

Conference Proceedings

Key Note: Professor Dave Goulson

Talk outline:

Bees and other pollinators are vital to our wellbeing: about one third of all the food we eat depends on the pollination services they provide. More broadly, natural ecosystems depend upon pollination: without it, most flowering plants would disappear and ecosystems would collapse. Hence we should be concerned that wild bees are in decline, with some species of bee having gone extinct. Dave Goulson will explain the various reasons why they are declining, which include loss of flowers from the countryside, our accidental spreading of bee diseases, and our overuse of pesticides such as neonicotinoids. He will then discuss the many ways that we can all help to ensure that all types of bees have a future.

About Professor Goulson:

Professor Dave Goulson was brought up in rural Shropshire, where he developed an early obsession with wildlife. He received his bachelor's degree in biology from Oxford University, followed by a doctorate on butterfly ecology at Oxford Brookes University. Subsequently, he lectured in biology for 11 years at the University of Southampton, and it was here that he began to study bumblebees in earnest. He subsequently moved to Stirling University in 2006, and then to Sussex in 2013. He has published more than 240 scientific articles on the ecology and conservation of bumblebees and other insects. He is the author of *Bumblebees; Their Behaviour, Ecology and Conservation*, published in 2010 by Oxford University Press, and of the Sunday Times bestseller *A Sting in the Tale*, a popular science book about bumble bees, published in 2013 by Jonathan Cape, and now translated into German, Dutch, Swedish, Korean, Chinese and Danish. This was followed by *A Buzz in the Meadow* in 2014.

Goulson founded the Bumblebee Conservation Trust in 2006, a charity which has grown to 8,000 members. He was the Biotechnology and Biological Sciences Research Council's Social Innovator of the Year in 2010, was given the Zoological Society of London's Marsh Award for Conservation Biology in 2013, was elected a Fellow of the Royal Society of Edinburgh in 2013, and given the British Ecological Society Public Engagement Award in 2014. In 2015 he was named number 8 in BBC Wildlife Magazine's list of the top 50 most influential people in conservation.

SESSION I

The impact of *impatiens glandulifera* (himalayan balsam) on the pollination of native plant species in the UK

Laura White - University of Portsmouth

Additional Authors: Mr George Horn, Dr Rocio Perez-Barrales

Biological plant invasions have devastating effects on the biodiversity of wildlife. Management of invasive species can be costly, with 900 'alien' plant taxa in the UK since 2000. An in-depth understanding of invasive species and what native ecological processes they disturb can help management and control an invader's spread.

The invader species *Impatiens glandulifera* (Himalayan Balsam) was introduced to Britain in 1839 and is now well established in natural environments, and often becoming the dominant species. In the present study, we aimed at studying the impact of *I. glandulifera* on the pollination ecology of native species, with focus on *Stachys sylvatica*. Specifically, we firstly observed bee visitation and pollen load on the stigmas in pristine and invaded localities. Secondly, in a pristine site, *I. glandulifera* was introduced to study the initial period of a biological invasion on pollination services.

The visitation rate to *I.glandulifera* was found not to be in direct competition with native species, and even facilitated visits. In contrast, the pollen load from native species carried by bumblebees decreased in the presence of the invader. The probability of invasive pollen transferred varied depending on the pollination syndrome apparent; where pollen was placed on insects and specialisation of bumblebees' fit with native and invasive flower morphology.

We found that the probability of finding conspecific pollen on the stigmas of *S. sylvatica* decrease up to 80% after the introduction of Himalayan balsam. In contrast, the probability of observing pollen of Himalayan balsam on *S. sylvatica* stigmas was low. These results suggest that the invader had a negative impact on pollen transfer to *S. sylvatica* stigmas, resulting in decreased female fitness. This study highlights how biological invasions can modify the function of natural environments by changing insect behaviour and disrupting the pollination of native flowering species.

Turf lifting, seed sowing and natural regeneration: a comparison of techniques for chalk grassland restoration in the South Downs National Park

Ted Chapman - Birkbeck College, University of London. Royal Botanic Gardens, Kew

Additional Authors: Stephanie Miles, Kate Hardwick

This study compared the effectiveness of three commonly used techniques – turf lifting, seed-sowing and natural regeneration – in the restoration of chalk grassland destroyed by the construction of a water pipeline at Crane Down.

The work was undertaken to bring a practical evidence base to a wider partnership between the Royal Botanic Gardens Kew and South East Water, who own the site at Crane Down, and forming part of each organisation's contribution to the South Downs Way Ahead Nature Improvement Area (NIA).

A replicated trial of the three techniques was established at Crane Down to answer three research questions:

- 1. Is turf lifting and reinstatement more effective than seed sowing or natural regeneration?*
- 2. Is seed sowing more effective than natural regeneration?*
- 3. Do differences in the effectiveness of the treatments reduce over time?*

Baseline vegetation surveys of the undisturbed site were carried out in summer 2013. Seed from the site was brush harvested, processed and stored at the Millennium Seed Bank, whilst turf was lifted and stored on-site by a local agricultural contractor. Following construction of the pipeline, experimental plots were laid out in three replicate blocks, with seed sown and turf re-laid in spring 2014. Untreated plots of bare soil were left to act as a control and evaluate the effectiveness of natural regeneration from the soil seed bank and seed rain.

Early results found that turf lifting and reinstatement was significantly more effective than seed sowing or natural regeneration in the short term, retaining most of the undisturbed chalk grassland community and severely limiting opportunities for colonisation by non-characteristic species. It is shown to be an effective if labour-intensive technique for sites of high conservation value. Seed sowing and natural regeneration plots, by contrast, recorded high levels of colonisation by non-characteristic species from the soil seed bank, with very similar results for both treatments.

The study was also an opportunity to refine and demonstrate techniques for turf translocation and bulk seed harvesting on chalk grassland, building local capacity to undertake this specialist work. In time it is hoped the research will enable a cost-benefit analysis of the different treatments to inform practicable, effective restoration following infrastructure developments in the National Park.

SESSION 2

Using Google Earth to map erosion in the Western Rother valley

Professor John Boardman - University of Oxford

Google Earth™ has been used in several geomorphological contexts, especially in the study of river networks, glacial, coastal, landslides and desert landforms. In some cases, quantification is possible and landform-process relations can be inferred. GE has been little used in studies of contemporary soil erosion. This brief case study of its use in the Western Rother valley illustrates the potential for quick, free and accurate surveys that are particularly valuable as an aid to field work. The main drawback of GE is the arbitrary timing of imagery, in this case with only 3 years of complete coverage of the study area between 2001 and 2015.

Geomorphological change detection in Telscombe cliffs using high resolution photogrammetry from an Unmanned Aerial Vehicle

Ignacio Eduardo Ibarra Cofre - University of Sussex

Additional Authors: Dr John Barlow, Dr Roger Moore, Dr Jamie Gilham

The coastal systems of England have been historically exposed to coastline retreat, cliff instability and landslide processes. Under this scenario, it is important to understand the activity patterns, erosion and evolution of coastal cliffs through accurate descriptions of morphological changes, as it is a required stage in mitigating cliff instability hazards. Small Unmanned Aerial Vehicles (UAV) or drones are new types of aerial platforms from which high-resolution remote sensing measurements of landform features and processes can be obtained. Here, geomorphological feature detection in Telscombe cliffs, East Sussex, is analysed using high resolution digital photogrammetry from an Unmanned Aerial Vehicle. The study area encompasses 712 m of unprotected cliffs, which have a near-vertical slope profile and a maximum altitude of 49 m. Morphological monitoring between consecutive surveys is used to map rock mass discontinuities, quantify failure volumes and to get monthly volumetric inventories of rockfalls. The overall technique for data collection involved installation of a Nikon D810 digital camera on board an octocopter. Ground control for the survey was conducted using a combination of dGPS and total station surveying to produce a network of Ground Control Points (GCPs) on the cliff face and shore platform. Linking GCPs and a Bundle Adjustment numerical method, the digital photogrammetry image processing was undertaken in 3DM Analyst Mine Mapping Suite software. From 37,000,000 processed 3D points, a merged terrain model consisting of 138 individual Digital Terrain Models (DTMs) was obtained with a computed image accuracy of 0.79 pixels. Preliminary results show different sequences of discontinuities, most represented by closely spaced bedding planes (flint bands) and steeply conjugate sets of joints, which control modes of slope failure. The model's resolution was able to identify a fault dipping at 76°, and dissolution pipes along the cliff's top. In addition, Notches and rockfalls were recognized to the NW of the study area, illustrating the influence of marine processes on this section of Telscombe's cliff. As the first survey was 7.5 minutes of flying, the using of an UAV not only contributed to a flexible and rapid geomorphological assessment, but also to a safe and low-cost method for data collection compared with other techniques such as Terrestrial Laser Scanning or airborne LiDAR, demonstrating the utility of using UAV photogrammetry for monitoring cliff instability hazards.

Change on the fringe: environmental change at Alice Holt Research Forest

Edward Eaton - Forest Research

Additional Authors: Sue Benham, Elena Vanguelova

Alice Holt Research Forest lies in the northernmost edge of the South Downs National Park and is a major hub for research into forests in Britain. For the past 20 years, Forest Research has been monitoring the changing environment here, to improve our understanding of the extent and impacts of these changes on forests. Originally stemming from concerns over air pollution and acid rain in the 1980s, the data collected at Alice Holt now provide us with valuable insights into how climate change is affecting not only British oak trees in southern England, but also other aspects of the ecosystems around them. The data collected and the research carried out here include the changes in air pollution and atmospheric deposition, the weather, and the soils under the forest, and how

these changes are affecting the trees, the plants, and some of the wildlife, that make up Alice Holt Research Forest.

This presentation will consider how the environment of the forest has changed over the past two decades, and how the forest and its various components have responded to these changes. Furthermore, as Alice Holt Research Forest is part of British and European networks looking at environmental change, it is possible to think about how this part of the National Park fits into the broader landscape of environmental change across the country and the continent. Understanding what change there has been in the recent past, and how this has affected the forest in this part of the South Downs, is vital if we are to successfully and sustainably manage forests in a climate that is still changing.

SESSION 3

Battling nature to save it: outdoor adventure activities and understandings of sustainability

Dr Paul Hanna - University of Surrey

Additional Authors: Ilias Paliatsos, Sarah Wijesinghe

Over the past fifty years concerns surrounding the impact of humans on the environment have been increasingly voiced (e.g. Carson, 1962). Politically such concerns have been raised on a number of occasions including WCED (1987), UNCED (1992), WSSD (2002), Rio+20 (2012) and annual climate change congress meetings (IPCC, 2014). However human impact on the environment is still increasing (Freudenburg & Muselli, 2013; IPCC, 2013). This paper attempts to tease out some of the conflicting arguments surrounding outdoor adventure activities (e.g. mountain biking, rock climbing) to explore the possibility for such activities to be considered as ways to encourage more sustainable ways of living.

Research has traditionally examined outdoor adventure activities through a lens that either highlights their negative environmental impacts, or has sought to conceptualise motivations and/or experiences (e.g. risk, thrill). However, through a multidisciplinary investigation into re-connecting with nature via outdoor adventure activities, a significant and growing pastime in the UK (Hay, 2013), this paper will examine if such activities facilitate a greater understanding for and appreciation of nature, and if they encourage more sustainable practices in the 'everyday'. In the paper we argue that through practices that are not explicitly 'sustainable' or 'ethical' there is the possibility to think differently about human-nature relationships and pro-environmentalism.

In this paper we draw on data from two projects looking in to the ways in which people understand and experience outdoor adventure activities. In the analysis of the data we make the argument that whilst outdoor adventure activities have an immediate negative environmental impact, they can be understood as the vehicle for broader reconnections to nature, offering the potential for more sustainable behaviours in the 'everyday' practices of the participant. Thus we conclude with the suggestion that spaces such as the South Downs National Park have the potential to offer practical and achievable solutions to engage more individuals in everyday sustainable practices through active participation with natural environments.

What community stories can tell us about changing drainage management approaches in the River Adur catchment

Dr Mary Gearey - University of Brighton

Introduction

The integrity of renewable freshwater resources is critical for the sustainable development of economies and societies. However, to add to existing complexity, water environments will face a further range of acute challenges over the next twenty five years resulting from rising population hubs, factors associated with climate change, riverine water quality issues and changing land management practices. One of the recent debates in land management policy is the shift in emphasis regarding responsibility for rural drainage. Although it has always been the responsibility of land owners to adequately manage the impacts of water on their land there has existed for many years a sympathetic relationship between land owners and the Environment Agency (EA). Over time this has evolved into an expectation, certainly within the River Adur catchment, that the EA can and should continue with clearance of smaller watercourses. The EA have now restated that these additional works are no longer viable for them due to a wide range of resource and policy factors. With rising anxiety about flooding events this restatement of legal responsibility combines to potentially change the way in which the EA and landowners interface with each other.

Main aim of the project

The data discussed in this paper are drawn from a wider piece of research recently undertaken by the University of Brighton around community understandings and perceptions of changing water conditions orientated around the concept of resilience. As part of that project, in which respondents from the mid catchment communities of Steyning, Bramber and Upper Beeding were asked to discuss their interests and concerns around local water resources management issues, narratives around land drainage and its impact on watercourses emerged across a range of interest groups.

Study and methods used

The study, undertaken between September 2015 and February 2016, involved semi-structured qualitative individual and group interviews with respondents living and working alongside the River Adur catchment.

Main outcomes and their implications.

- The stories provided by the community tell historically of a joint endeavour between land owners and the EA to keep watercourses flowing.
- Over time this has led to an expectation that it is the EA's responsibility to help transition water from smaller watercourses to the river.
- Consequently the restatement of legal responsibilities by the EA is perceived as a retraction of support.
- This is framed within a narrative of reducing government assistance against a rising anxiety concerning flooding, heavier rainfall events and the implicit costs of individualising drainage management.

One key implication is that these community stories tell us that the push to create 'resilient communities' is viewed as a way of obscuring the reality that the government is no longer willing to

financially support the local impacts of climate change and unsustainable land management practices, particularly around run off from housing developments.

Dartmoor Farming Futures – An Evaluation of an Outcome Focused Approach to Agri-Environment Schemes

Jennifer Manning - Dartmoor National Park Authority

Dartmoor Farming Futures (DFF) is a pioneering scheme to get farmers and commoners more engaged in the design, delivery and monitoring of environmental outcomes through agri-environment agreements. The initiative was developed by Dartmoor National Park Authority and Dartmoor Commoners' Council, with support from the Duchy of Cornwall, Natural England, RSPB and South West Water.

DFF links into and complements the Dartmoor Vision, which sets out what the moorland will look like in 2030. It is focused on two areas of common land within the National Park: (i) Haytor and Bagtor Commons; and (ii) the Forest of Dartmoor. The pilot is now in its sixth year and has been subject to a longitudinal evaluation through two qualitative studies. The first study was completed in 2013 and focused on evaluating the impact of getting farmers engaged in agreeing an agri-environment agreement focused on environmental outcomes. The second study has focused on the impact of the agreements on farmer behaviours, perceptions and farm businesses. It has involved face to face semi structured interviews with farmers/commoners from the two pilot areas, including those involved with Dartmoor Farming Futures and those with little or no involvement. Further interviews were held with key stakeholders involved in the project to gain an understanding of their attitudes towards the approach.

The results from the studies show:

- the process of engagement has led to a greater understanding amongst the farming community of the agri-environment agreements and the outcomes they are delivering – a pride in what they are doing
- over 60 farmers have participated in training so that they can undertake SSSI condition monitoring. This training process has helped the farming community understand the biodiversity
- the approach has the potential to allow commoners/farmers more flexibility than would be allowed under a 'traditional' agri-environment scheme: there are no set stocking calendars; participants can keep stock out longer or increase their stock if they can show that it will help deliver the agreed environmental outcomes. The commoners/farmers have set up their own system to consider and potentially approve these 'derogations' (as they term them)

The results are of relevance to the forthcoming Environment and Food and Farming Strategies and the mid-term review of the Common Agricultural Policy.

SESSION 4

Linking forest carbon fluxes and phenology in the South Downs National Park

Matthew Wilkinson - Forest Research

Additional authors - Edward. E. Eaton, James. I. L. Morison

Forests and woodlands are a key component of the global carbon cycle, and their effective management is an important mechanism for reducing atmospheric greenhouse gas (GHG) concentrations. Understanding what determines the size of forestry C stocks and their components, and the processes and controls on the exchanges of carbon dioxide (CO₂) and other GHG in forests and woodland, is important in assisting the forestry sector to contribute to reducing anthropogenic climate change.

Alice Holt Forest has been studied for many years by scientists at Forest Research (the research agency of the Forestry Commission) and is the site of several long-term monitoring and experimental studies. In the Straits enclosure at the southern end of the forest, the exchange of CO₂ between the atmosphere and a deciduous oak plantation has been measured directly since 1999, and now represents one of the longest records of its type in the world. The objectives of this study site are to quantify the stand scale carbon budget, understand the causes and drivers of inter-annual variation in the carbon budget and to examine the effects of management. Overall the forest has acted a strong sink for atmospheric CO₂ with an annual net average C sequestration of 4.9 tC ha⁻¹ y⁻¹ but with considerable inter-annual variation.

In this paper we will present the long-term results from the site and discuss the likely causes of inter-annual variation. We will also present results from our innovative forest phenology monitoring studies where inter-annual changes in the timing of budburst and the state of the forest canopy have been monitored using digital cameras mounted at the top of 26m tower.

Dark Night Skies

Dan Oakley – South Downs National Park Authority

Light pollution and the loss of darks skies are an important issue for protected landscapes, particularly for the South Downs National Park (SDNP). Surrounded by some of the most polluted skies in Europe the SDNP Authority sought to address this issue by applying for International Dark Sky Reserve Status. In order to satisfy the requirements to the International Dark-Sky Association, a comprehensive sky quality map was developed using innovative and low cost techniques using GPS and Unihedron SQM-LU correlated data. Analysis showed that the SDNP had approximately 66% of its landscape with skies at a category of Bronze (20 to 20.9 magnitudes per arcsecond²), with 3% within the silver category (21 to 21.74). Mapping showed that 95% of the lighting threats resided outside of the NP boundary and that recent regional changes to street lighting improved quality. SDNPA Planning policies have been developed to conserve and enhance this special quality, accompanied by a number of events with key astronomical partners. With Over 70 organisations and 1,000 individuals showing their support for the project, the South Downs was successfully designated 'Moore's' Reserve in May 2016.

POSTER PRESENTATIONS

Genetic approaches to inform on the conservation management of water voles

Dr Rowena Baker – University of Brighton

Additional Authors: Peter King (Ouse and Adur Rivers Trust), Dr. Dawn Scott (University of Brighton), Dr. Andrew Overall (University of Brighton)

Genetic monitoring is becoming a favourable tool for directing the future conservation of protected species, providing information on population processes that may otherwise go undetected using standard ecological techniques. We present three case studies that highlight how genetic information can be used to inform on the management and policy of one of the UK's most threatened mammals, the water vole. The first study concerns the impact of reintroductions on the phylogenetic patterns and diversity of populations across south-east England. The second shows how information on the genetic structure of populations has proved integral to monitoring the success of mitigation strategies designed to reduce the impact of a coastal realignment project on water voles. The last case study shows how information on genetic relatedness of populations provides a case for improving the habitat management of linear wetland systems.

SMART – Sediment and Mitigation Options for the River Rother

Jennine Evans – University of Northampton

Additional Authors: Prof. Ian Foster, Prof. John Boardman and Prof. Ian Livingstone

In the UK, some rivers are failing to meet the criteria for Good Ecological Status (GES) set out in the European Union Water Framework Directive. Current failures across the UK are complicated and are reported to include a range of chemical failures and / or have excessive sediment pressures in some cases leading to the burial of former gravel bed rivers by sand and silt. The Environment Agency and South Downs National Park Authority have identified sediment pressures as a key issue for the River Rother, a 350 km² river catchment draining much of the South Downs National Park in Southern England.

While fine sediment (which is known to transport nutrients and pollutants) has been identified as a key variable likely to prevent the attainment of GES in the Rother, the specific sources and causes of the problem have yet to be fully evaluated. Within this project we will explore potential sources and causes using a combination of primary and secondary data. Several of the soil associations in the catchment are known to be at high risk of erosion. However, erosion risk may have changed either as a result of changes in weather and climate or changes in land use and land management or some combination of the two. We will explore temporal changes in sediment yield using both long term records of turbidity and flow and reconstructing changes in rates of reservoir sedimentation over the last ~100 years in order to identify trends and possible causes.

Ten monitoring sites have been identified on 4 major tributaries and the main channel of the Rother. Tributaries have been chosen to represent a range of land use types and lithologies. Sediment samples are being recovered from sediment traps and from bed disturbance experiments in order to fingerprint potential sources within sub-catchments and the relative significance of individual sub-

catchments. Using sedimentary archives in lakes and floodplains, core data can be compared with historical land data to determine any changes through time and assist on evaluating sources of soil erosion. Monitoring in key sub catchments can also aid in targeting mitigation options to problematic fields and pathways.

The Sussex Peregrine Study

Jon Franklin

Additional Authors: Dr Mike Nicholls

The Sussex Peregrine Study is a group of dedicated enthusiasts monitoring a small but historically important population of Peregrine Falcons breeding on the south coast of the United Kingdom.

The study documented the post pesticide recovery of breeding pairs in Sussex, following a 30-year absence, which has been attributed to the direct effects of organochlorine chemicals.

The Peregrine population in Sussex has now undergone unprecedented expansion and the study continues to collect data on territory occupation and reproductive statistics.

Current research also includes ringing Peregrine chicks with unique identification rings in association with the British Trust for Ornithology and the collection and DNA analysis (Canterbury Christ Church University) of feather samples to determine the origins of the post pesticide population in South East England.

EcoServ-GIS v3.3: A toolkit for mapping Ecosystem Services in the South Downs National Park

Andrew Lawson – Sussex Biodiversity Record Centre

Ecosystem services can be described as benefits which people receive from nature and the natural environment. EcoServ-GIS is a Geographic Information System (GIS) based toolkit developed by the Durham and Scottish Wildlife Trusts which attempts to map a range of ecosystem services at a landscape scale.

The main aim of the current project is to use the above Toolkit to map the current and potential flow of nine such services for the full geographic extent of the National Park. The services in question include: air purification, carbon storage, local climate regulation, noise regulation, pollination, water purification, access to nature, education knowledge, and green travel.

With financial support from SDNPA, Sussex Biodiversity Record Centre (SxBRC) acquired and formatted the necessary input data, and developed expertise in running the EcoServ-GIS Toolkit. A series of models for each service were then run to produce maps showing the geographic extent and relative degree of Service Capacity, Service Demand, and Service Flow (based on the overlay of capacity and demand). The rationale underpinning each model and the specific parameters influencing the analysis are drawn from the available scientific literature, and are documented in the EcoServ-GIS v3.3 Handbook.

Outputs were delivered to SDNPA earlier this year, and will form part of the evidence base for the Local Plan, enabling planners to factor ecosystems services provided by the National Park into their

decision making. These outputs will also feed into a spatial targeting tool currently under development by Oxford University, on behalf of SDNPA.

Ecological determinants of Lyme disease hazard in the South Downs National Park and the potential for One Health based interventions

Jo Middleton – School of Pharmacy and Biomolecular Sciences, University of Brighton

Additional Authors: Ian Cooper, Anja S. Rott

Introduction

Lyme disease (LD) is tick-borne and if untreated can cause skin, cardiac, nervous system and musculoskeletal disease. UK annual diagnoses have more than trebled over the last two decades. Two of the ten areas in England and Wales where LD infection is reported to be most frequent are encompassed in the South Downs National Park (SDNP); the South Downs themselves and much of Wealden West Sussex. This project is the first survey of the ecological determinants of LD hazard in the SDNP.

Main aims of the project

The study is mapping LD vector (ticks) and pathogen distribution, and assessing extent of hazard in both woodlands and grazed downland. We are also seeking to determine whether *B.miyamotoi* (an emerging disease hazard recently detected in the UK) is present. Elsewhere increased wildlife populations have been implicated in rising tick-borne disease, setting up a potential conflict between biodiversity and human health. Given the key objectives of National Parks include enhancing wildlife and encouraging public enjoyment of the countryside, such conflict would be problematic. We thus, in addition to mapping hazard, will provide an evidence summary of proposed interventions based on One Health (an integrated approach to wildlife, livestock and human health) and will suggest actions within the SDNP and where reasonable elsewhere.

Methodology

The multi-year project (now in its second year) involves volunteer tick collection from culled deer, tick collection by drag-sampling (presently at seven sites) and real-time polymerase chain reaction. A systematic review is being carried out to determine (a) what interventions have been proposed to decrease LD hazard at nondomestic sites without negatively affecting ecosystem health, and (b) what evidence exists to support their effectiveness?

Outcomes

The study will provide mapped assessment of LD hazard in the SDNP and support development of policies that avoid or minimise conflicts between public health and ecosystem health. Given LDs widespread distribution in the northern hemisphere, further knowledge of its ecological determinants will be of value beyond the Park. The systematic review underway is the first on the topic and will be published Open Access to ensure its evidence summary is available to all stakeholders.

Biodiversity & soil pollution around a car park: A case study of the South Downs National Park

Sarah Paine – Southampton Solent University

The purpose of a national park is to conserve and enhance the natural beauty, wildlife and cultural heritage. And to promote opportunities for the understanding and enjoyment of the special qualities of national parks by the public. It is important to establish whether there is a negative impact on the environment by promoting the special qualities of a national parks so management plans or the Sandford Principle can be put in place to minimise the effects.

The presence of heavy metals in soils represents an environmental hazard, as heavy metals can be extremely difficult to get rid of. Heavy metals, once introduced to the environment, may spread by the interactions occurring in nature. There are two main reasons for this firstly, the physiochemical properties of the heavy metals; they do not biodegrade and therefore accumulate in the environment. Secondly, the physical and chemical properties of the soil, for example: soil organic matter content, mineralogical composition and pH. Most heavy metals are toxic to living organisms, even those considered as essential can be toxic if present in excess. The most obvious impacts of heavy metals are their effects on the species diversity of plant communities.

This project will look at a car park in the South Downs National Park to establish if there is any heavy metal soil pollution from automobiles. Using systematic sampling along transects soil samples will be taken and analysed using XRF to see if there are any elevated heavy metal concentrations, with particular emphasis on Pb, Zn, Cu, Cd and Pl. Biodiversity will be looked at by using JNCC survey guidelines. If there is pollution there will likely be low species richness where there should be high, as the site is on chalk grassland.

Impact of environmental factors and land use changes on the nesting success of Lapwing *Vanellus vanellus* in the South Downs National Park

Alexandra Weeks – University of Brighton

Additional Authors: Dr Rachel White

The lapwing was once a readily seen UK farmland bird, however, in the past 25 years their population has declined by more than 50%. Lapwing population decline and range contraction has been greatest in the south of England where changes in agricultural practices have been drastic. Reduced nesting success and high chick mortality is often linked to reduced food availability and suitable habitat associated with the shift from arable farming to intensive grassland systems. Lapwings have specific environmental breeding requirements including access to bare ground while nesting, and access to grazed pasture while chick rearing. It has been observed that environmental conditions can affect the survival of lapwing chicks, such as reduced chick growth resulting from low temperatures.

Agri-environment schemes (AES) are government funded conservation options available to farmers to help promote biodiversity. Creation of fallow plots is the option most associated with benefiting lapwings. Despite the implementation of fallow plots, alongside other AES options, lapwing populations are still declining.

The project's main aim is to investigate how environmental factors have affected lapwing nesting success on the South Downs National Park over the past 10 years. Spatial and temporal variations in lapwing breeding are linked to changes in environmental factors likely to affect lapwing populations such as land use changes and weather conditions. Lastly, a model is generated to predict optimal lapwing nesting locations on the South Downs based upon the previous nesting records and environmental data.

The data used for analysis include the South Downs lapwing breeding records, and environmental recordings consisting of rain fall, temperature, and land use data. Desk based GIS analysis is used to highlight areas with suitable environmental conditions for lapwing nesting. South Downs Lapwing breeding records from 1995-2015 have been supplied by the RSPB. The dataset is incorporated with the 2007 Land Cover Map in ArcGIS using a map of the South Downs as the base. The Kernel Density spatial analysis tool allows the visualisation of breeding hotspots, displaying the variation over time. Weather datasets supplied by the Game and Wildlife Conservation Trust are also incorporated, helping to identify favourable environmental conditions for nesting.

The outcome of this project is potentially beneficial to Natural England when considering adjustments to AES options. This information may additionally be used to advise farmers on the correct placement of fallow plots, including recommendations for suitable habitat features and environmental conditions to help enhance lapwing breeding success.

Trialling In-ditch Sediment Traps to Help Limit Agricultural Runoff to Rivers

Ses Wright – Arun and Rother Rivers Trust

Introduction:

The fine sandy soils of the Rother valley are particularly vulnerable to erosion. The Western Rother has elevated levels of sediments (both in suspension and deposited) which reduce water quality and limit the river's habitat and biodiversity. The impact of agricultural land use on surface runoff is thought to be a contributing factor, including a move since the 1970s from one of mixed (dairy and arable) farm enterprises to more arable based land use. The Environment Agency (EA) provided funding to the ARRT to work with external partners to trial the practicalities of in-ditch sediment traps as a means of managing agricultural runoff in order to help improve the ecological status of local rivers as well as reducing soil loss.

Main Aim of the Project:

To evaluate the effectiveness of in-ditch sediment traps as a means of interrupting key sediment pathways that link the land to rivers and streams. Benefits include the ability to catch a much wider area of runoff compared to in-field traps, the latter of which can be effective in trapping runoff from fields sown with high erosion-risk crops such as maize, potatoes or lettuce but less effective when other crops are sown in rotation and yet they still require regular maintenance to be effective in the long term; it was hypothesised that in-ditch traps might prove to have advantages which had not been put to the test.

Study Details and Methods:

Successful liaison with local agricultural enterprises and concurrent research projects being delivered by the universities of Northampton, Oxford and Portsmouth led to two trial in-ditch sediment traps being constructed in 2013 and monitored for their effectiveness over a 3 year period. The amount

of sediment accrued by the traps over time has been measured and the effectiveness of the traps in preventing surface runoff from entering local rivers has been evaluated.

Main Outcomes and their Implications:

The project has concluded that it is both uneconomic and impractical to construct sediment traps that attempt to catch the majority of surface water runoff within a watershed area; the traps would have to be unfeasibly large. The research project indicates that smaller traps are still effective in trapping the larger fraction of suspended sediments in surface water runoff, typically those between 63 and 500 microns in diameter (i.e. 0.063-0.5mm). It is debateable which fraction of soil/water runoff is having the greatest impact upon the Rother; there is likely to be a compound impact.