Site Assessments (ISA) and supporting progress towards Biodiversity 2020 targets for the condition of Sites of Special Scientific Interest (SSSI). This provided a fantastic opportunity for Hanna to develop her field skills and land management expertise from national specialists and a highly experienced mentor.

The key projects undertaken by Hanna Etherington were;

- Support fieldwork required for the Salisbury Plain SSSI ISA to formally assess the condition of the site on Salisbury Plain Training Area (SPTA). Hanna has worked extensively on SPTA and this was an opportunity to raise awareness amongst NE staff of the military use, history and challenges of managing the UK's largest military training area. The secondment helped significantly to deliver this large scale survey involving up to 30 people on the ground, which led to successful outcomes for both parties.

- Design and initiate a monitoring strategy for a mire restoration project at Shapwick Heath SSSI/SPA/Ramsar. This was to assess the impact of various management approaches on three SSSI units where mire restoration is being undertaken. A National Vegetation Classification survey was also undertaken.

- Survey and map the extent of heathland communities at Crook Peak to Shute Shelve Hill SSSI/SAC and assess its condition and importance in relation to the other designated habitats on the site.

- Undertake a baseline evaluation on a MOD tenant's Higher Level Stewardship Agreement.

- Assist with an ISA at Povington and Grange Heaths SSSI/SAC/SPA/Ramsar on the MOD site, Lulworth Ranges. The SSSI includes mire, wet heath, dry heath and pockets of acid grassland habitat.

These projects enabled Hanna to develop existing skills but also to increase her understanding of a range of other habitats such as heathland and mires. She gained additional insight into the ISA methodology, Environmental Stewardship and other high priority NE casework. It also gave her an opportunity to work at MOD sites she had not worked at before.

Bog pimpernel *Anagallis tenella* © Marc Arbuckle

This secondment was recognised by both NE and DIO as a great success and an effective way to promote better partnership working whilst delivering personal development goals and individual training requirements. Andrew Windrum of NEFU said, *'We share a lot of expertise which, when combined, enables us to make some great progress in delivering our work.'*

Hanna Etherington
Ecologist
Defence Infrastructure Organisation

Migratory tracks and an assembly site for tropical pelagic seabirds

Members of the Army Ornithological Society expedition to Ascension Island in 2016 © R. Moody

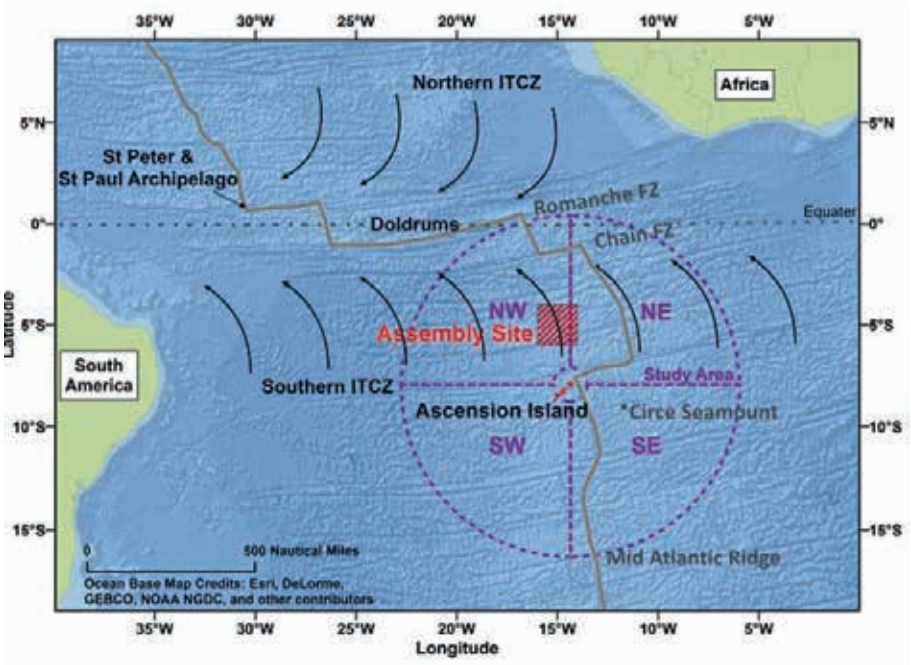
It is well known that pelagic seabirds spend most of their life far out to sea but just where they go or when they leave their breeding colony is unclear.

The Army Ornithological Society (AOS) has monitored seabirds on Ascension Island in the tropical South Atlantic for 25 years. Over the years the study has progressed from monitoring population size to ringing 25,000 seabirds and collecting samples of blood and contour feathers for stable isotope analysis. Recent research has focused on identifying at-sea migratory tracks and assembly sites for pelagic seabirds. Sites where seabirds assemble indicate areas of high marine biodiversity. Migratory tracks and assembly sites can be identified by fitting geolocators (tracking devices) to seabirds.
A geolocator collects light data that allows calculation of sunrise and sunset and hence day length at locations where the bird is. Retrieved data are 'date and time stamped' and from sunrise it can estimate longitude and from day length estimate latitude.

A sooty tern fitted with a geolocator © R. Dickey

Sooty terns *Onychoprion fuscatus* are a common and widespread tropical seabird that only comes to land to breed. Of the seabirds on Ascension Island 95% are sooty terns. These terns migrate during the non-breeding season but just where they go was a mystery. Sooty terns do not have waterproof feathers and do not rest on the sea thus if they are not near land they have to remain on the wing. During breeding seasons between 2012 and 2016 the AOS fitted 70 geolocators to sooty terns and in the following seasons managed to recover more than 20 of the devices. The results await a full analysis but what is clear from the migratory tracks are that sooty terns forage over pelagic tropical waters to the north of Ascension Island.

Using a combination of data sources to identify an assembly site for pelagic seabirds in the tropical Atlantic Ocean. Data used includes migratory tracks of seabirds published in ornithological journals, at-sea records collected by the Royal Navy Bird Watching Society during trips to and from the Falkland Islands and on-land direction-timed counts of seabirds returning from foraging trips to identify an assembly

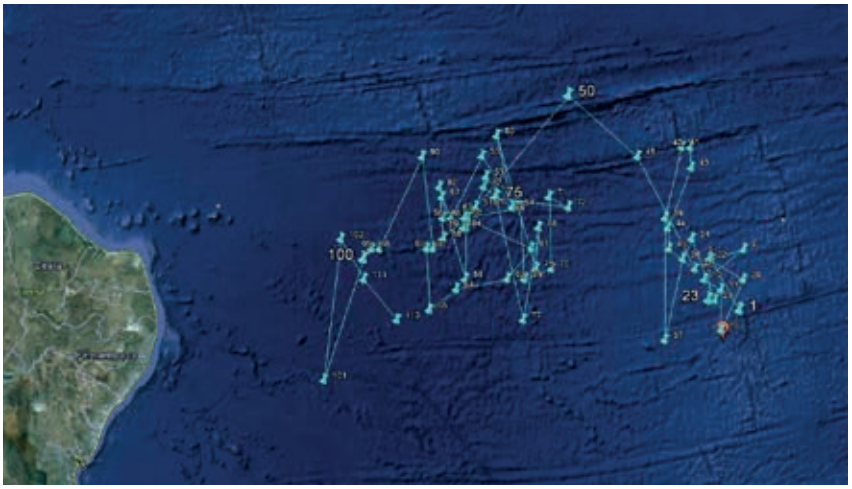


Ascension Island study area and location of pelagic seabird assembly site © A. Giles

site for seabirds. The marine study area was waters within 500 nautical miles (M) of Ascension Island. The study area encompassed Ascension territorial waters and ≈ 2 700 000 km^2 of 'high seas' (i.e. international waters) south of the equator.

During the search of ornithological journals reports were found and geolocator tracks of eight species of trans-equatorial migrant seabirds that crossed the equator mid-Atlantic. The Royal Navy's world database for seabirds sighted contained 126 sightings of seabirds in the study area. Dates of sightings were used to identify temporal peaks in abundance. To estimate relative square abundance of species, the relative occurrence of sightings in 2° × 2° grid squares was examined. To identify the direction of flight used most frequently by foraging seabirds that breed on Ascension Island, sea watches were conducted by the AOS. More than 600 five-minute timed counts and details of flight directions of seabirds returning to the island were recorded. The rate of passage was calculated as the number of birds flying past the sea-watch site per hour.

The three independent datasets (i.e. migratory tracks of seabirds, at-sea records and on-land counts of seabirds) provided evidence of an assembly site at 14-16°W and 4-6°S. Indicators that this location is an assembly site are that two or more individuals of 20 species co-occurred in the site on two or more occasions; multiple seabird species were recorded in the site between 1957 and 2012 with peak aggregations occurring in two months of the year (i.e. April and November); more than 3,400 tropical seabirds from Ascension used the site daily and the species recorded in the assembly site breed in the four distinct geographical regions represented by the Arctic, the Antarctic, at mid-latitudes and on tropical Islands. Of the 20 species recorded on at least two occasions at the assembly site, eight (40%) were tropical seabird species known to breed on Ascension Island. The breeding locations of trans-equatorial migrants recorded at the assembly site were split equally between the Arctic, Antarctic and mid-latitude regions with four species (20%) breeding in each region.



Location of an Ascension Island sooty tern during migration © J. Reynolds

Assembly sites at sea are widely acknowledged as potential indicators of locations of marine biodiversity and important assembly sites provide a significant rationale for conservation action. Ascension Island waters have been identified as a 'Hope Spot'; a place that is critical to the health of the ocean. In January 2016 waters around Ascension Island were designated a Marine Protection Area (MPA) but scientific research to scope the final boundaries of the marine reserve is needed. The AOS is pleased to have contributed to this research. The migratory tracks of sooty terns and the assembly site for pelagic seabirds that have been identified provide evidence for establishing the boundary of the Ascension Island MPA. The findings are important because no migratory tracks of sooty terns or seabird assembly sites have previously been identified in pelagic waters around Ascension Island.

Open access to our research is available at **www.armybirding.org.uk/what-we-do/ascension**

Dr B. John Hughes
Army Ornithological Society

AWE sustainability in action
pride, trust, excellence and innovation

LED site lighting, powered by wind and solar panels © AWE

AWE is proud to have played a central role in defence of the UK for more than 65 years, providing the UK's nuclear warheads, including those for Trident, the current UK Continuous At Sea Deterrent. It relies on a reliable and resilient operation, underpinned by new build, refurbishment and demolition projects, utilising highly specialised assets and supporting infrastructure, to deliver this vital programme.

AWE's Head of Environment, Peter Caddock, said: *"At AWE, our aim is for capital project teams to view sustainable construction as fundamental to their way of working. For us, the sustainability agenda is about innovation, engaging people and cost-effective business performance, and we see it as an integral part of our mandate to deliver enhanced value to the nation. Our experience has shown that adopting a positive sustainability culture delivers benefits across the board, both within the organisation and outside, for our external stakeholders and the wider community.*

AWE plays an important role as part of the nation's defence nuclear programme and, with over 5,000 people working at a number of complex and diverse sites, operating in a responsible and sustainable manner is key to our future success. We have a variety of construction projects, from high profile and complex capital projects to smaller scale refurbishments, from infrastructure upgrades to demolition of redundant buildings.

These will collectively deliver us the modern, efficient and effective estate needed for the delivery of our future programme and our challenge is to ensure that this programme is delivered in a responsible and effective manner with minimal environmental impact."

As part of this work, and in support of its company values – Pride, Trust, Excellence and Innovation – AWE seeks ongoing environmental performance improvements via its ISO14001- certified Environmental Management System.

In the waste arena, this has seen the target for diversion of construction and demolition waste (excluding Controlled, Radioactive and Explosive waste) from landfill raised to 90%, in line with its corporate Sustainability Plan. In fact, in recent years, AWE has exceeded this target, achieving a 99% landfill diversion rate. Capital projects use the Inert Aggregates Protocol, Materials Management Plans and on-site Waste Exemptions to coordinate the recovery and treatment of demolition waste from one site for re-use as engineered fill on another. On-site concrete batching has meant significantly reduced numbers of concrete deliveries.

Through its re-use of waste concrete and subsoil, AWE has achieved significant savings, with more than 2,500 tonnes of waste concrete crushed and re-used, 25,000m^3 of soils re-used, and 850 tonnes of aggregate and subsoil re-used. This has delivered the triple benefits of reducing levels of waste heading for landfill, reducing the company's reliance on costly virgin aggregate and reducing the carbon footprint for both delivery and disposal operations.

Re-use of waste concrete and subsoil has achieved significant savings © AWE

A sustainable approach to use of resources has also been successful, resulting in reductions in the volume of material sent off site and brought onto site and the number of vehicle movements.

Swans enjoying one of the ponds © AWE

Projects across the AWE portfolio are employing a variety of innovative measures to minimise waste generation. These include on-site wormeries for food waste from the canteens, on-site treatment of concrete wash-out water, an envirowash system to process paint-wash waste and even selling offcuts of untreated timber, with the proceeds given to charity.

AWE has a team of dedicated environment and waste professionals, who are fully integrated within the construction teams. This embedding of skilled and enthusiastic professionals has driven a positive sustainability culture and ensures environmental protection issues are given a high profile. This has resulted in construction staff increasingly wanting to 'do the right thing' by demonstrating their own individual commitment and championing initiatives to improve overall environmental performance.

Other examples of sustainability in practice include the installation of a 130m^2 sedum roof on a service building, providing a diverse range of microhabitats for insects, birds and wildlife. Sustainable Urban Drainage System (SUDs) ponds have both pollution management and wildlife amenity benefits and there is extensive use of wildflower grassland turf to increase biodiversity with the added advantage of a reduced maintenance regime. Nesting boxes for house martins have replaced nesting sites lost to window replacement work, while the installation of state-of-the-art LED site lighting, powered by wind and solar panels, has contributed to a reduction in site carbon footprint.

Because AWE's sites are located in built up areas, the company strives to minimise the impact that its construction activities have on local communities. This includes a targeted engagement programme to keep communications channels open and dynamic. A group of local parish and district councillors meet AWE managers quarterly as the Local Liaison Committee, where they receive briefs on forthcoming construction works and sustainability-related issues, including AWE's charitable work, sustainable construction programmes and site ecology and heritage.

AWE also carries out 'Voice of the Stakeholder' surveys and, in 2015, held a showcase event to explain more about the business. More than 400 local residents attended and heard how AWE is having a positive impact by reducing traffic movements and encouraging local wildlife.

AWE's occupational learning scheme educates contractors about the importance of sustainability and the benefits that 'getting it right' can have on a project. The company has found that sustainable construction adds value in environmental, social and economic terms. It promotes best practice and continuous improvement and, anecdotally, these lessons have regularly been taken on to other projects outside AWE.

Adele Graham
Senior Environmental Specialist
AWE

Marsh fritillaries break all the rules at Castlemartin

Devil's-bit scabious *Succisa pratensis*, the caterpillar's foodplant © Deborah Sazer

The marsh fritillary *Euphydryas aurinia* is a rare and stunning butterfly whose population is under threat across Europe. Even in Wales, one of the butterfly's strongholds, many populations have contracted or disappeared over the past fifty years. That is why MOD Castlemartin Range in south Pembrokeshire is critical to its future. It is home to the butterfly's largest Welsh population, and one of the largest in the UK. Clearly, MOD / Landmarc Support Services' management in consultation with Natural Resources Wales (NRW) is a success.

Castlemartin's marsh fritillaries break all the rules. Typically, Welsh populations occupy damp, tussocky 'rhos' pasture with purple moor-grass *Molinia caerulea* and abundant devil's-bit scabious *Succisa pratensis* (the butterfly's larval foodplant). 'Tussocky-ness' is believed to be critical, providing shelter and hibernation niches for developing larvae. This structure is usually maintained by light cattle or pony grazing, but not by sheep, who love to eat the scabious.

In contrast, Castlemartin's marsh fritillaries live in short, open and wind-swept maritime and dry calcareous grassland and heath. The habitat is lightly grazed by cattle but also sheep. The usual requirement for a protective tussocky sward is apparently unnecessary in Castlemartin's mild coastal climate and well-drained, south and west-facing cliff-top limestone grassland and heath. The other key to the Range's exceptional butterfly population is the enormous and well-connected extent of scabious all along the coastal strip.

Flower-rich grassland and heathland survives at Castlemartin because, under MOD management, it escaped the agricultural 'improvement' that damaged or destroyed most of the UK's unimproved grassland over the past hundred years. MOD Castlemartin training area is so important for wildlife that it has been designated a Special Site of Scientific Interest, while the coastal strip is included in the Limestone Coast of South West Wales Special Area of Conservation.

NRW commissioned a marsh fritillary habitat survey on the Range in 2015, where 33ha of good condition habitat were recorded, along with 40ha of 'suitable' habitat – land with good potential to support marsh fritillaries under improved management, such as a slight reduction in grazing intensity. This amount of habitat far exceeds NRW's definition of 'favourable condition' for the butterfly.

The marsh fritillary *Euphydryas aurinia* © Deborah Sazer

The management task at Castlemartin is complex. The needs of the Range's many key species and habitats must be balanced with the MOD's own training requirements. There are small issues, such as accidental burns, that can be easily resolved. Current grazing levels are good, and the needs of other key species which require very short turf, such as chough *Pyrrhocorax pyrrhocorax*, can be accommodated in areas that are less suitable for the butterfly. Future monitoring of this rare population and the maintenance of suitable management should ensure the long-term future of Castlemartin's exceptional marsh fritillaries.

Dr Deborah Sazer
Ecologist

Delivering social value across the Defence Training Estate

Youngsters at Gatehouse Primary School benefit from exciting new outdoor play facilities after Landmarc and DIO donated time and money to create a new playground for the children © Landmarc Support Services

The Public Services (Social Value) Act was passed in 2012 and requires public bodies in England and Wales to consider how the services they commission and procure might improve economic, social and environmental wellbeing. Procurers look for contractors who can maximise the positive impact of their investment beyond value for money by perhaps creating employment opportunities, or reaching diverse social groups, or tackling social issues that are relevant to the area where money is being spent.

In partnership with the Defence Infrastructure Organisation (DIO), Landmarc Support Services (Landmarc) manages and operates military training facilities across the UK. The nature of our work means that we are closely integrated with local communities, often in remote areas, so the implementation of this new Act has provided the perfect opportunity for Landmarc to work with DIO to embed social value across its day-to-day operations.

Whilst many of Landmarc's contractual services include deliverables that enhance the environment for local communities, including the management of heritage, nature conservation and public access areas, delivering social value requires something extra. It needs to be woven through all areas of business and should reflect the interests of its stakeholders. As a result, Landmarc engages with DIO, suppliers, tenants and military users of the estate and those who live and work alongside it to develop and implement initiatives that are both relevant and deliver sustainable value.

> Landmarc has been instrumental in pioneering the Act throughout government and industry

A rural investment scheme, Landmarc 100, provides funding and mentoring for people local to the training estate with innovative business ideas. A Rural Enterprise Hub is also available in Wiltshire, offering office space and meeting rooms for local entrepreneurs.

Landmarc Managing Director Steve Utley and DIO's Liz Richardson received one of the first Cabinet Office Social Value Awards from Social Enterprise UK Chief Executive Peter Holbrook © Landmarc Support Services

A Community Interest Fund provides funding for local projects in both military and rural communities and Landmarc seconded a member of staff to work as a Business Connector in rural Northumberland for 12 months as part of its involvement with Business In The Community (BITC). Most recently and as part of BITC's national volunteering day, Give and Gain Day, Landmarc launched its Employer-Supported Volunteering Scheme, Be The Difference, to enable staff to take paid time off work to support community projects. This is supported by a commitment to employ and invest in local people through training, apprenticeships and graduate opportunities and to use local suppliers where possible.

Landmarc has also been instrumental in pioneering the Act throughout government and industry, joining forces with Social Enterprise UK to launch the UK's first Social Value Summit in 2013. This event has grown considerably, culminating in the Cabinet Office's first Social Value Awards in 2016 where Landmarc won the 'Promoting and Mainstreaming the Social Value Act' category.

Whilst the foundations have been laid for the continual development of measurable social value initiatives for the training estate, the challenge now is to ensure that the benefits are enduring for Landmarc, DIO, our employees, users of the training estate and our communities.

Mary Lavin
Sustainability Advisor
Landmarc Support Services

National Pollinator Strategy
five simple steps to help our bees

Four-banded flower bee *Anthophora quadrimaculata* © Marc Arbuckle

Changes to the British landscape over the last century means pollinators are encountering many pressures, and not all can find the food and shelter they need. This is why it is a priority for Government and others to take action to support them. With a 235,500ha Defence estate, covering approximately 1% of the UK's land mass, the MOD has for many years taken the initiative on projects that benefit pollinators, primarily driven through the efforts of their local Conservation Groups. Defra's National Pollinator Strategy has given the MOD the opportunity to not only reflect on past achievements, but provide ongoing positive contributions to the Strategy. This initiative has the ultimate aim of bringing about the best possible conditions to support bees and other insect pollinators.

In addition to the endeavours of the Conservation Groups, the MOD has been proud to collaborate with organisations such as Plantlife, National Parks, Wildlife Trusts and of course their very own tenant farmers to set up suitable areas for pollinators to thrive and in some cases this has led to the creation of wildflower meadows.

The National Pollinator Strategy has allowed MOD to inject new formal policy into the SSSI management programme, led by the MOD Ecology team, which has strengthened business cases and resulted in support from the MOD Conservation Stewardship Fund.

Defra has been working with its delivery bodies, other Government departments and stakeholders to lead action to support pollinators. Bees' Needs Week earlier in the year promoted advice on supporting pollinators to families, gardeners, farmers, developers, land owners and local authorities, encouraging them to follow five simple steps:

- Grow more flowers, shrubs and trees
- Let your garden grow wild
- Cut grass less often
- Don't disturb insect nests and hibernation spots
- Think carefully about whether to use pesticides

The National Pollinator Strategy builds on Defra's existing work on habitat creation, species conservation and honey bee health. The Countryside Stewardship scheme, through the Wild Pollinator and Farm Wildlife Package, will play a key part in helping farmers create new pollinator habitats and sympathetically manage their land. Since 2010, Defra has helped create over 290,000 acres of field margins, wetlands, woodlands and other habitats which play an important role in supporting pollinators.

Defra has also ensured that through its Landscapes for Wild Pollinators Initiative, expert advisors partner with corporate and major land owner interests to provide co-ordinated advice on landscape and pollinator management. It has also financed Local Nature Partnership pollinator projects to provide benefits across communities in five areas across the country.

Further details about the National Pollinator Strategy can be found at **www.gov.uk/government/news/bees-needs-food-and-a-home**

Emily Musson
National Pollinator Strategy
Defra

Stewart Guy
Senior Manager Statutory Designations & Compliance
MOD

Around the regions
with the conservation groups

There are over 125 Conservation Groups operating across the MOD.
The following section provides an update on the dedicated work of some of these groups.

1. Spotlight on... **Newtown Range** Isle of Wight
2. **MOD Boscombe Down** Wiltshire
3. **Altcar Training Camp** Merseyside
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22. **Senne Training Area** Germany

Spotlight on... **Isle of Wight**
Newtown Range Conservation Group

The two peregrine falcon chicks in the nest on the osprey platform. Not a bad second choice © Crown

It's been a busy year in the Newtown Ranges Camp and Training Area with the weekend usage running at 84%; the regular customers enjoyed their stay as have the first timers who have booked to come again.

In addition to the cadets, this year has seen a good variation of units, including: HMS King Alfred RNR, 43 Sig Sqn, RN Kayak Course, Army Med Services, 4626 (AE) Sqn RAF, HQ Army and 10 QOGLR RLC from Aldershot, they stayed a week and carried out adventure training on the island which included; cycling, kayaking and mountain biking. Their stay culminated with a traditional curry night. Staff were invited to join them, which obviously could not be refused.

How the osprey platform sits in the Range landscape, the platform is marked by the white circle © Crown

Date	Description of event
10 April	Alerted to a peregrine call during skylark survey. Female falcon perched on one of the osprey poles
19 April	Sitting on nest on osprey pole
26 May	Sighting of chicks
02 June	Confirmed two young being fed
09 June	Sought advice from Roy Dennis (expert on osprey) about ringing chicks
11 June	Anthony Roberts Class A ringer on Island; he arranged licences from BTO and asked for assistance from Scottish Southern Electric in the form of a cherry picker
19 June	Two ringers lifted in cherry picker, measurements taken and chicks ringed
28 June	Chicks growing and moving around the nest
03 July	One chick flew from nest to nearby tree
05 July	Both chicks left the nest

At the Newtown Range Conservation Group AGM in November the membership celebrated its 40th birthday and the volunteer subject experts reported on their Newtown Range activities throughout the year.

A certificate acknowledging the groups 40 years in conservation was awarded by the Defence Infrastructure Organisation's Environmental Support and Compliance Team (DIO ES&C). A glass was raised and candles blown out in celebration of the achievement and yet another very successful year in conservation.

On the 10th May, during the conservation group open day and wildlife walk, Iain Perkins from DIO ES&C, representing the MOD, presented Bill Shepard, Terry Rolf MBE, Barry Angell and John Willmott with individual certificates to mark 40 years of long standing contribution to conservation.

Special mention should be made of a rare micro moth which has been discovered on the Range meadow, the large gold case-bearer *Coleophora vibicella*. This threatened species is being monitored closely and has attracted national interest.

Scottish and Southern Electric's 'cherry picker' used to help reach and ring the young peregrines © Crown

John Willmott, the conservation group's ornithologist, religiously carries out a BTO Wetland Bird Survey (WeBS) every month and it was during one of his WeBS counts that he spotted the peregrine falcons *Falco peregrinus*. John was responsible for the siting and erection of the three osprey platforms which were installed four years ago – with no sign of activity until 2015 when the peregrines decided to nest.

Bird ringing is carried out on the Range on a regular basis overseen by BTO licenced ringer Jim Cook. Jim produces an annual report for both the conservation group and the BTO who have declared the Range to be a site of importance on the Isle of Wight – particularly for nightingales *Luscinia megarhynchos*. Tabulated opposite is an extract from John's comprehensive notes on the peregrine falcon nesting.

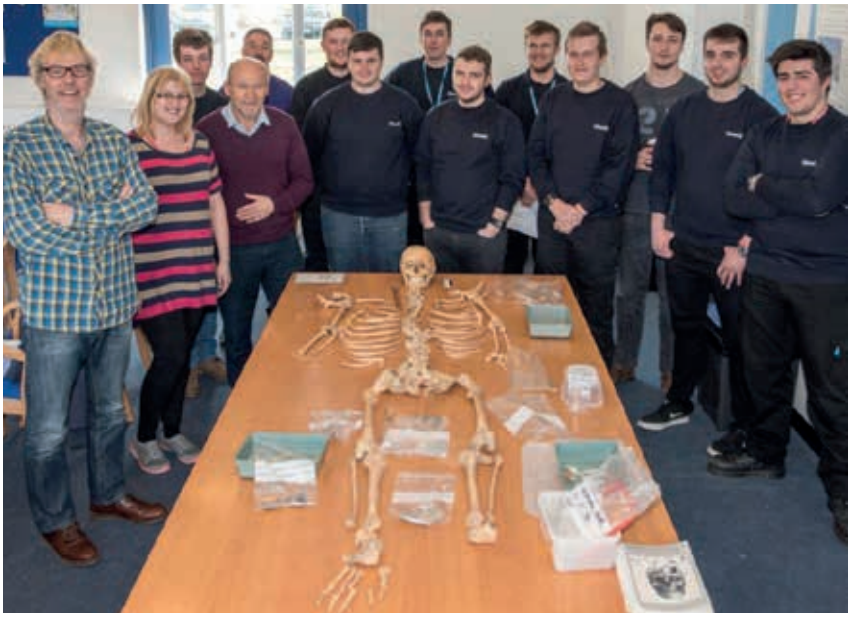
Since fledging, all four birds have been seen from time to time creating havoc around Newtown NNR as the juveniles learn to fend for themselves. But... according to Roy Dennis, the young will have been driven off by the parent birds during September. To have such an iconic bird breeding on one of the osprey nesting poles is certainly not a bad second choice and there is hope they will return in future years.

Special thanks must go to John Jacobson of Scottish and Southern Electric for the use of their 'cherry picker' which made it possible for the group to safely reach and ring the young peregrines. Thanks must also go to the two bird ringers, Anthony Roberts and Jim Cook for their ringing skills.

The Newtown Range Conservation Group is lucky to have the dedication and support of so many wonderful people who do so much to enhance the diversity of our special site.

Maj (Retd) Dave Maidment
Range Officer & Training Estate Manager
Newtown Range & Jersey Camp

Wiltshire
MOD Boscombe Down



Bob Clarke, Emma Elton with students from the QinetiQ Apprentice Training School © Crown

The Conservation Group at MOD Boscombe Down continues to monitor intrusive groundwork at the site. All archaeological watching briefs and mitigation work is organised in partnership with QinetiQ Facilities Management and contractors engaged to carry out ground work. Alongside this a number of historic buildings have been recorded and placed on the Heritage Environment Record; continually maintaining the visibility of the conservation effort both on site and to the wider heritage community.
A number of interesting discoveries have come to light, including concrete railway sleepers, now used as curbing, that were part of a large temporary goods yard laid for the construction of the main runway in 1944. Followed by the discovery, through records, that tunnels cut in the chalk during World War II were assessed in 1984 as gas-proof refuges! A survey of these tunnels is proposed next year.

From late February this year (2016) Bob Clarke, Boscombe Archaeologist and Emma Elton, co-director of Broad Town Archaeology (an organisation committed to introducing the community and especially young adults to their local and national heritage), have been working with students from the QinetiQ Apprentice Training School during their weekly enrichment sessions. The team delivered a number of bespoke group sessions blending illustrated talks with handling sessions – everything from samples of waterlogged timbers from Flag Fen over 3,000 years old to the reassembly and assessment of two real skeletons, one Roman, the other Saxon.

The earthwork survey team © Crown

Students were asked to think of a project that could be run on the airfield over the next year – they came up with 'Discovering World War II MOD Boscombe Down'. Briefly, Boscombe Down has been operational since 1917. The historic environment currently has structures from every major phase of airfield architecture, from the World Wars to the Cold War and beyond. The WWII footprint, including expansion period, is a poorly understood resource at the airfield location, so recording this period is extremely useful and timely.

The teams are currently producing earthwork surveys for all identified structures and in so doing are applying both new skills from the archaeology classes and those they have learnt in aviation maths and science – often without realising it! The current recording project will add valuable information to the MOD archive and wider Heritage Environment Record. Moreover, World War I has, recently, moved beyond living memory, removing that tangible link between those who experienced the war and young people today; a similar situation is rapidly approaching for WWII.

The chance for students to experience the world their grandparents were directly involved in allows them to engage with earlier generations with a better level of empathy and understanding. It is hoped a full account of activities will appear in a future edition of Sanctuary.

Bob Clarke
Boscombe Down Conservation Archaeologist

Emma Elton
Broad Town Archaeology

Merseyside
Altcar Training Camp

Guided walk on I-range during the orchid season © Phil Smith

Altcar Ranges is managed by the Reserve Forces and Cadets Association for the North West of England and Isle of Man, Altcar Training Camp occupies approximately 250ha on the Sefton Coast north of Liverpool in Merseyside. Much of the area was reclaimed from the shore in the late 18th century, before becoming the Altcar Rifle Range in 1860. It is now one of the UK's premier facilities for small arms marksmanship training.

Flanked to the west and south by high dune ridges and to the east by the River Alt, the ranges consist of almost level sandy grasslands, often waterlogged in wet winters. To ensure uninterrupted sight lines from the firing positions to the targets, the ranges are managed by mowing several times a year.

Altcar Conservation Advisory Group, representing relevant statutory and voluntary organisations and individuals, as well as the Training Camp authorities, was set up in 1977 to support and give advice on the management of the Altcar estate. The Group has developed a Conservation Management Plan for the site and also arranges a series of guided walks for the public each year to what is otherwise a restricted area.

Back in 1985, local recorders were amazed to discover 35 flower-spikes of green-winged orchid *Anacamptis morio* on C-range as a new plant for the Sefton Coast. The following year a more detailed survey found 517 spikes, many having been damaged by mowing. This led to an agreement to delay mowing selected areas of the ranges until 15th July each year so that the orchids could flower and set seed. Subsequently, numbers of flower-spikes on C and I-ranges increased in most years, reaching a total of nearly 32,000 by 2016. This is now by far the largest population of this English Red Data Book 'Vulnerable' species in the north of England, being comparable in size to colonies found on a few nature reserves in the south.

As elsewhere, green-winged orchids at Altcar show a wide range of colour-forms from deep magenta through to salmon-pink and white. Perhaps because of the generally damp soil conditions, flower spikes are often up to 30cm tall providing a spectacular backdrop for the many local people who attend guided walks in May to see and photograph them.

Other orchid species colonised those ranges that had the modified mowing regime, in particular marsh-orchids *Dactylorhiza*, up to 25,000 flower-spikes of several different species and hybrids having been counted. They are accompanied by a rich variety of other plants, creating a visually spectacular meadow habitat that was once commonplace but has now largely disappeared from the wider countryside.

This conservation success story could not have been achieved without the helpful and willing co-operation of a succession of Training Camp Commandants and their staff over a 30-year period.

Philip H Smith & Steve Cross
Altcar Conservation Advisory Group

Essex
MDP Wethersfield

The new wildlife pond is establishing itself nicely © R Gourgey

We recorded our 73rd bird species on the Wethersfield site this year, 37 of which are Red or Amber-listed on the British Trust for Ornithology (BTO) Birds of Conservation Concern List, the vast majority having the highest international protection, including EU legislation.

Comprehensive surveys, which were carried out by County Recorders in recent years on the plant populations, bats, invertebrates and amphibians, show that the Wethersfield site is a biodiversity hot-spot; an island of semi-permanent grassland surrounded by intensive arable farmland. We have made contact with neighbouring farmers to suggest some joint monitoring of species, such as migrating golden plover *Pluvialis apricaria* which rest and feed locally on their journeys north and south.

In regard to botany, this summer we were rewarded with a special display of over 150 bee orchids *Ophrys apifera* in some of the areas of longer grass.

Bee orchid *Ophrys apifera* © Iain Perkins

The new wildlife pond, pictured above, created as part of the mitigation for disturbance of great crested newts *Triturus cristatus*, has had welcome donations of aquatic plants, attracting new populations of egg-laying damselflies and dragonflies. These have included the broad-bodied chaser *Libellula depressa*, common hawker *Aeshna juncea* and the emperor dragonfly *Anax imperator*.

BTO members Ken Venus (left) and Josh Stafford (right) ringing a barn owl chick *Tyto alba* © R Gourgey

The Diamond Jubilee Wood (the only one in Essex), which was planted with 75,000 native trees and shrubs in 2012/13 to celebrate HM The Queen's Diamond Jubilee, will hopefully be protected in the future; with Park Wood, our 10ha local wildlife site of ancient woodland and its surrounding grassland, along with the other important communities and habitats that have been nurtured for future generations.

However, Wethersfield has been identified for disposal by 2020 as part of MOD's Estate Optimisation Programme and the future of this site is uncertain.

Ros Gourgey
Chair
Wethersfield Wildlife & Conservation Volunteer Group

Lancashire
Holcombe Moor Training Area

Probable water frame components © Holcombe Moor Heritage Group

Way back in 2009 a few enthusiastic members of Holcombe Moor Heritage Group located what they imagined was an early site of the Industrial Revolution. On early maps the site was referred to as 'an engine house' or 'Bottoms', later to become 'Bottoms Mill'. It was thought to be either a water or steam powered mill, and if it was steam that would make it a very important site as it would be a very early example. But as to what kind of textile process went on we had no idea.

Initial excavations proved to be rather complex and it soon became clear that the site had seen many alterations over the years, and the hunt for either a wheel pit or boiler debris was revealing nothing. We found lots of 'interesting' features and artefacts, but had little understanding of what they told us. And not just us. The County Archaeologist and experts from the University of Salford were equally bemused.

Damage caused by Boxing Day floods 2015 © Holcombe Moor Heritage Group

The site's significance reached new levels when, in 2014, our Industrial Revolution site suddenly produced evidence of medieval iron working! We found large deposits of slag and some unburnt charcoal, but frustratingly the actual hearth had probably been covered by the construction of a mill pond in the 18th century. However, carbon dating gave a date of around 1175AD for the iron working.

The local storms of 2015 washed away over 120 cubic metres of our site and this year we have concentrated on the post-medieval industrial deposits – and working even harder to understand the form and the function of the mill building. We have now located the wheel pit and the tailrace direction, though unravelling the headrace from the pond is proving to be a major effort. However, we can say that the mill was definitely water powered rather than steam powered – a disappointment for some members!

But the real jewel in the crown this year has been the retrieval of early machine parts. We had located some parts at the end of 2015 and had them verified as belonging to a form of water frame – confirming that our building was a spinning mill. Add to this the partial excavation of the wheel pit and the excavation of cast iron gear wheels from a probable gear pit, then we can start to put together a good picture.

Our site has assumed national importance through a series of happy accidents. The Army had not disturbed anything very much since 1912 and it had become a relic landscape. Our efforts to find a steam powered mill has resulted in rolling back the site's origins to medieval times and then turned full circle to confirm the textile history.

Barry Simpson
President
Holcombe Moor Heritage Group

Surrey
Ash Ranges

Heather in flower on Ash Ranges © James Adler

One of the most heavily used live firing areas in the Defence Training Estate South East; Ash Ranges is an area of 1,437ha in Northwest Surrey. A complex of ranges fire into a 978ha Range Danger Area (RDA). The surrounding area is utilised for infantry tactical training and doubles as a buffer zone between the RDA and residential areas.

Owned and safeguarded by the MOD for 150 years, Ash Ranges is the largest lowland heathland area in Surrey, and is recognised as being of international nature conservation importance. The site is protected as a Special Protection Area and a Special Area of Conservation.

Surrey Wildlife Trust (SWT) took on the conservation management in 2007. A Higher Level Stewardship agreement has allowed SWT to carry out large-scale conservation works. This has including the introduction of cattle grazing to the RDA.

The site holds important populations of the internationally protected bird species; nightjar, woodlark and dartford warbler; all six native UK reptiles and a host of rare invertebrates including the heath tiger beetle and silver-studded blue butterfly.

Amongst the rare plants on site are slender cotton grass (in its only UK location outside the New Forest), marsh clubmoss and white beak-sedge.

In 2014 a small colony of round-leaved wintergreen *Pyrola rotundifolia* was found growing inconspicuously in a ditch. It has since been confirmed as the rare subspecies *P. rotundifolia subsp. rotundifolia* by Dr Fred Rumsey of the Natural History Museum. This is the third record of the species in Surrey and the first ever record of this subspecies. How it got to Ash Ranges is a mystery, but its tiny dust-like seeds can be blown a long way.

Round-leaved wintergreen © Linda Pitkin

Coral necklace *Illecebrum verticillatum* was found on the edges of a muddy pool in 2015. This tiny plant is even rarer than *Pyrola* and has not been recorded in Surrey since 1932. With its nearest stronghold in the New Forest, coral necklace has been slowly expanding its range in recent years, including on MOD land where it is thought to be spread by vehicles. The only member of its family, the aptly-named plant is small and ground-hugging with ropes of tiny, delicate, tooth-shaped white flowers.

Jo Saunders
Grazing Officer
Surrey Wildlife Trust

Wiltshire
Imber Conservation Group

The duke of burgundy *Hamearis lucina* has benefitted from the planting of cowslip plugs © Marc Arbuckle

Imber Conservation Group's (ICG) ability to collect awards continues. This year Neil Skelton, Custodian of St Giles' Church Imber, was recognised for his services to the preservation and conservation of this Grade I listed building, he was presented with the British Empire Medal by the Vice Lord-Lieutenant of Wiltshire after a short service at Imber Church. It was a joyous occasion and a fitting reward for the effort he's put into the restoration of the church.

Since the last article, the previous ICG chairman Mike Jelf has retired after a long and very successful period. He is still involved with the conservation group and very much involved with organising fund raising events such as the Army Benevolent Fund historical and natural history tour which raised £1,000 for this deserving charity.

Other events arranged by the ICG were the Butterfly Conservation Trust (Wiltshire Branch) field outing, an entomological day with guests from the Natural History Museum and other taxa experts hoping for a chance to spot the rare shrill carder bumblebee. Unfortunately, this along with the three moth nights were hampered by inclement weather but we still managed to record interesting species such as the dusky cockroach (one of the three endemic rare species in the UK), a long-winged conehead grasshopper, the scarce fungus weevil and a western beefly.

Andrew Bray organised a successful bioblitz earlier in the summer and his monthly walks looking at flora and fauna continue to be popular.
In addition there is now a monthly BeeWalk led by Jenny Elvin and supported by Marc Arbuckle, that surveys a small area for bees across from the Water Tower near Tilshead. Species found include red-tailed mason bee *Osmia bicolor* and the spined mason bee *Osmia spinulosa*.

Penny Lee has organised plant walks along with various projects including growing and planting hundreds of cowslip plugs to help encourage the population of duke of burgundy *Hamearis lucina* butterfly.

ICG scrub management team, led by Andy Palmer, continue to support DIO, Natural England and the Wiltshire Butterfly Conservation by clearing low level scrub on ecological hot-spots, often with a species focus.

Neil Skelton is presented with his BEM © Mike Jelf

The ornithological group also supports the RSPB's stone curlew project and hen harrier monitoring, while the task of the Raptor and Owl Group never ceases; all of which is recognised as being of national importance.

Records continue to be submitted to the BTO, Butterfly Conservation, Wiltshire and Swindon Biological Recording Centre, county recorders and of course DIO.

To see the Training Area in June and July is a delight. It's a riot of colour with many butterflies, day-flying moths and other insects enjoying the bounty on offer.

Andrew Bray
Chairman
Imber Conservation Group

Oxfordshire
Bicester Garrison

New tools have been purchased to help with woodland management © Crown

The St George's Barracks (SGB) Conservation Group at Bicester continues to support the Sustainable Development (SD) of its areas. During the early part of winter 2015, SGB Conservation Group held a Conservation Awareness Day (Community Engagement) allowing interested industry partners the opportunity to assist in small areas of dense scrub management activities.

After a successful application bid through the DIO Conservation Group Grant Scheme, part of the Countryside Stewardship Fund, some tools have been purchased to enable more work to be carried out on scrub and woodland management which will enhance areas of the woodland and also benefit the sustainable development in line with the Biodiversity Action Plan. At the time of writing it goes without saying that the main focus is on creating more manageable areas of dense woodland scrub for flower/fauna also creating better habitat for nesting birds, especially the nightingale and the grasshopper warbler which favour B site and Training Area South (TAS) as a breeding site. A recent sighting of high importance has been a pair of turtle doves. Tree creepers have been spotted in Arncott wood, as well as bullfinches and flocks of goldfinches, also a very good presence of warblers across the site. Woodpecker's are also in good numbers and it was another successful year for ringing barn owls.

A successful community engagement, arranged during early spring, allowed a local bird watching club the opportunity to walk on the training area during the dawn chorus.

As the temperatures start to drop in the coming months ahead it will be likely that TAS will see a good number of wintering fieldfare and redwing as they return to feed on the hawthorn/blackthorn bushes that are filled with berries. It is expected that both common and jack snipe will return to the area, kestrels are constantly present and can be seen in flight hunting for field voles/shrews, red kites are also in good numbers along with the sighting of sparrow hawks. Little owls and barn owls have been seen after dark and their night call is also evidence of their presence.

In February 2016 a brown hairstreak butterfly egg search was organised and although an area of only 300m of blackthorn was searched a total of 40 eggs were found. During the spring and summer months surveys have been conducted, weather permitting, and the results are extremely good.

Butterflies that have been recorded are large skipper, small skipper, grizzled skipper, dingy skipper (Priority Species in UK Biodiversity Action Plan) common blue, red admiral, small tortoiseshell, marbled white, meadow brown, ringlet and small heath. It is very nice to see such a healthy population of marbled whites! It is of particular interest that black and brown hairstreaks (Priority Species in UK Biodiversity Action Plan) have been recorded on site as well as the sighting of a purple emperor.

Gary J Beckett
Estate Conservation
Bicester Garrison & Support Unit

Kent and East Sussex
DIO SD Training South East

Feathered gothic *Tholera decimalis* © David Kjaer

The year began with Cinque Ports Training Area hosting the Army Ornithological Society (AOS) AGM at Lydd Camp in May. High ranking birdwatchers included Field Marshall Sir John Chapple and Lt General Sir Hew Pike. The group saw peregrines and hobbies during a walk on the Ranges led by the local bird recorder for CPTA Ranges, Norman Baker.

A nightjar survey at Pippingford Park Dry Training Area was conducted on the evening of 18 June 2015 by Matt Kirk and Shaun Taylor of the Sussex Ornithological Society assisted by Major Rick Beven, STSO CPTA, and Simon Odey, Training Safety Marshal West. The distinctive churring of three male nightjars was heard and the team was also rewarded by seeing a bird in flight and hearing its unusual wing claps.

On 24 June 2015 Matt Kirk and Shaun Taylor also helped lead the Pippingford Conservation Walk, retracing part of the route taken to conduct the annual bird census on the training area, a record that has been maintained since 1987. The results of the census are sent to the British Trust for Ornithology and are eventually collated to form part of the Atlas of Breeding Birds of Britain. They were assisted by Monty Don of the Sussex Pony Grazing and Conservation Trust who briefed on the activities of the 24 Exmoor ponies that graze Pippingford Park training area. The outing illustrated the symbiosis between pony grazing and the maintenance of a healthy heathland habitat that benefits wildlife. The group saw and heard a total of 22 different bird species, including numerous buzzards, tree pipits, a woodlark and nesting grey wagtails and lapwings.

The CPTA Conservation Group visited Lydd Ranges on 5 August 2015 to assist Dr. Nikki Gammans of the Bumblebee Conservation Trust and her team conduct a bumblebee survey on the Ranges (See Making a Buzz with the Ministry of Defence in Sanctuary No. 44). Nikki's team is monitoring the expansion of the short-haired bumblebee since it was reintroduced to Britain at Dungeness in 2013. In addition, Megan Phillpott from Derek Gow Consultancy, led a very good site visit looking at the suitability of the ditch network on Lydd Ranges for the possible relocation of water voles from the proposed Lydd Airport extension; on her advice the number of mink traps was increased on Lydd Ranges.

Along with several common species of bumblebee, three Biodiversity Action Plan species were also seen; the brown banded carder, moss carder and ruderal.

The walk also highlighted that the extensive ditches and dykes on Lydd Ranges offer an excellent habitat for water voles. The problem of mink predation was raised and a number of additional mink raft traps have been positioned on Lydd Ranges to eradicate this apex predator.

On the evening of 2 September 2015 the CPTA Conservation Group met to conduct a bat survey of Asholt Wood (Area Z) on the Kent Training Area. The walk was led by Martin Newcombe and Shirley Thompson of Kent Bat Group. David Gardener and Ian Ferguson also set up a halogen lamp to show us typical woodland moth species that provide the main food source for bats. A total of five bat species were seen and heard on the bat detectors including soprano, common pipistrelles, noctule and serotine bats.

The mothing team trapped a number of moth species, including black arches, brimstone, square-spot rustic, large yellow underwing, feathered gothic, chequered fruit tree tortrix, and *Cydia fagiglandana*.

Environment Agency planning for the Lydd and Hythe Ranges Sea Defences continues, as part of the Folkestone to Cliff's End Sea Defences (FOCES) work was conducted in 2014 and 2015 to complete the Broomhill stretch of Sea Defences, including around the Jury's Gap Look Out at Lydd Ranges. The construction phase for Lydd Ranges sea defences is planned to start in 2018 and last until at least 2022.

Maj Rick Beven
Senior Training Safety Officer
Cinque Ports Training Area

Northumberland
Otterburn Training Area

The valley is an important refuge for the red squirrel *Sciurus vulgaris* © Crown

This year a new member was welcomed to the Otterburn Conservation Group. Lydia Speakman is the Project Development Manager of 'Revitalising Redesdale', a project funded by the Heritage Lottery Fund (HLF). The MOD is a partner in a Landscape Partnership HLF bid aiming to improve the natural and historic environment of Redesdale. Match funding is being provided through the MOD Conservation Stewardship Fund.

Other partners include Natural England, Tyne Rivers Trust, Northumberland Wildlife Trust, Northumberland National Park, local community groups including parish councils and the Redesdale Society, Forestry Commission, the Battlefields Trust and the Environment Agency. Some of these partners are also active stakeholders in the management of Otterburn Training Area.

Redesdale is a very special place. It is a remote upland area in north-west Northumberland, a frontier landscape on the border between England and Scotland. There is a wealth of historic features including Neolithic, Roman and Medieval through to more recent times including bastles, the fortified farmhouses unique to the area. The landscape reflects the long history of conflict, including the military use of Otterburn Ranges for over 100 years.

Redesdale's history, and its low density of population have resulted in the valley supporting a diversity of habitats and species including upland hay meadows, blanket bogs and wetlands.

The valley is an important refuge for the red squirrel *Sciurus vulgaris* and the river Rede is notable for containing one of only two viable populations of the highly threatened freshwater pearl-mussel *Margaritifera margaritifera* left in England.

A large part of the upper Rede catchment is contained within Otterburn Training Area. Conservation activities on the Training Area will contribute to the aims of 'Revitalising Redesdale'. The project is currently at the planning stage, with project delivery commencing in 2018. The focus will be enhancement of the tributary stream corridors, restoration of peatlands and some of the species-rich grasslands will be used to test methods to increase populations of the rarer indicator species of upland hay meadows.

The river Rede © Crown

This project will be an exemplar of partnership working and will demonstrate how DIO's stewardship has multiple benefits; delivering ecosystem services and developing links with local communities in addition to the provision of military training.

Dr Moira Owen
Ecologist
Defence Infrastructure Organisation

West Sussex
Thorney Island

Thorney Island bird hide © Donald Wells

Thorney Island, in Chichester Harbour, is a truly unique place. Nestled on the built-up south coast plain, backed by the South Downs, the Island is one of the last remaining pockets of wild land, where natural habitats thrive thanks to the custodianship of the Ministry of Defence. It is part of the protected landscape that forms the Chichester Harbour Area of Outstanding Natural Beauty (AONB).

Thorney Island was indeed once an island, but linked by Victorian Land reclamation to the mainland in the late 1800s. Its wildlife and heritage is now managed through the Thorney Island Conservation Committee, made up of a variety of local interested organisations, including Chichester Harbour Conservancy, the body responsible for looking after the Chichester Harbour AONB.

The Conservancy has for many years enjoyed a harmonious working relationship with the MOD on the Island, allowing us to carry out a range of conservation activities on the island, including (and not limited to) wildlife surveying and monitoring; woodland planting and management; volunteer beach cleans and the provision of information and interpretation.

12 Regiment volunteers with members of Chichester Harbour Conservancy © Crown

Each year, we carry out two beach cleans on the remote Pilsey Island beach, a deserted stretch of sand inaccessible to the public. This is the highlight in the calendar of many of our volunteers, who enjoy the chance to visit this remote and beautiful spot, whilst helping to clear it of the plastic waste that is washed up from the wider Solent.

The beach is overlooked by a bird hide that sits on the base of a World War II gun emplacement, providing a wonderful spot to watch the wading birds scurrying around feeding at low tide. Our volunteers are proud to keep the bird hide in tidy order and we have printed new information panels to go on the inside, helping people to identify the birds they are likely to see. If they are lucky, they may spot one of the resident harbour seals, which rest on the exposed mudbanks off the Island.

With the help of a woodland creation grant, we planted a new 8 acre woodland on made-up ground, which is now flourishing, with regular TLC from volunteer work sessions to keep the area clear of invasive gorse and brambles. The native, local tree species are thriving and provide a home to a host of bird species, roe deer and brown hare.

Our conservation volunteers have also worked closely with the local archaeological society, to clear and maintain the many WWII structures that make up the Island's cultural heritage, including pill boxes and gun emplacements. For our volunteers, this is a symbiotic relationship; allowing them access and enjoyment of this beautiful area whilst actively helping to conserve its special qualities.

Nicky Horter
Countryside Officer
Chichester Harbour Conservancy and
Thorney Island Conservation Group

Essex
Carver Barracks

Celebrating the unveiling of the Battle of Britain memorial commemorating all airmen who flew from the base © Crown

Wimbish Station is situated in tranquil rural North Essex. The Station was formerly RAF Debden a World War II operational air station, opened on 22 April 1937, used by both American and British aircrew alike. Since the end of WWII there have been various army units in residence with the airfield becoming a back door training area. This has allowed nature to develop and prosper on the 440 acre site for decades.

Currently 101 (City of London) Engineer Regiment (Explosive Ordnance Disposal) and 33 Engineer Regiment (Explosive Ordnance Disposal) are the residing army units, who with assistance from Wimbish Station Support Unit have taken the opportunity to develop the nature rich environment of Carver Barracks to assist the education of children from the local community. This has been achieved by allocating some of the woodland that flourishes on the back door training area as an Outdoor Science Walk.

Forest Schools has been developed to allow primary age children to learn in the great outdoors. Specially trained teachers will take small groups of children to wildlife rich areas near to the school to teach the children about their natural surroundings. However, this also incorporates more main stream subjects such as Maths and English which are taught using the natural environment the children are in. Debden and Wimbish Primary Schools have been wanting to foster this scheme and have been looking for a suitable local site. Wimbish Station identified that this was a feasible project and its service families and the local community would prosper alike.

A survey was conducted on site as part of the selection criteria to identify a plot of woodland which had a varied selection of wildlife, insects and flora. During this process it identified that there was in excess of eleven tree species and seven shrub species amongst the woodland and open grass land at Wimbish Station and a large proportion of these are providers of pollen and nectar for bees. There was also a strong population of barn owls living within the backdoor training area with a regular and transient population of muntjac deer frequenting the site.

Trees found on Wimbish Station Backdoor Training Area included: oak, hornbeam, beech, wild cherry, scots pine, silver birch, crab apple, field maple, rowan, small-leaved lime and bird cherry. Shrubs included: dog rose, dogwood, blackthorn hawthorn, holly, hazel and spindle.

Entrance to the new Community Woodland and Outdoor Science Walk © Crown

The site selected was adjacent to the runway to allow easy access for motor vehicles from the school. A horseshoe-shaped track has been cut and laid sympathetically to the environment around the chosen woodland to allow all-weather access even for those with disabilities. Teaching areas have been selected around the Outdoor Science Walk which offers a larger area than the pedestrian track for lessons to take place. These were chosen to offer teaching opportunities from the subtle changes in the environment, such as views over open grassland or a glade amongst the woodland.

The future looks positive with interest from a local Saffron Walden bee keeper Derrick Johnson, of the Essex Bee Keeping Association, who would like to place bee hives on the boundary and within the woodland to make the most of the pollen and nectar producing flora. This will benefit the environment and the education of the primary age children for years to come.

Construction of the new horseshoe shaped all-weather track © Crown

It has been a highly worthwhile task undertaken not only to foster greater connections with our local community but also developing a greater understanding of what wildlife lives within Wimbish Station.

And last but not least, a local historian Keith Braybrooke, who as a boy during World War II watched aircraft taking off and landing from RAF Debden (Carver Barracks), campaigned for the sites importance to be recognised with a memorial commemorating all airmen who flew from the base. The local council commissioned a memorial which has been placed at the southern end of the runway. The rising runway forms a fitting backdrop for any visitors viewing the memorial.

Sadly Keith will not see his hard work realised as he passed away at the end of last year knowing that all his hard work was being brought to fruition by the positive involvement of the Station in his aspiration.

To facilitate Mr Braybrookes vision, the plant section of 22 HQ & Sp Sqn were tasked with clearing the land, replacing existing barriers, laying hardcore and paths and also providing a suitable backdrop for the memorial itself. This memorial gives our young soldiers the opportunity to actively contribute and help to commemorate a major point in our national and military history.

Capt Tony Dale
WSSU USEA
Carver Barracks

Warwickshire
Defence Munitions Kineton

The chocolate-tip *Clostera curtula* © Alan Prior

The 1,000ha ammunition depot at DM Kineton was compulsorily purchased in 1942 as one of the ammunition depots in World War II. In 2017 it celebrates its 75th anniversary. Originally brick built store houses, rail served, were scattered over the three-mile long estate. The rebuild in the late 70s and early 80s, with the last of the serious Cold War money, created two concentrated areas with reinforced bunkers. Capability and safety were maintained with more land returning to a mixture of woods and 500ha of pasture and arable land, the latter being let to tenant farmers.

The 250 bunkers and repair buildings had their blast walls built with the blue lias clay from the old Jurassic sea bed on which the depot lies. This created borrow pit lakes and ponds on which the wildlife and vegetation has thrived. Classic species such as fallow, roe and muntjac deer are in good numbers as are badger setts, 27 at the last count. Their activities, and those of foxes and great crested newts, have to be managed to allow explosive demolitions, stop damage to the bunkers and reduce the impact on the Explosive Licence. We also have little and barn owls, nightingales, grasshopper warblers and masses of cow-slips. Over 85 species of bird have been recorded although we are looking for someone to lead on a new survey. More importantly, it is the smaller, less sexy, examples of flora and fauna that have been the focus of the last few years of study.

In one evening the Warwickshire Butterfly Conservation group recorded 193 species from 2,500 moths. More notable species included the dark smudge, the buff-marked neb, the chalk rose bell and, probably the most important find, the black groundling, a Notable A species.

Also found on site are the May highflyer, the scorched wing, the orange footman and the treble lines. Larger types, such as the lunar-spotted pinion, dark umber and double dart have been found in reassuringly high numbers due to the excellent and relatively undisturbed good quality grassland. The scarce silver-lines and the chocolate-tip were recorded in 2015. Between 2013 and 2015 there have been 350 species counted from 5,200 moths.

The flora has been just as impressive. Species such as the broad-leaved helleborine, dropwort and narrow buckler-fern have been found as well as adder's tongue fern, dwarf spurge and pickerelweed. Bee orchids and the common spotted orchid are found near a borrow pit lake kept in good order by the fishermen. Nearby, on some undeveloped land was found the pepper-saxifrage, cow parsley and knotted hedge-parsley. The round-fruited rush has been seen in the past and efforts are underway to trace it again.

A visit by the Warwickshire Dragonfly Society found 19 species of dragonfly. The ruddy darter was found to be present in substantial numbers as was the common blue damselfly. The presence of the beautiful demoiselle was, no doubt in part, due to the relatively undisturbed waters and uncultivated land in the Depot.

Things are certainly looking positive for the conservation of 1,000ha in the middle of England. The future of the Depot is as secure as anything can be in a changing world. Most important of all is that the military chain of command is very much in favour of the conservation effort, allocating time to its management, encouraging the contractors, CarillionAmey to cut the relevant grassy area after the orchids are over. Future plans include clearance of areas of brambles and reed mace to leave clear spaces for the fresh growth of dormant plant species whilst retaining cover for birds to nest and mammals to take refuge.

Bill Pearson
General Manager
Defence Munitions Kineton

North Yorkshire
Catterick Training Area

The newly installed stone circle on the edge of the bluebell bank © Crown

Foxglove Covert Local Nature Reserve is a hidden gem, lying on MOD land at Catterick Garrison. Open daily to the public, visitors can wander across the purple heather-covered heath, pass through the colourful wildflower meadows, follow the winding stream that meanders through shady woodland, or simply sit and enjoy the view out over the lake and wetland ponds from one of the bird hides.

There have been a number of other developments on the reserve. In the springtime we received a donation of some large stones by a local quarry. These were installed as a stone circle out on the moorland. They are situated on the edge of our bluebell bank and in the spring it is quite a spectacle, with the stones standing proud, silhouetted against the skyline in a field of bluebells and yellow gorse.

We have installed water vole feeding platforms in some of our ponds in recent months. When baited with apples visitors have a good chance of spotting these seldom seen creatures as they come to the platforms quite readily to sit and munch.

In August, Channel 5 Television came to Foxglove. With them came Tony Robinson, filming part of his latest television series, *Coast to Coast* which is to be broadcast in the autumn. Tony spent a day at the reserve, getting stuck in with the Foxglove Volunteers for a variety of activities. The main task of the day was to create a new floating island, as a perch and safe haven for the various waterfowl that use the lake, whilst giving viewers in the bird hide a better chance to see them.

To achieve this, a large ash tree, hanging over the lake, was felled into the water, then winched out into position in the centre of the lake and anchored. The tree came down in the lake with an almighty splash, but once everything had settled, the waterfowl seemed very pleased with their new home!

Afterwards, Tony and the film crew spent some time identifying moths with some of our reserve volunteer moth recorders. He then proceeded to the ringing room, to learn about the process of bird ringing and its value in nature conservation. Every year at Foxglove for the last 24 years licensed and trainee bird ringers have been putting individual rings onto thousands of birds as part of the British Trust for Ornithology's Constant Effort Site scheme, helping to keep track of local bird populations and increase our understanding of their distribution and movements.

Ringing a barn owl chick © Crown

Elsewhere on the reserve, our team of dedicated volunteers with their extensive knowledge of flora and fauna continue working away behind the scenes. Whether their interest is bird ringing or moth trapping, flower identification or helping out with a school visit, planting trees or cutting them down, there is always something happening at Foxglove.

Stacey Adlard
Foxglove Summer Manager
Catterick Conservation Group

Wiltshire
Larkhill and Westdown

A freshly emerged marsh fritillary *Euphydryas aurinia* © Marc Arbuckle

In January 2015 Mark Khan and our archaeology team surveyed the remains of two Mk22 Spitfires on Salisbury Plain. They also located the remains of a rare Fairey Battle aircraft and a De Havilland Mosquito. In April, they assisted with the excavation and recording of an extensive set of WW1 trenches on Perham Down as part of Op Nightingale. This was followed by Ex Tell Alliance at East Chisenbury which was a Bronze and Iron Age site dig organised by DIO archaeologist Richard Osgood.

Tony Rowlands conducted a survey of flowering blackthorn in March. 131 records were generated and plotted on a range map to explain an apparent bias towards the south of our area; unfortunately no conclusions could be drawn. A party of Dutch scientists was shown around our area in June and were deeply impressed by the extent and quality of the chalk grassland of which there is little in Holland.

During the year, Mike Lockwood monitored three UK Butterfly Monitoring Scheme (UKBMS) transects across various different habitats around the Larkhill area. An impressive 37 species were recorded.

The highlights of the year were sightings of the elusive brown hairstreak, white-letter hairstreak and the marsh fritillary. Several species show increasing numbers including small blue, chalkhill blue, adonis blue and dark green fritillary.

Marc Arbuckle led several successful BeeWalks on the Plain during 2015 in collaboration with the Bumblebee Conservation Trust (BBCT). The bumblebee population took a while to get going but in the height of summer several hundred were recorded from 12 species including the broken-belted bumblebee and Barbut's cuckoo bee.

Phil Deacon and our ornithology group had another productive year ringing 4,125 birds, reflecting good breeding in 2014. 66% of the birds ringed comprised seven species of migrant warblers which make use of the Westdown scrub habitat to breed or as a stop-over feeding station, including garden warblers, reed warblers and sedge warblers. One of the latter was killed in Ayr, Scotland and another trapped in Loire-Atlantique, France a few days later. Sadly the nightingale population continues to dwindle significantly; only five males and one female were trapped.

2015 has been a mark time year for raptors, principally due to a shortage of their staple diet, the short-tailed field vole. Nigel Lewis reports that tawny owls are holding their own. After a successful year in 2014, barn owl numbers were stable and close to the ten year norm, but the shortage of food prevented any second broods and there is an increasing threat from ravens, red kites and buzzards. Sadly the little owl continues to struggle; it needs abundant cover to avoid predators; this is in short supply on the Plain but better within Army camps. Although declining nationally, kestrels had a good year with growing numbers.

Lt Col (Retd) Richard Clayton
Secretary
Larkhill and Westdown
Conservation Group

Anglesey, Wales
RAF Valley

Pyramidal orchid *Anacamptis pyramidalis* © Crown

RAF Valley is situated on the Isle of Anglesey – Ynys Môn, North Wales. Located in an Area of Outstanding Natural Beauty (AONB). RAF Valley is surrounded by 11 Sites of Special Scientific Interest (SSSI), three Special Protection Areas (SPA) and two Special Areas of Conservation (SAC).

22-23 June 2016 marked a significant conservation milestone for RAF Valley namely, the successful completion of a comprehensive decennial flora and fauna survey. This was no mean achievement considering RAF Valley comprises of a wide diversity of terrestrial and aquatic habitat over an area in excess of 378ha. To further complicate matters a major runway refurbishment project was about to go into full swing effectively giving us a very narrow window of opportunity to complete the task before most of the site would become inaccessible due to the construction work.

The last major ecological survey completed at the Station was back in June 2006. Therefore, to ensure a proper a review of the existing Conservation Management Plan it was essential to obtain as much new data as possible in relation to the prevalence and distribution of certain species of flora and fauna which can in turn be useful indicators as to the 'health' of habitats.

Therefore, making the most of the fine summer weather that is so typical of RAF Valley and ably supported by my very knowledgeable colleague from CESO (RAF) Mr CJ Johnstone we successfully covered the entire site in the short two days available to us. In the process we managed to take no less than 250 photos and catalogued as many species that we were able to positively identify (sadly neither of us are experts!!). All collected data will now be forwarded to DIO's ecology experts and will hopefully prove useful in the planned review and update of our Conservation Management Plan.

Japanese rose *Rosa rugosa* © Crown

We continue to fulfil our stewardship role in relation to our 'adopted' section of the Isle of Anglesey Coastal Path* by undertaking annual surveys to monitor the condition of the path as per the terms of the Memorandum of Understanding agreed with Cyngor Sir Ynys Môn - Isle of Anglesey County Council. To help raise awareness of the Coastal Path, annual Coastal Clean events are held. With an event planned for mid-September, weather permitting. These events also have an important Total Safety dimension since they achieve the effective removal of large amounts of potential Foreign Object Debris/ Damage (FOD) located right on the periphery of an extremely active airfield.

Robert A Hughes
Station Environmental Protection Advisor & Coastal Path Project Officer

**A 125 mile (200 km) route that circumnavigates the island, passing through the largest designated Area of Outstanding Natural Beauty in Wales.*

Essex
Fingringhoe Ranges, Colchester

Borrow dykes before April 2015 © Crown

In April 2015 *Azolla*, an invasive non-native species, was recorded in three of the Borrow dykes at Fingringhoe, and following further monitoring it's coverage had significantly increased.

Fingringhoe Ranges are part of the Colne Estuary SSSI, which includes Notified features such as; Invertebrate Assemblage and Outstanding Dragonfly Assemblage within it dykes and ditches. Therefore, it is extremely important that the spread of *Azolla* was contained, reduced and if possible eradicated.

The fairy fern *Azolla filiculoides* is an aquatic plant with delicate fern-like foliage that originates in the Americas. It was first recorded in the UK in 1840 and continues to be a popular garden aquatic. It is listed in Schedule 9 of the Wildlife and Countryside Act 1981 (as amended) and it is an offence to plant or cause its spread in the wild.

At Fingringhoe *Azolla* was probably brought in on the feet of wildfowl. If allowed to establish uncontrolled there is an increased chance of it

Borrow dykes after February 2016 © Crown

spreading into other water bodies within the ranges and out into neighbouring sites.

Azolla with its free-floating fronds grows rapidly until fragments break off to form new plants. It forms mats, up to 30cm thick, on the surface of the water, and can double in size in four to five days. These mats block out light, killing the aquatic flora, reducing oxygen levels that can lead to the death of fish and invertebrates. The key characteristic of *Azolla* is the red colouration that the plant takes on over winter, or when stressed; during the summer it is usually green.

Biological control: the North American, azolla or water fern weevil *Stenopelmus rufinasus* © Crown

As there are no organisms native to the UK that feed on *Azoll*a, the Environment Agency Advisor for invasive non-native species recommended biological control, using the weevil *Stenopelmus rufinasus*, also a native of the Americas.

In July 2015, via the MOD Conservation Stewardship Fund, 2,000 weevils were purchased from CABI (Centre for Agriculture and Biosciences International) and introduced into the dykes; the weevils died out naturally once they had eaten their way through the *Azolla*, eradicating the weed without the need for dredging and chemicals.

Since their introduction no further outbreaks of *Azolla* and so far this important habitat has remained clear of this red invader.

Iain Perkins
Ecologist
Defence Infrastructure Organisation

Northern Ireland
Ballykinler and Magilligan

Assisted by the Woodland Trust, cadets from 2nd Battalion planted 500 native saplings © Crown

Another busy year on the Northern Ireland (NI) training estate, with plenty of conservation work and a change of tenant farmers to support the conservation grazing process at Ballykinler and Magilligan. *Secret Britain* filmed on site with the opening shots taken on Ballykinler beach, with Ellie Harrison riding a 'Game of Thrones' horse along the waterline with the majestic Mourne Mountains providing an impressive backdrop on a clear and sunny early morning.

Ballykinler co-hosted the annual Bio-Blitz with Murlough, allowing twelve ecologists and conservationists from across NI to survey the different dune habitat, wildflowers, invertebrates and bryophytes. The site had not being surveyed in detail since the 1950s; all records were sent to the Centre for Environmental Data and Recording (CEDaR) with 212 species identified over 24 hours.

In June we hosted, supported by Ulster Wildlife and Butterfly Conversation NI, a local Integrated College Eco Club visit; allowing students to see conservation work on an operational MOD site. Moth traps were set the night before ready to view during the nature walk; with Andy Crory's (Ulster Wildlife) excellent knowledge, over forty species were trapped, identified, recorded and released.

Next was a talk about the NI barn owl project by Catherine Fagan (Ulster Wildlife) and Debbie Nelson of Debbie Doolittle's Wild Life Rescue. Ballykinler is part of the barn owl project and a number of owl boxes have been put up around the training estate over the last two years. Debbie Nelson then brought out a special guest, her rescued barn owl 'Sprite' for the students to see up-close and personnel.

In addition to the red squirrel breeding project, and linked to the World War I archaeological trench project was the planting of a special Centenary Grove at Ballykinler. Inspired and assisted by the Woodland Trust, 60 cadets from four companies of the 2nd Battalion rolled their sleeves up to plant 500 native saplings.

Gregor Fulton, Woodland Trust's operations manager in NI, said: *'In addition to the four flagship woods across the UK, we are encouraging groups and landowners to create their own memorial wood, and we are delighted to have teamed up with DIO and the Army Cadet Force to plant this special Centenary Grove here at Ballykinler Training Centre.'*

The trees are planted to leave an open area looking out towards the Mournes in the shape of a shamrock, which is associated with the Irish regiments of past and present, in this Centenary year of the Battle of the Somme, and are a lasting and respectful tribute to the people of Ireland who lost lives and loved ones during the war.

At Magilligan, following the hydrological investigation project in partnership with Queens, Trinity and British Geological survey to test water levels and sea water ingress into the dune system. Scientists estimate there is approximately twenty times more water within the dune system than in the Silent Valley reservoir which supplies water to Greater Belfast.

Both sites are involved in a wild fire project with the NI Fire and Rescue Service and Northern Ireland Environment Agency, both estates have fire provision and reaction plans being drafted to safeguard these high value conservation sites for future generations.

Maj Tony Canniford
Senior Training Safety Officer NI
Defence Infrastructure Organisation

Caithness, Scotland
Vulcan Naval Reactor Test Establishment

Eider *Somateria mollissima* © David Kjaer

Vulcan Naval Reactor Test Establishment is a MOD site adjacent to the Dounreay civil nuclear site, in a remote section of the Caithness coast, some ten miles west of Thurso. Since the early 1960s, Vulcan has provided MOD with a comprehensive understanding of the long term operation of nuclear reactors which power the Royal Navy's submarine fleet. Following the final shut down of the onsite reactor in 2015, decommissioning plans are being developed by Defence Equipment and Supply.

Vulcan is adjacent to the North Caithness Cliffs Special Protection Area which comprises most of the sea-cliff areas between Red Point and Duncansby Head on the north mainland coast, and the western cliffs on the island of Stroma. Cliff ledges, stacks and geos (steep sided sea inlets) provide ideal nesting sites for important populations of seabirds, especially gulls and auks. The nesting seabirds feed in the Pentland Firth, as well as further afield. The cliffs also provide important nesting habitat for peregrine.

As part of Environmental Impact Assessment of the next phase of decommissioning the Dounreay civil site, in 2015, the Dounreay site operators contacted MOD to see if there was any information on the ecology of the Vulcan site and surrounding areas to assess any cumulative effects arising during decommissioning the civil site. There was none, and in support of MOD plans for future decommissioning Vulcan, the opportunity was taken for Defence Infrastructure Organisation (DIO) ecologists to carry out a survey in 2016 at the same time as ecologists from Dounreay, in a unique collaboration.

The DIO survey confirmed the presence of four eider nests on the edge of the foreshore close to the security fence which was notable, particularly in comparison to similar habitat extending west from the Vulcan boundary where no eider nesting was recorded. This suggests that eiders are preferentially choosing to nest close to the secure boundary patrolled by MOD Police dogs due to reduced activity of natural ground predators such as foxes. Nesting oystercatchers were observed within the secure site boundary and site employees explained that they could watch predation of chicks by gulls within a few yards of their offices!

Ecologists from DIO and Dounreay, undertaking the joint survey © Crown

The joint findings of the surveys will be published in an Environmental Statement prepared by the Dounreay site operators during 2016, and the information will in turn inform the Environmental Impact Assessment and Habitat Regulations Assessment which will be needed for future decommissioning of the Vulcan site.

Stuart Patton
Senior Nuclear Estates Advisor
DIO Nuclear Equipment Support

Pembrokeshire
Castlemartin Range

Chough *Pyrrhocorax pyrrhocorax* © Crown

The Pembrokeshire Ranges Conservation Group has been active since the late 1980s when climbers wanted official access to Castlemartin Range so restrictions to protect cliff nesting birds were needed. The Group has changed its name a number of times but has gone from strength to strength with its monitoring and active management and each year the Range throws up some interesting surprises.

Outstanding ecologist Bob Heckford and his colleague Stella Bevan visited Castlemartin to look for a rare micro-moth. Unfortunately they didn't find what they were looking for but they did find the very rare moth *Elachista collitella*. This is a proposed Red Data Book 1 species that, as far as Bob and Stella are aware, has only been recorded in five sites in the UK and not since 1987. The last record for Wales was in 1938. Bob reinstated this species to the British list when he discovered it in Devon in 1975. Bob and Stella will check the records held at the Natural History Museum and then produce an article about their findings later in the year.

For the first time in 17 years two pairs of peregrine falcon have nested on Castlemartin Range. One pair nested successfully in 2012 and 2013 but to have two pairs is fantastic.

In January 2016 the Military kindly loaned and installed one of their remote surveillance cameras opposite a barn owl box known to be a roosting site. After one week the camera was removed and it had recorded 40 x 15 second clips of either one or two barn owls. The camera was replaced and remained to take photographs of any chicks that fledged.

The Amphibian and Reptile Conservation Trust, funded by Defence Infrastructure Organisation's Conservation Stewardship Fund (CSF), has laid 60 refuge sheets across Castlemartin Range in order to monitor what species we have. The bid also involves the search for adder hibernacula.

'Happy Birthday' to you! One of our male chough was born and ringed on the nest in 1995. This makes him an incredible 21 years old. Although he has a bad limp he is still keeping active and has just helped to raise another three chicks. 13 pairs of chough are nesting on Castlemartin this year which is an increase in five pairs since 2013.

The population of green-winged orchids above St Govan's Chapel has had its best year since records began in 2004. The flowers are fenced to prevent them from being trampled but information is displayed explaining what the flowers are.

Green-winged orchid *Anacamptis morio* © Crown

I have worked with cavers to try and improve Range access arrangements for the last 13 years and in March 2016 I was invited to visit the cave Ogof Gofan to see for myself why the cavers wanted access. This visit was part of a CSF funded project to carry out a biological and archaeological survey of the cave. Swinging on a caving ladder above the sea, squeezing through tight holes and crawling through narrow passages isn't exactly my idea of fun – but the stalagmites and stalactites, the crystal pools and beauty of the cave made it all worthwhile! Saying that; I won't be doing it again! Although we did record one torpid greater horseshoe bat and two sea slaters.

Lynne Houlston
Authority Ranger
Pembrokeshire Coast National Park

Germany
Senne Training Area

The rare moor frog *Rana arvalis* © Heiko Arjes

Sennelager Range Control's Plant Troop was called upon by the Federal Forestry Department (Bundesforst) in April 2016 to assist in the breeding success of the rare moor frog *Rana arvalis* on the Senne Training Area. This species, not native to the UK, is most noteable for the transformation of male frogs into a fetching, bright blue colour in the spring mating season.

Some of the existing shallow ponds, which the frogs use for breeding, were re-modelled with a digger and a few new scrapes were dug, with the mud and peat removed appropriately. Ponds have been formed at a varying degree of depths to give the best chance for at least some of these pools to be attractive to the frogs and other amphibians. This is part of an ongoing trial to see whether the habitat can be improved year-on-year. Particular care was taken to protect colonies of Senne orchids growing in the surrounding boggy heathland, as these are considered to be a potentially unique hybrid species, which botanists are now investigating. There did seem to be a healthy population of orchids when the site was inspected early in the summertime.

A major story in the press and topic of conservation in local hostelries is the inexorable spread of the wolf from east to west across continental Europe. There are now thriving populations of the Eurasian grey wolf *Canis Lupus* in the State of Lower Saxony, Northern Germany, including in the region around Bergen-Hohne Training Area, which is still used by British Forces following the hand-back of Hohne and Fallingbostel Camps in 2015. An army officer based with 20 Armoured Brigade, who still owns a house near Hohne, recently witnessed a wolf staring at him from beneath a deer-hunting, high seat and described the experience as somewhat like 'a Mexican stand-off between a fearless wolf and a nervous human!' He was subsequently informed that there are around 30 wolves divided into a number of packs in the vicinity.

A single 'lonewolf' was filmed on a mobile phone in April 2016 crossing a road near the small town of Rietberg, which is only about 14 miles from Paderborn, where most of the remaining British Forces in Germany are stationed. It is speculated that this was a young male in search of a pack and it is well understood that such wolves can roam considerable distances in short periods of time. If this wolf had crossed the Teutoburger Wald (forest) a little to the north and into the Senne Training Area, then it is likely to have discovered a wolf paradise, at least in terms of prey, as there are large numbers of red and fallow deer, as well as plentiful wild boar.

The Bundesforst are convinced that it is only a matter of time before wolves arrive in the Senne, so they have appointed an officer to consider the potential impact and implications. Sennelager Range Control has also been requested to report any sightings or tracks found on the training area for investigation by the forestry department. If wolves do colonise the Senne, they will certainly have to beef-up protection measures for the rare-breed, heath sheep, perhaps with robust electric fencing, or more fearsome sheepdogs!

Any wolf arriving in the Senne over the next few years could possibly be living alongside another of the iconic, northern European predators – the Eurasian lynx *Lynx lynx*. A lynx was spotted by a local forester a few winters ago in the forest north of the training area, feeding on the carcass of a fallow deer. This secretive and elusive cat was also seen at a distance by a rather surprised range patrol driver.

Mark F Johnson
Land Management Services
Defence Infrastructure Organisation

2017 Sanctuary Awards
Nomination Process

Winners and runners up at the 2015 awards ceremony © Crown

The MOD Sanctuary Awards Ceremony is held each autumn in Main Building, London, where the winners and runners-up receive their awards from the Defence Minister. It is attended by over 100 guests including senior representatives from MOD, Industry Business Partners and other 'sustainability champions'.

Nominations for Sanctuary Awards are invited for the following categories:

Environmental Projects
Wildlife, public access, biodiversity, or improving public awareness of these issues

Sustainability Projects
Design and building, climate change resilience, defence communities, utilities, and procurement projects

Heritage Projects
Archaeology, preservation of historic buildings or monuments and historic landscape assessment

Utilities Projects
Utilities consumption and cost reduction activities, projects or technological interventions, behavioural change

Individual Contribution
For those who, in the consideration of the judges have made a significant personal contribution within the Environmental, Sustainability, Heritage or Energy areas across the Estate and wider MOD.

The MOD Sanctuary Award Board, staffed from MOD and external judges will discuss and agree the recommendations from the Award Panel and also agree which of the Winners will be recognised for the Silver Otter and the Sustainable Business Awards.

The Award Panels will take into account the following in their judging:

Aim and Objective
Initiative and Innovation
Dedication/Resources
Best practice and wider application
Reputation enhancement
Education and awareness
Savings achieved/to be attained

The Rt Hon Anna Soubry MP delivering a speech on the importance of sustainability within the MOD at the Sanctuary Awards 2014 © Crown

For further information please contact the Sanctuary Team **dio-sanctuary@mod.uk** who look forward to hearing from you.

Sanctuary Awards timetable for 2017

Defence Instructions and Notices (DIN) is issued (communicated internally and via sustainable MOD working groups, chief environmental safety officers (CESOs) and MOD conservation groups)	**20 February 2017**
Nominations are invited	**1 March - 31 May 2017**
The Sanctuary Award Board convenes	**20 June 2017**
The nominees are notified	**August 2017**
The Sanctuary Awards Ceremony	**Autumn 2017 TBC**

Richard Brooks © Crown

In the last edition of *Sanctuary* (44 2015) I wrote of the transformation within Defence Infrastructure Organisation (DIO) that saw the creation of the Environmental Support and Compliance Team (ES&C) within the Safety, Environment and Engineering directorate of DIO. Twelve months on and the dust has settled and it is clear that this repositioning of the conservation type function has been a success. I truly believe that the good environmental works undertaken across the MOD supported by ES&C are becoming increasingly embedded into 'normal' business and that the professional 'ologists' within my team and the wider MOD and its contractors are being recognised as a key part of the defence picture. It is good to see so many examples of this to be found within these pages.

ES&C staff have been key to the Army Basing Programme environmental works, its associated biodiversity offsetting plan, leading the biosecurity group, championing public access and protecting the heritage on the estate – examples to just scratch the surface. It never ceases to amaze me just how much is delivered by ES&C and the wider SEE environmental staff. Their knowledge and commitment is a real credit to DIO and the wider MOD as demonstrated in successful environmental delivery.

Part of this success has been due to ES&Cs management of the MODs Conservation Stewardship Fund (CSF). The CSF supports a wide range of projects across the MOD estate relating to ecology, archaeology, historic buildings, public access, landscape and community. The CSF is the first time that an MOD wide budget has been available for environmental works and the specialists within ES&C ensure that the limited funds are targeted at the most deserving projects which assist the MOD in fulfilling its environmental policies and maintaining the MODs good reputation in environmental land management.

The MOD estate continues to facilitate continuous changes in military activity and operations. ES&C are now well positioned to ensure that environmental best practice, developed over past years and highlighted in Sanctuary magazines over the past 40 years, continues to be part of the MODs development processes and we look forward to engaging with many exciting and challenging projects in the future.

Richard Brooks
Principal Environmental Advisor
Defence Infrastructure Organisation

DIO ES&C specialists provide in-house expertise to DIO and the wider MOD by providing advice and guidance in the fields of:

Access & Recreation
- Technical & legal support on access & recreation legislation and management of the public on the MOD estate. Provides part of the 'Safe Place to Train' assurance.

Forestry & Woodland
- Providing and maintaining woodlands and trees for military training and capability whilst unlocking the sustainable economic returns. Legislation, policy, audit/assurance, industry best practice and safe working practices across the estate to ensure compliance and liability management.

Historic Environment
- Advice and expertise allowing MOD to sympathetically manage the archaeological monuments and landscapes on the estate whilst enabling training capability.
- Providing support to meet Departmental Government targets, including heritage appreciation, training and preservation of historic MOD archives. Advice and support relating to historic buildings and gardens to allow for the best use of the buildings for MOD capability.

Natural Environment
- Statutory assessments and approvals for development processes, fulfilling statutory duties through SSSI, Stewardship and Integrated Rural Management Plan programmes, Specialist ecological support/advice including Habitat Regulations Assessments and Protected Species management. Integrating training into designated landscapes.

Conservation Groups & Sanctuary
- The ES&C also supports MOD Conservation Groups across the estate and is responsible for the Sanctuary Awards and the production of Sanctuary Magazine. We would encourage all areas of MOD business including project partners and individuals to suggest articles for the 2017 Sanctuary magazine and to consider putting forward projects and individuals for the 2017 Awards.

Sustainable Development Support & Environmental Planning
- Advice & support regarding the implementation and integration of sustainable development and environmental planning best practice into estate management.

As the magazine highlights, we actively encourage organisational collaboration and project partnership and we would be happy to discuss any ideas you have to further integrate conservation / sustainability into our business.

Please see the opposite page for all contact details.

Hankley Common located on the Longmoor Training Area © Crown

Defence Infrastructure Organisation

DIO manages the MOD's property infrastructure and ensures strategic management of the Defence estate as a whole, optimising investment and providing the best support possible to the military.

Secretariat maintains the long-term strategy for the estate and develops policy on estate management issues. It is the policy lead for sustainable estate.

Safety, Environment and Engineering

The SEE provides direct support to Project & Programme Delivery and Service Delivery by providing a front line support, a safety assurance function, technical oversight to ensure MOD/DIO discharges its duties and corporate responsibilities under the Health and Safety at Work etc Act 1974, Environment Protection Act, other relevant legislations and Regulatory Articles; and also by providing the DIO intelligent client interface with industry.

Environment and Planning Support (EPS)

The EPS team is the focal point for all your environmental and planning needs and enquiries across the Defence Estate. It includes professional ecological, archaeological and planning support to the MOD. Specialists and experts maintain communications and liaison with a large number of statutory and non-governmental organisations.

Environmental Support and Compliance
Building 21
Westdown Camp
Tilshead, Salisbury, SP3 4RS

ES&C Ecology
Tel: 01980 674820
ES&C Historic Environment
Tel: 01980 674718
ES&C Access and Recreation
Tel: 01980 674782
ES&C Scottish Environmental Liaison
Tel: 01383 648042
ES&C Forestry
Tel: 01980 674766
EPS Environmental Planning
Tel: 01980 674665

Energy, Utilities & Sustainability Team

The EUS team is responsible for Energy Management, Energy Delivery and Payment, along with Water and Waste Policy Implementation and Data across the MOD estate both in the UK and Overseas.

Energy Management Team
Tel: 0121 311 2017
Energy Delivery and Payment Team
Tel: 0121 311 3854
Water and Waste Policy Implementation and Data Team
Tel: 0121 311 3733
Sustainable Development Support
Tel: 01980 674866

FMC Cap Infra

FMC Cap Infra acts as the strategic infrastructure planners and policy makers for Defence; taking a defence-wide perspective on estate assets and construction, and advice for capability planning for estate and infrastructure.

Including agriculture, forestry, natural and historic environments, access, planning and strategic engagement, waste management, energy, and environmental protection, Greening Government Commitments and MOD's sustainability strategy. Contact: **FMC-Cap-InfraPolSustEste@mod.uk**

Ministry of Defence

SUBMISSIONS

If you would like to contribute to Sanctuary Magazine or enter future Sanctuary Awards please contact Iain Perkins, Sanctuary Editor at:

dio-sanctuary@mod.uk

COVER IMAGE: Cover image kindly donated by Sam Bosanquet: Hidden in the fungi-rich grassland of the Sennybridge Training Area, Wales, are waxcaps, such as the violet coral *Clavaria zollingeri*. The waxcaps are easily overlooked as the fungi are only visible when they produce their fruitbodies. The MOD is playing an active role in conserving these areas by including habitat management recommendations on their constraints map/ sensitivity plan to help protect them.

BACK COVER: Back cover image kindly donated by Emmanuelle Briolat. The six-spot burnet *Zygaena filipendulae* on a pyramidal orchid *Anacamptis pyramidalis* at Penhale Training Area, Cornwall.

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