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Marwell Wildlife

Cover photo © Jason Brown, Marwell Wildlife

Marwell Wildlife

2019 Impact Report

Bee orchid
Ophrys apifera.

photo © Tim Woodfine, Marwell Wildlife

Contents

Our Work

Welcome to our review of charitable activities and impacts for 2019. In the following sections we share highlights of our work to restore nature, promote sustainable living and help catalyse changes needed to improve the fortunes of people, wildlife and the wider environment. Our work is all about collaboration with like-minded organisations and communities around the world. Many of these alliances have been in place for years and positive outcomes are accruing because of such long-term commitments.

The release of North African ostriches into Bou Hedma National Park fulfilled a goal of creating a national meta-population of these giant birds across four protected areas in Tunisia. Following the scimitar-horned oryx and addax, the North African ostrich becomes the third species we have helped reintroduce to multiple Tunisian protected areas, having previously disappeared from these environments.

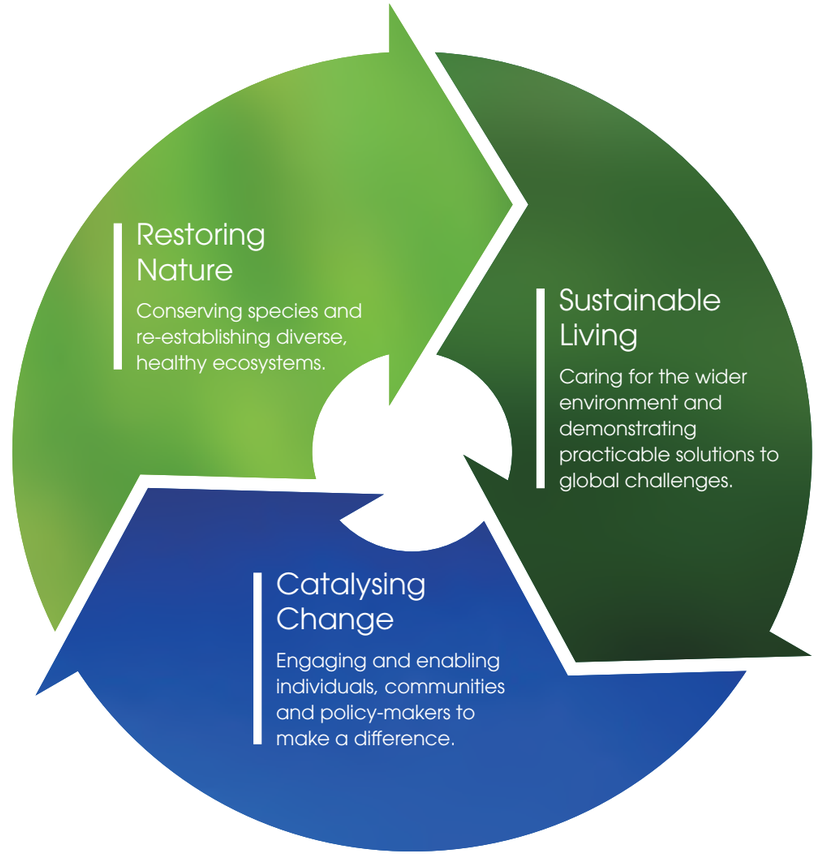
In the UK, the release of 87 sand lizards concluded three years of efforts to reintroduce one of Britain's rarest reptiles to the dry heathland on the north of Eelmoor Marsh Site of Special Scientific Interest in Hampshire. As a result, we have now successfully re-established this species in 27 locations across the South of England.

Local teams working across extensive landscapes in Africa and central Asia continued to deliver invaluable insights about wildlife and the human impacts on these environments.

It is encouraging that many species are holding on against the odds in remote and overlooked areas. However, it is also clear that the persistence of wild plants and animals is dependent on the restoration of vast tracts of degraded land, and time is of the essence to secure vital ecosystem services.

During the year we launched a refreshed Master of Research programme (MRes) in Wildlife Conservation in collaboration with the University of Southampton and delivered the inaugural intramural rotation in Zoological Medicine for final year BVMSci students from the University of Surrey. Nearly 40,000 children visited Marwell with their schools in 2019, while further initiatives connected younger generations with nature as far afield as China and remote parts of northern Kenya.

Further details of these and many other initiatives are summarised throughout this report.



Economic Impact

Our charitable delivery is possible because of resources generated by the operation of Marwell Zoo in Hampshire, creating a centre for enjoyment, learning, sustainability and scientific endeavour, and underwriting our conservation activities around the world. In 2019:

544,684 guests visited Marwell Zoo	**238** full-time equivalent employees	**£64.4** million Gross Value Added contributed to the regional and rural economy	**1,100** jobs supported in the area	Over **1,500** local businesses supported by our supply chain

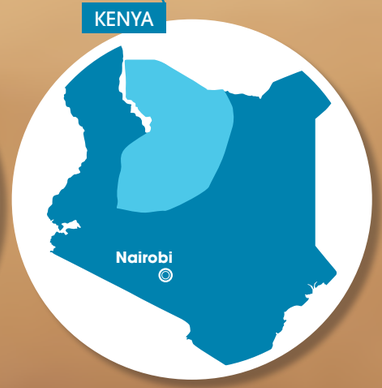
Where We Work

Internationally, we work with local stakeholders in places that are largely overlooked and under-represented, but hold important wildlife populations in biologically and socio-economically fragile environments. These are places with genuine need coupled with local aspiration for conservation, and the potential for scalable impact, including across international borders. It is also important that we get it right on our own patch, managing and using our own land sustainably, enhancing local biodiversity and contributing to species and habitat conservation across the wider landscape.

Semi-natural lowland ecosystems in the South of England.

Southern Tunisian arid steppe and the Grand Erg Oriental.

Matobo Hills, Zimbabwe.



Semi-arid and arid rangelands of northern Kenya.

Tian Shan mountain ecosystem bordering China, Kazakhstan and Kyrgyzstan.

Restoring Nature

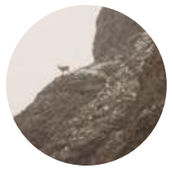
Tian Shan mountain range, the location of trans-boundary snow leopard *Panthera uncia* surveys.

photo © Saltore Saparbayev, Kazakhstan

Restoring Nature

Trans-Boundary Cooperation for Snow Leopards

513 camera trap images of wildlife, including snow leopards and their prey species, taken by the Kazakh team.



> **RIGHT**
A young inquisitive snow leopard *Panthera uncia* in the West Tian Shan mountains of Kazakhstan, on the outskirts of the country's largest city, Almaty.

Stunning images of snow leopards *Panthera uncia* and their prey species emerged from camera-trap survey efforts in the Tian Shan mountain range between Kazakhstan, Kyrgyzstan and China.

Teams continued to communicate and to coordinate survey efforts across country boundaries, reflecting the local and national political, social and environmental challenges. The Kazakh team had particular success during the year, collecting 513 images of wildlife including snow leopard and their prey species, such as argali sheep *Ovis ammon*, Siberian ibex *Capra sibirica*, Caspian red deer *Cervus elaphus maral* and Siberian roe deer *Capreolus pygargus*. The trans-boundary study area covers 20,000 km^2 centred around Pik Pobedy / Tomur Feng mountain. Equally important were observations of human impact, including previously unmapped gold mining activity close to national borders, and insights from residents and protected area rangers about natural resource use. These included illegal harvesting of plants and poaching of animals, as well as legal hunting of wildlife in designated areas. We are undertaking research to understand how, and the extent to which, people utilise facets of this mountain environment to provide vital information for managing the ecosystem and conserving its apex predator, the snow leopard.

PARTNERS NABU Germany and Kyrgyzstan | Wildlife Institute, Beijing Forestry University, China | Almaty State Nature Reserve, Kazakhstan | Institute of Zoology, Ministry of Education and Science, Kazakhstan | National Academy of Science, Kyrgyzstan | Wildlife Without Borders, Kazakhstan

photo © Saltore Sapartbayev, Kazakhstan

Desert but not Deserted

1st aerial survey undertaken over parts of the Grand Erg Oriental, covering a 430,000 ha area.

Striped hyaenas *Hyaena hyaena*, fennec foxes *Vulpes zerda*, African golden wolves *Canis anthus* and wild cats *Felis silvestris* were among encouraging observations of species from our ongoing assessments of arid ecosystems in southern Tunisia.

Photographs from camera-traps, indirect evidence of wildlife from walked transects, invertebrate pitfall traps and vegetation surveys helped gather seasonal information about the state of arid steppe and desert ecosystems within protected areas. Our team also traversed over 200 km of the desert by vehicle and undertook the first aerial survey over parts of the Grand Erg Oriental, covering an area 430,000 ha, to gain additional insights about the wider environment.

Records of nearly 100 species of invertebrates were among positive outcomes for the desert environment of Jbil National Park. Desert hedgehog *Paraechinus aethiopicus*, Saharan striped polecat *Ictonyx libycus* and red fox *Vulpes vulpes* captured in camera-trap images are likely to be at the edge of these species' ranges but, together with sightings of African golden wolf and fennec fox, provide good indications of an ecosystem able to support the collective insectivorous and carnivorous needs of these animals.

Slender-horned gazelles *Gazella leptoceros* were seen within Jbil National Park, while there were signs but no direct sightings during the aerial survey of the southern section of the Grand Erg Oriental. Local anecdotal reports suggest these animals move seasonally and are more likely found in other parts of the desert, so our work will continue to help assess the status of this endangered species. Meanwhile, the quality of vegetation in other parts of the Grand Erg Oriental, traversed by vehicle earlier in the year, looked very promising for slender-horned gazelles and would certainly support the reintroduction of addax *Addax nasomaculatus* into the wider environment. Our first camera-trap images of striped hyaena were a highlight of ongoing studies in the arid steppe ecosystem of Dghoumes National Park, while presence of genet *Genetta genetta* was confirmed in Bou Hedma National Park.

PARTNERS Direction Générale des Forêts (Ministry of Agriculture, Water Resources and Fisheries), Tunisia | Bou Hedma, Dghoumes and Jbil National Parks and associated CRDA | University of Tunis El Manar

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ABOVE RIGHT
Camera-trap image of African golden wolf *Canis anthus*, one of a number of predators found in Tunisian National Parks.

Fourth Release of North African Ostriches

The reintroduction of North African ostriches *Struthio camelus camelus* into Bou Hedma National Park fulfilled a goal of creating a national meta-population of these giant birds across four protected areas in Tunisia.

At 2.75 m (9 ft) tall and weighing 150 kg, the North African ostrich is the largest living bird. Now restricted to just a few savannah populations, the species disappeared from its extensive Saharan range due to habitat loss, egg collecting and hunting for food and feathers. Despite being previously abundant, it had disappeared from Tunisia by 1887.

At the end of 2014, we helped reintroduce North African ostriches to Dghoumes National Park, marking the return of the species after an absence of 127 years. This was followed by further efforts in Sidi Toui National Park and the Orbata National Reserve, and by the end of 2018 there were over 70 North African ostriches living in Tunisia. With numbers growing, it allowed us to translocate and release birds into Bou Hedma National Park where there are now eight ostriches (four males, four females) inhabiting the semi-arid steppe and woodlands.

The North African ostrich becomes the third species that we have helped reintroduce to multiple Tunisian protected areas, alongside the scimitar-horned oryx *Oryx dammah* and addax.

PARTNERS Direction Générale des Forêts (Ministry of Agriculture, Water Resources and Fisheries), Tunisia | Dghoumes, Bou Hedma and Sidi Toui National Parks, and Oued Dekouk, Orbata, El Gonna National Reserves and associated CRDA | Friguia Zoo | Sahara Conservation Fund Niger | CEVA Vet Pharmaceutics

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RIGHT
North African ostriches *Struthio camelus camelus* reintroduced to Bou Hedma National Park.

Wildlife Monitoring in Northern Kenya

>4,000
kilometres
of patrol routes covered, on foot, by Community Scouts who record wildlife information using CyberTracker enabled Smartphone devices.

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ABOVE RIGHT
Gerenuk *Litocranius walleri* was one of the most commonly seen species during Community Scout patrols in northern Kenya.

Photo © Tim Woodfine, Manyeli Wildlife

Our Community Scouts in the far north of Kenya covered over 4,000 km on foot in their efforts to gather information about wildlife and the environment through direct observations, anecdotal reports and use of camera-traps.

Despite patrol efforts hampered by periods of insecurity and drought, scouts reported sightings and other evidence of 24 species of large mammals, including 13 ungulates and 10 carnivores. Dik-dik *Madoqua guentheri* and gerenuk *Litocranius walleri* were the most commonly seen species, reflecting the large tracts of semi-arid scrubland habitat across this area. Black-backed jackals *Canis mesomelas* were the most commonly seen of the carnivores, while there were reasonably frequent reports of caracal *Caracal caracal* and cheetah *Acinonyx jubatus* amongst other predators. Sightings of the endangered Grevy's zebra *Equus grevyi* occurred on 57 separate occasions, with more juveniles and foals detected compared to patrol observations in 2018. While this semi-arid environment is under increasing pressure, the persistence of this variety of wildlife is remarkable outside of protected areas.

PARTNERS Kenya Wildlife Service | Grevy's Zebra Trust | Lewa Wildlife Conservancy | Milgis Trust | Northern Rangelands Trust

Restoring **NATURE**

Drought Relief for Grevy's Zebra

Despite encouraging news reported in our 2018 Impact Report, the endangered Grevy's zebra remains vulnerable to human threats and natural catastrophes. Hence, following prolonged drought across northern Kenya, we joined forces with Grevy's Zebra Trust to distribute hay to hungry animals in the worst affected areas.

The Recovery and Action Plan for Grevy's Zebra in Kenya sets out the case for supporting animals affected by drought or disease, because the overall population is not yet large enough to be resilient to these threats. With the failure of two consecutive rainy seasons, it became clear that the body condition of Grevy's zebra across our remote study area had deteriorated. Lactating mares and their foals were particularly vulnerable because of the need to travel much further distances in search of pasture before returning to drink at available sources of water.

Locations for supplementary feeding of Grevy's zebra agreed with the Kenya Wildlife Service followed an assessment of forage and water availability. Between July and October, hay distributed to water points in the hills was available for Grevy's zebra when they came to drink at night, undisturbed by presence of people and livestock. The rains finally returned in October and supplementary feeding discontinued once vegetation had recovered sufficiently. Subsequent observations suggested the intervention helped adult Grevy's zebra and their foals survive this difficult period.

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ABOVE RIGHT
Night-time camera trap image of Grevy's zebra *Equus grevyi* feeding on hay distributed as part of drought relief efforts in northern Kenya.

Hay loaded on a motorbike ready to be transported to the areas worst affected by the drought.

PARTNERS Kenya Wildlife Service | Grevy's Zebra Trust

Vegetation and Mammals of the Matobo Hills

The condition of habitats and contemporary information about populations and distribution of a variety of large mammals emerged from surveys of the Matobo National Park, Zimbabwe.

Verifying the status of closely monitored black rhino *Diceros bicornis* and white rhino *Ceratotherium simum* populations were among the important outputs of this work, which also included a suite of management recommendations for enhancing the environment.

Conducted by Dambari Wildlife Trust and the National Park's Scientific Services team, and supported by Marwell, a park-wide survey of major habitat types revealed conditions were generally good. High botanical diversity reflected in the 84 species of trees and 52 species of grasses found across 110 sampling locations. However, the survey also highlighted the spread of alien invasive plants and human pressure, possibly exacerbated by recent drought. Livestock encroachment, over-grazing, and the poaching of animals and harvesting wild honey and wood are currently having detrimental effects, but careful management of natural resources and collaboration with the community could yield benefits for people and wildlife in this area.

A combination of road transects, walking transects, and camera-trap surveys in the Whovi Game Park section of the Matobo National Park helped produce contemporary information about 34 species of mammals, including 16 ungulates and 12 carnivores. As there had been no comparable assessments carried out for decades, the survey provided much needed population estimates and spatial distribution information for species ranging from small antelopes, like klipspringer *Oreotragus oreotragus*, to larger animals, like eland *Taurotragus oryx* and giraffe *Giraffa camelopardalis*.

PARTNERS Dambari Wildlife Trust | Zimbabwe Parks and Wildlife Management Authority | Matobo National Park

> **RIGHT**
White rhino *Ceratotherium simum*, one of 34 mammal species recorded during a survey of the Whovi Game Park region of Matobo National Park, Zimbabwe.

photo © Tim Woodfine, Marwell Wildlife

Habitat Restoration in the South of England

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ABOVE
Long-leaved sundew *Drosera intermedia* and purple butterwort *Pinguicula vulgaris.*

Planting 7,275 trees together with interventions to restore semi-natural ancient woodland and heathland habitats were among a series of activities carried out during the year.

Creating secondary woodland by planting thousands of native trees was part of a plan to enhance 3.6 ha of our land for wildlife and increase carbon sequestration. It will also allow us to sustainably harvest woody material each year for feeding to browsing animals. Similarly, production of nearly 2,000 bales of hay helped maintain 15 ha of our valuable chalk grassland while providing forage for zoo animals. Thinning and coppicing of trees diversified the understorey of 1.4 ha of our semi-natural ancient woodland, while improvements to a 650 m length of bridleway enhanced public access and enjoyment of our woodlands and grasslands.

Nearly 2 ha of heathland habitat at Eelmoor Marsh Site of Special Scientific Interest benefitted from removal of encroaching scrub. Targeted interventions designed to support populations of notable species included creating 126 m^2 of open sand to facilitate sand lizard *Lacerta agilis* nesting and restoring 200 m of boggy ditches to encourage insectivorous plants, such as purple butterwort *Pinguicula vulgaris* and long-leaved sundew *Drosera intermedia.*

PARTNERS QinetiQ | Natural England | Forestry Commission | The Hampshire and Isle of Wight Wildlife Trust | The Woodland Trust

A Good Year for Heathland Butterflies and Dragonflies

1,500%
increase
in silver-studded blue butterfly population at Eelmoor Marsh, over 20 years.

More species of butterflies and dragonflies appeared at Eelmoor Marsh in 2019 compared to the previous year, with positive outcomes for several of the rarer ones.

Of the 31 butterfly species recorded on site (27 in 2018), recent discoveries silver-washed fritillary *Argynnis paphia* and white admiral *Limenitis camilla* increased or maintained their numbers, hopefully signalling they are here to stay. Meanwhile, the green hairstreak *Callophrys rubi* bounced back following lower counts in recent years. Butterfly populations were no doubt helped by the hot summer, but analyses of our long-term datasets suggest that targeted habitat restoration and management is having a positive impact. A great example is the recovery of the silver-studded blue *Plebejus argus* which had almost disappeared from Eelmoor Marsh 20 years ago, but has since increased in number by over 1,500%.

It was a similarly positive year for dragonflies and damselflies at Eelmoor Marsh, with a total of 23 species recorded (20 in 2018). Years of creating suitable habitat for the nationally scarce small red damselfly *Ceriagrion tenellum* meant the population was resilient enough to recover from low water levels caused by a lengthy period of dry weather the previous year, while the local population of the nationally uncommon keeled skimmer *Orthetrum coerulescens* remained strong. Four other species of conservation concern, previously seen sporadically on site, all appeared in 2019: hairy dragonfly *Brachytron pratense;* golden-ringed dragonfly *Cordulegaster boltonii;* downy emerald *Cordulia aenea;* and white-legged damselfly *Platycnemis pennipes.*

PARTNERS QinetiQ | Natural England

Three-Year Sand Lizard Release Completed

The release of 87 sand lizards in September concluded three years of efforts to reintroduce one of Britain's rarest reptiles to the dry heathland on the northern side of Eelmoor Marsh.

The 70 hatchlings and 17 yearlings brought the total number of sand lizards released on site to 253. Previously released lizards survived hibernation, and observations during the spring and summer months included encouraging signs of breeding behaviour. Monitoring the fortunes of this newly formed population will continue for years to come.

With the prospect of more sand lizard releases needed to support the conservation of this species across the South of England, we upgraded our bespoke breeding and research facilities. Hot weather during the sand lizard breeding season was a key factor in reproductive success. The 110 sand lizard eggs produced was better than seen for several years. A high hatching and survival rate meant that 107 animals were available either for release at Eelmoor Marsh or retention in the colony for future projects.

PARTNERS QinetiQ | University of Southampton | Natural England | Amphibian & Reptile Conservation Trust | Surrey Amphibian and Reptile Group

> **RIGHT**
Sand lizard *Lacerta agilis* in Marwell's breeding and research facility.

Advances in Animal Welfare

The last year saw progress in the practical application of the novel Animal Welfare Assessment Grid for a range of taxonomic groups at Marwell, several successful examples of animal training to enhance welfare, and we marked 40 years of global data sharing to advance animal welfare and conservation.

Animal Welfare Assement Grid

By scoring factors associated with physical and psychological health, environment, and veterinary and other management interventions, the Animal Welfare Assessment Grid (AWAG) produces a graphical means of understanding welfare of an individual animal or group at a given time. The system was tested and routinely employed for monitoring welfare of five species in 2019, while templates reflecting the needs of primates, carnivores, ruminants, macropods and fish were designed to enable the next stage of implementation. Our next step is to develop smartphone accessible software to enable rapid data collection and analysis.

Animal Training

Learning is a natural biological process that has evolved to provide organisms with an evolutionary advantage. As a result, animals are constantly looking for cues in their environment to act on for their benefit. This principle sits at the heart of our work to encourage zoo animals to participate voluntarily in aspects of their own care and management, resulting in improved welfare.

There were several successful examples of this positive reinforcement training during the year, including encouraging a ring-tailed lemur *Lemur catta* to enter and become accustomed to a transport crate, avoiding the need for physical capture; an elderly Amur leopard *Panthera pardus orientalis* to receive hand delivered injections, avoiding the need for sedation; a Javan green peafowl *Pavo muticus* to come when called to shelter during inclement weather and allowing vets to check for signs of arthritis; and five pygmy marmosets *Cebuella pygmaea* to stand on individual platforms when called for weighing and visual health checks in an otherwise densely planted environment where observations can be difficult.

PARTNER University of Surrey, School of Veterinary Medicine

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ABOVE AND RIGHT Pygmy marmosets *Cebuella pygmaea*, Javan green peafowl *Pavo muticus* and ring-tailed lemur *Lemur catta*, some of the species for which successful positive reinforcement training was carried out in 2019.

photo © Jason Brown, Marwell Wildlife

This approach to supporting husbandry and veterinary intervention has a wide range of applications and is often safer and less stressful for both animals and people. With this in mind, we developed a competency framework for staff and started rolling this out so that animal training becomes more widely adopted and embedded into our routine work.

40 Years of Sharing Animal Records

We marked the 40th anniversary of Marwell joining what has become a global network of organisations sharing data to advance animal welfare and conservation. During this period, we have shared information about 520 species based on our records of 11,183 individual amphibians, reptiles, birds and mammals. As well as giving our own and other animal care professionals immediate access to information to support daily decisions, this collective dataset has resulted in more than 80 scientific publications.

Today, sharing information through global databases is a common occurrence. Forty years ago, the idea was novel, and the technology wasn't available. However, Marwell became an early adopter of a shared zoological inventory system which began by collecting data on old computer punch cards. Superseded in 1985 by the PC-based Animal Records Keeping System (ARKS), further advances soon followed with the creation of the Medical Animal Records Keeping System (MedARKS) and Single Population Analysis and Records Keeping System (SPARKS). This suite of software revolutionised the way zoological institutions could share information for mutual benefit. It created a global inventory of zoo animals, helped share information about veterinary care, and facilitated the creation of international and regional studbooks as the basis of cooperative breeding programmes. By 2011, a new web-based Zoological Information Management System (ZIMS) was launched and Marwell was again an early adopter having helped test and advise on its development through staff participation on a panel of international subject matter experts.

We are now part of a network of more than 1,200 zoo, aquarium, university, NGO and governmental members across 99 countries that seeks to improve animal welfare and species conservation through a not-for-profit organisation, Species360, which evolved from those pioneering ideas all those years ago.

PARTNER Species360

Sustainable Living

Marwell's semi-natural ancient woodlands.

Photo ©Tim Woodfine, Marwell Wildlife

photo ©Tim Woodfine, Marwell Wildlife

photo © Spirit Solar

Sustainable Living

Towards a Better Environment

< **LEFT** Marbled white butterfly *Melanargia galathea*. Sequestration by Marwell's open habitats and ancient woodlands will be considered in future calculations of our carbon footprint.

Solar panels on the Wild Explorers rhino house.

Progress On Zero Carbon

We passed a major milestone for on-site solar energy, with the total amount of electricity generated since the first of our solar panels were installed in 2011 surpassing 500,000 kWhs; enough to power an average home for 33 years.

The remainder of our electricity is supplied from renewable, zero carbon sources anyway but local generation contributes to the national total and reduces losses in transmission of electricity across the UK power network. Towards the end of the year, we received planning permission and placed the orders to build a new low carbon biomass heating system. The plant will process waste straw bedding and herbivore dung from a variety of our larger animals including giraffe, zebra, and antelopes to supply warmth to the Tropical House, other animal buildings and Marwell Hall via a district heating system. When complete, it will give us the ability to process much of our waste on site, removing the need for lorry movements on the roads and will reduce our carbon footprint by nearly 100 tonnes, moving us ever closer to our goal of net zero.

Water Conservation Plan

At the end of 2019, we adopted an ambitious new Water Conservation Plan to reduce consumption of this precious resource and retain water in the local environment.

New remote logging equipment installed on our water meters will allow us to monitor water consumption more closely and identify presence of leaks or areas where we can make improvements through changes in practices. This has already paid dividends with leaks pinpointed and fixed in aging underground pipes. We will also be investigating the amount of water used in the production of goods that we buy and where they come from, to guard against inadvertent damage to water stressed ecosystems around the world.

photo © Lydia Cross, Marwell Wildlife

> **RIGHT**
A team from IBM's Extreme Blue internship programme worked with us to develop a simple device that uses AI to identify rubbish and determine which items are recyclable.

Application of Artificial Intelligence

Through our ongoing collaboration with IBM, we continued to explore innovative ways of meeting our sustainability objectives using artificial intelligence (AI).

Following the success of a prototype AI sensor for controlling heating in our nyala house (reported last year), a second-generation controller was developed and installed. The new kit uses the same thermal imaging principle as the prototype but has an enhanced sensor which we anticipate will result in an additional 10% improvement in energy efficiency. Meanwhile, a team from IBM's Extreme Blue internship programme worked with us to develop a simple device to engage people in recycling. Using AI, the prototype device was able to identify rubbish and tell whether it could be recycled, adding some fun and handy information to an otherwise mundane process. The team won first prize in a competition for IBM interns across the whole of Europe, highlighting the degree of innovation applied to what seems like a simple idea. Further work is being undertaken to improve the accuracy of the device with the hope of deploying the technology at Marwell and elsewhere.

PARTNER IBM

Sustainable **LIVING**

30,000
guests
have used the Marwell bus service since its launch 10 years ago.

Environmental Standards

We marked 10 years since the launch of our Environmental Management System by retaining certification against the ISO14001:2015 internationally recognised standard.

Our catering team at Café Graze once again achieved The Soil Association's 'Food for Life' Silver standard for serving freshly prepared food using locally and sustainably sourced ingredients with high standards of animal welfare. To conclude the year, we were delighted to win Gold in the Beautiful South awards for Ethical, Responsible and Sustainable Tourism.

Single-Use Plastics

Four water bottle filling stations were installed at Marwell to encourage guests to use their own reusable bottles.

Meanwhile, products such as snacks and sweets wrapped in compostable packaging made of plant-based materials were made available in our gift shop and catering outlets. These steps are part of a wider plan to eliminate single-use plastics from our operations and supply chain.

> **RIGHT**
Four water bottle filling stations installed at Marwell allow guests to refill their reusable bottles.

Green Travel

During the 10 years since its launch, the Marwell bus service has now carried 30,000 guests to the zoo, helping to reduce carbon emissions and remove traffic and pollution from the roads.

It has also provided a direct link to Marwell's rural location for people without their own transport. First trialled as a mini-bus service from Eastleigh train station, the bus ran twice a day from Southampton on weekends, bank holidays and school holidays from April until early September in 2019.

photo © Alison Cook, Marwell Wildlife

PARTNERS Three Rivers Rail Partnership | First Southampton | Velvet | One Community

Catalysing Change

A member of our Wild Explorers Club identifying species found during a pond-dipping activity.

photo © Wild Explorers Club, Marwell Wildlife

Catalysing Change

Natural Curiosity

School Visits

A total of 39,596 children visited Marwell with their schools during the 2019 calendar year.

During this period, we delivered 770 workshops across all key stages of the national curriculum with topics such as animal classification, rainforests, adaptation and food webs proving popular choices with teachers. During the 2018/19 academic year, schools from 32 different local education authorities (LEAs) visited Marwell. We welcomed groups from 56% of schools in Southampton, 43% in Portsmouth, 38% in Hampshire, and 27% of schools in both Bournemouth and Reading LEAs.

Early Years Appreciation of Nature

Shared appreciation of snow leopards spanned the 5,000-mile divide between children from the Kids Love Nature Kindergarten at Marwell and their counterparts at the New Oriental Stars Kindergarten in Beijing, China.

Using video logs, the children shared their understanding and love of snow leopards during a month-long exchange between the two centres, demonstrating the universal appeal of nature. Some of the children and staff from New Oriental Stars Kindergarten enjoyed a subsequent visit to Marwell, seeing our snow leopards and participating in sessions led by our Nature Interpreter. These activities were part of a study trip to the UK and Finland, as New Oriental Stars seek to develop a nature-based pre-school nursery model to roll out in China.

Our wider partnership with Kids Love Nature resulted in delivery of over 300 activity sessions for children aged 2-5 years, with topics including phenology, taxonomy, lifecycles and adaptation. The children also became citizen scientists participating in national bird and bumblebee counts.

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ABOVE
Children from New Oriental Stars Kindergarten in Beijing, China proudly displaying booklets they made about snow leopards during an exchange programme with the Kids Love Nature Kindergarten at Marwell Zoo.

PARTNERS Kids Love Nature | New Oriental Stars Kindergarten, Beijing

photo © Jason Brown, Marwell Wildlife

Natural History Collection

A fresh inventory of our natural history artefacts catalogued over 800 items, representing around 300 species and providing an invaluable educational resource.

Our diverse collection ranges from microscope slides of unicellular organisms through to complete vertebrate skeletons, including those of ostrich, cheetah, and chimpanzee. The cataloguing process involved logging photographs of each item, along with information on condition, location and provenance. As many of the specimens are derived from threatened species, they require special licensing under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).

Some specimens were passed on to us for educational use following confiscation by HM Revenue and Customs, while others were private donations. The artefacts with the most intriguing provenance are those from the former University of Southampton Zoological Museum which was closed in the 1960s and its collection consigned to a basement until coming to Marwell in 2010. These particular skulls, skeletons and other specimens are likely to be decades or even older, and we have no clue about their individual origins. They are, nevertheless, much used and appreciated learning resources.

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ABOVE
Natural history artefacts, such as the pictured giraffe skull, provide an invaluable educational resource.

Natural Curiosity

Butterfly

Beetle

Accessibility

Throughout 2019 we continued initiatives to support zoo guests with special cognitive, sensory and communication needs. This included refreshing our audio sensory trail highlighting the sounds, scents and tactile experiences of a visit to Marwell.

We worked with Autism Hampshire to create tips for guests with cognitive and sensory needs, highlighting quiet times and places for anyone wanting a break from stimulation, and to help plan their day in advance to make sure everything runs smoothly. Training was provided for teams all around the zoo to look out for guests displaying the Hidden Disabilities sunflower in case they need additional support or a little more time and space. Meanwhile, as an approved Makaton Friendly organisation, we updated resources and trained our teams to support people who use Makaton to aid their communication.

PARTNERS Autism Hampshire | The Makaton Charity | Hidden Disabilities Sunflower Charitable Trust

Conservation Explorers

Helping sand lizard conservation, creating wildlife habitats and honing species identification skills were just some of the activities enjoyed by members of our Wild Explorers Club.

Scientific and practical aspects of saving a species were highlighted during a special session with one of our conservation scientists, when children between the ages of 4 and 12 helped manage sand lizard breeding habitat and learn about the radio tracking equipment we've been using to locate tagged animals during reintroduction to the wild. In September, the Wild Explorers Club held a 'Bio-Blitz' day, finding and identifying nearly 200 native species around Marwell with the help of the Southampton Natural History Society.

PARTNER Southampton Natural History Society

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ABOVE
Makaton is a unique language programme that uses symbols, signs and speech to enable people to communicate.

photo © Heather Gurd, Marwell Wildlife

Outreach in the Far North of Kenya

Working with rural schools and communities, our Kenya team engaged nearly 200 pre- and primary age school children and livestock herders living in remote areas on the topic of 'wildlife living around us'.

With special emphasis on the endangered Grevy's zebra and its conservation, 130 primary school pupils participated in sessions in the communities of Arge, Illaut, Keleswa and Mpang. Inspired by these conversations, pupils from Farakoren Primary School in Mpang have since established their own wildlife club. Engaging 49 livestock herders in Arge and Lkoitikal was particularly important because these young children often don't attend school but do have a close connection with the environment through their daily activities. Lack of training and support for teachers on this topic and periodic insecurity across the region means that opportunities for children to learn about wildlife and environment are otherwise limited.

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ABOVE
Enrita, from our Kenya team, engaging primary school children during an outreach session on the topic 'wildlife living around us'.

Higher Education

Our scientists supervised and facilitated 20 undergraduate and 36 postgraduate research projects during the year and taught over 600 university and college students, contributing to academic qualifications in the UK and internationally.

MRes Wildlife Conservation

In collaboration with the University of Southampton, we re-launched our Master of Research programme in Wildlife Conservation, welcoming eight new students.

Following a successful first five years during which 38 students gained postgraduate qualifications, we took time out during the 2018 / 19 academic year to refresh and re-validate the course. Reflecting rapid changes in conservation science and practice, the course is a pathway to the professional competences and the personal development and confidence needed to have real impact in the world.

PARTNER University of Southampton

Veterinary Medicine

Our veterinary team launched the first Zoological Medicine intramural rotation for final year BVMSci students from the University of Surrey.

This is a four-week elective, where between two and four students at a time come to shadow the work of the veterinary team. During the year, 16 final year students undertook clinical work to gain hands-on practical experience, carried out a research project, and participated in workshops covering topics such as animal enclosure design, welfare assessment, body condition scoring, and nutrition. We also provided separate veterinary work experience and internships for four additional students.

Our teams delivered a series of specialist lectures and workshops on zoo and wildlife medicine, biodiversity and ecosystem health, and conservation biology for 120 fourth year veterinary students, while a further 120 third year veterinary students attended lectures on wild animal nutrition. Our contributions to University of Surrey career days and open days provided guidance to graduating and prospective new students.

Congratulations to the University of Surrey School of Veterinary Medicine having celebrated graduation of its first cohort of students and received accreditation from the Royal College of Veterinary Surgeons (RCVS).

PARTNER University of Surrey

photo © Jamie Wharton, Marwell Wildlife

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ABOVE
Marwell run the clinical zoo medicine elective for the University of Surrey's final year students, where they are involved in every aspect of the veterinary team's work.

Trainee Teachers

A total of 294 trainee teachers across Early Years, Primary and Secondary education accessed training opportunities at Marwell in 2019.

Three Focus Days, designed in collaboration with the University of Southampton, provided 71 secondary trainee teachers with insights into biodiversity and conservation, learning outside the classroom and teaching students with special educational needs. Nearly half of all the secondary trainee teachers studying at the university during the year accessed this training provision.

Over 200 primary trainee teachers from the University of Winchester visited Marwell to learn about our conservation work and educational opportunities for school groups, while a workshop on outdoor education was attended by 15 Early Years practitioners. Six primary student teachers from local universities completed placements within our education team. Spending up to two months with us gave students the opportunity to gain experience in environmental education in a setting other than a school.

PARTNERS University of Southampton | University of Winchester | University of Chichester

Participation

Marwell Volunteers

In 2019, 135 dedicated volunteers collectively contributed 10,920 hours of their time in support of our mission, a huge 60% increase compared to 2018.

Our volunteers are instrumental to our success, taking on a diversity of duties across the organization. Whilst some share their knowledge and passion for the natural world with school groups, members of our Wild Explorers Club and the wider public, others provide critical support to ensure we remain a place of enjoyment and learning.

Business Generosity

A total of 370 employees from 23 businesses across the region contributed a record 2,220 hours of their time, enabling the completion of 88 separate projects.

Their collective efforts included the planting of 7,000 spring bulbs, 490 saplings and 101 trees; sowing of 155 m^2 of wild flower seed; spreading 1,103 m^2 of mulch across gardens; and filling 63 barrels with branches and leaves to make browse silage for feeding to zoo animals with specialist diets over winter.

> **RIGHT**
One of our dedicated volunteers engaging with guests in the Energy for Life Tropical House.

photo © Jason Brown, Marwell Wildlife

Multiplying Impact

Sahelo-Saharan Interest Group

At the invitation of the Tunisian Ministry of Agriculture, Water Resources and Fisheries, we facilitated and participated in the 19th Sahelo-Saharan Interest Group (SSIG) meeting.

The scientific forum brought together over 100 participants with an active commitment to nature conservation across the region to share outcomes of their work and foster partnerships.

Equid Specialist Group

With representation on the IUCN Species Survival Commission Equid Specialist Group, and the European Equid Taxon Advisory Group, we participated in the 2nd International Wild Equid Conference in Prague, Czech Republic.

The conference, attended by 120 researchers, academics and practitioners from 30 countries, provided a platform for knowledge exchange on current research and conservation efforts for wild equids. Topics covered included: population viability, behavioural ecology, reproductive biology, genetics, morphology and more. Prior to the conference, we participated in a closed meeting of the IUCN/SSC ESG which looked at the status of all equid species as well as issues surrounding taxonomy and diseases in wild equids.

Grevy's Zebra Conservation & Research

As a member of Kenya's Grevy's Zebra Technical Committee (GZTC), we sponsored and co-organised the 'Grevy's Zebra Conservation and Research Conference 2019' held at the Kenya Wildlife Service Headquarters in Nairobi.

As part of the agenda guided by the Recovery and Action Plan for Grevy's Zebra 2017-2026, our team presented outcomes of community-based monitoring of Grevy's zebra using the SMART ('Spatial Monitoring and Reporting Tool') software application and results of a five-year study to understand Grevy's zebra movements and landscape connectivity in northern Kenya using GPS tracking technology. The interdisciplinary conference brought together 120 delegates, including representatives from national and county government, research institutions, NGOs, private / community conservancies and local communities.

photo © Tim Woodfine, Marwell Wildlife

photo © Yasmina Khaznawi / Sahara Conservation Fund

\> RIGHT
Grevy's zebra *Equus grevyi* conservation and research highlighted at a special meeting in Nairobi.

Tim Woodfine (furthest right) at the SSIG meeting in Tunis with key speakers, including the Minister of Agriculture and the Director General of the Forestry Department.

Multiplying Impact

Five Years of Sustainability Forums

We reflected on five years of chairing the Winchester Sustainable Business Network, part of the Hampshire and Isle of Wight Sustainable Business Network.

During this time, we have helped organise and contribute to 26 seminars for local businesses providing the information businesses need to reduce their own environmental impact, as well as the encouragement and support required to take the next step. Attended by 839 delegates from businesses across the Solent region, these seminars have covered a wide range of topics, including: energy and carbon; waste and recycling; water saving; transport; purchasing; environmental management systems; clean and low carbon technologies; eliminating single-use plastic; and the circular economy.

Zoo Nutrition Conference

We organised and hosted the 10th European Zoo Nutrition Conference attended by 160 delegates from over 30 countries including representation from Australia, Europe, Japan and the USA.

The meeting brought together wildlife nutritionists, veterinarians, researchers and animal care practitioners demonstrating the advances in understanding of wild animal diet and nutrition which has developed rapidly over the last 20 years. This year's conference included sessions dedicated to mammal, bird and reptile nutrition, provision and storage of natural forage for browsing animals, and the role of vitamin D.

photo © Saltore Sapparbayev Kazakhstan

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ABOVE
Philip Riordan presenting details of our trans-boundary snow leopard project at a meeting held in Nur-Sultan, Kazakhstan and convened by the Snow Leopard Foundation and the Global Snow Leopard and Ecosystem Protection Programme (GSLEP).

Antelope Specialist Group

Having hosted the IUCN Antelope Specialist Group (ASG) Programme Office since 2014, the team was delighted to receive the Species Survival Commission Chair's Citation of Excellence.

The award recognised the group's outstanding contributions to conservation planning and resulting actions, and the wider sharing of these outcomes through a range of publications and news items. The ASG is the world's leading body of scientific and practical expertise on the status and conservation of all antelope species.

Snow Leopard Forum

We presented details of our trans-boundary snow leopard project at a meeting held in the Kazakhstan capital, Nur-Sultan (formerly Astana), and convened by the Snow Leopard Foundation and the Global Snow Leopard and Ecosystem Protection Programme (GSLEP).

Proceedings of the meeting, incorporated into an official resolution, are due for presentation at the next International Snow Leopard conference in Russia in 2020.

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PARTNERS

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and additional staff at Marwell Wildlife

photo © Jason Brown, Marwell Wildlife

Looking to the Future

photo © Marie Petretto, Marwell Wildlife

Our Charitable Impact Plan sets out our aspirations between 2019 and 2022, by which time Marwell Wildlife will be 50 years old.

In the last five decades, the global human population grew from 3.7 billion to 7.8 billion people. In the next 50 years, our planet may be supporting the livelihoods and aspirations of 10 billion people and rapid changes in society. We are, therefore, facing an unprecedented demand for nature's life sustaining and life enhancing services. What society now chooses to do about loss of biodiversity, climate change and other environmental challenges will have imminent consequences for wildlife and the quality of human life around the world.

Our plan is motivated by these needs but encouraged by positive outcomes of our work to date, which often bucks wider trends. We are now charting courses to expand populations and ranges of threatened species for which we have special responsibilities; to become a carbon neutral organisation; and to help realign relationships with nature by promoting environmental literacy, building capacity for conservation, and using our experiences to influence wider policy and practice.

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ABOVE
North African ostriches *Struthio camelus camelus* in Dghoumes National Park.

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RIGHT
Scimitar-horned oryx *Oryx dammah* in Bou Hedma National Park.

photo © Marie Petretto, Marwell Wildlife