



Research Prospectus

2021/22

Introduction

At Surrey Wildlife Trust, we are committed to finding the long-term solutions to ongoing biodiversity declines that nature so badly needs in our county. Science is at the heart of our decision-making, and we strive to use evidence to inform both our policy and our actions. This evidence-base is a continuous piece of work, ever growing with advancements in applied science and conservation experience. As part of our role to ensure we can contribute to this process, to inform both ourselves and others, we are keen to work with external partners to further understanding of the natural world.

There are six themes to this work:

1. Understanding the pressures on the natural world and how they impact biodiversity and bio-abundance.
2. Understanding the causes for decline of key priority species in Surrey and establishing a course of action to reverse this.
3. Discovering better ways to manage and restore the environment to improve biodiversity, bio-abundance and habitat connectivity.
4. Understanding how best to capture information about the environment and to utilise it within GIS to address a variety of questions.
5. Understanding how people benefit from and interact with the natural environment, from a variety of aspects including education, social, and health and wellbeing.
6. Understanding the economic and social value of natural assets (Natural Capital) within Surrey and how these can then be utilised to aid local policy makers embed more sustainable practice within all forms of commerce, including the development sector.

We are also committed to investing in successor generations of scientists and researchers, and ensuring they are involved in worthwhile and meaningful projects during their secondary and tertiary education. Through our research placements, we aim to provide vital experience in the sector for young people and help them develop new skills in real-world research, monitoring and conservation work. By working as part of The Wildlife Trusts national movement, there will be ample opportunity for networking to promote future employment prospects.

Our Work with Universities

Surrey Wildlife Trust have been working with local universities for many years in different ways. We are partnered with the School of Veterinary Medicine at the University of Surrey and have provided cattle and other livestock for their students to gain experience with farm animals. Additionally, Imperial College London have conducted annual visits to the Trust for several years now as part of the Environmental Management MSc course. They receive talks from various departments and partake in practical conservation experience. The University of Surrey's final year Biological Sciences BSc students are joining us for a similar visit for the first time this year. We are also collaborating on a PhD from the University of Surrey's Centre for Environment and Sustainability. We are beginning to build relationships with other local universities including Royal Holloway and Kingston University.

Past Students

These are some of the students we have worked with over recent years, talking about their experiences collaborating with us on their projects.



Rachel - MSc Environmental Technology, Imperial College London

I collaborated with the Surrey Wildlife Trust (SWT) on my postgraduate thesis during the summer of 2021. After listening to a lecture from SWT during my second term on the work that

the Trust was conducting regarding connectivity, I reached out to and asked if they would consider supervising me, as I wanted to do a project on this too. They had previously worked with students on similar projects, so they were aware of the entire thesis process. SWT were incredibly quick to respond and supportive in helping me pick the direction

I wanted to go, giving me freedom in doing so. I wanted to look at how collaboration between farmers could improve connectivity across landscapes. Through the support and the expertise from various members of staff, I was able to learn how to use new software programmes like GIS, which became integral to my project. As I was new to this software, I was able to ask for meetings at any point, which I found incredibly helpful as this project was done during the pandemic. Collaborating with the SWT also enabled me to learn from different members of the organisation, providing many contacts that I could interview to support and strengthen my work. It was a great experience being able to work with an organisation outside of an academic setting and I am incredibly thankful for the opportunity that SWT provided me.

Some projects have already been allocated, but are kept in to show the breadth of opportunities. These are indicated using strikethrough text. This document will be updated on the Surrey Wildlife Trust website as projects are added and removed.

Please check the current version at: www.surreywildlifetrust.org/research

Theme 1 – Applied Conservation Science

Project 1.1: Evidencing the relationship between bio-diversity and bio-abundance

Contact: Policy & Research Manager,
mike.waite@surreywt.org.uk

The interdependence of healthy ecosystem function and maximised biodiversity is often assumed as a given but remains relatively poorly evidenced, at least for the purposes of confidence in practical environmental policy-making. Indeed, there is little agreement in how to monitor and quantify biodiversity change for the assessment of ecosystems and biodiversity for policy targets (Hill et al., 2016). In the absence of data on abundance, biodiversity serves largely as a proxy for bio-abundance, this being the more likely critical factor. Species richness, often used as the metric for biodiversity, tells us relatively little about important components of the population i.e. numbers of rare species (Hillebrand et al., 2017). There has, in addition, been research which suggests that this assumed proxy is incorrect for some groups of animals (Nimmo et al., 2011).

This question remains relevant globally as well as locally. Surrey-based research could therefore attempt to explore and provide evidence for this suggested correlation of bio-diversity and bio-abundance using our county as a case study. As a very mixed and highly crowded county in terms of land-use and habitat, it would hopefully provide a useful exemplar. The project is somewhat open in terms of methods, but it is expected to be a desk-based study in which available data would be utilised to analyse the relationship between bio-diversity and bio-abundance by investigating historical species records and changing statuses. Data would be provided by ourselves in collaboration with the Surrey Biodiversity Information Centre.

Key references:

- Hill, S.L.L., Harfoot, M., Purvis, A., Purves, D.W., Collen, B., Newbold, T., Burgess, N.D. and Mace, G.M. (2016). Reconciling Biodiversity Indicators to Guide Understanding and Action. *Conservation Letters*, 9(6), pp.405–412.
- Hillebrand, H., Blasius, B., Borer, E.T., Chase, J.M., Downing, J.A., Eriksson, B.K., Filstrup, C.T., Harpole, W.S., Hodapp, D., Larsen, S., Lewandowska, A.M., Seabloom, E.W., Van de Waal, D.B. and Ryabov, A.B. (2017). Biodiversity change is uncoupled from species richness trends: Consequences for conservation and monitoring. *Journal of Applied Ecology*, 55(1), pp.169–184.
- Nimmo, D.G., James, S.G., Kelly, L.T., Watson, S.J. and Bennett, A.F. (2011). The decoupling of abundance and species richness in lizard communities. *Journal of Animal Ecology*, 80(3), pp.650–656.

Project 1.2: Impact of Demon Shrimp on Surrey's rivers

Contact: Wetlands Projects Manager, glen.skelton@surreywt.org.uk

Demon Shrimp (*Dikerogammarus haemobaphes*) has now established and spread across much of the UK, since its arrival in September 2012 (Environment Agency, 2012). There is a relatively poor understanding of the impacts associated with *D. haemobaphes* in comparison to the closely related *D. villosus*, which has been extensively studied (Bovy et al., 2015). There is some evidence to suggest that the species could pose a similar threat to native organisms in freshwater systems (Bacela-Spychalska and Van Der Velde, 2013).

There has been a recent incursion of this species into Surrey's rivers, and there remains no effective means of controlling the spread of either *Dikerogammarus* species (Johns et al., 2019). This project would compare affected and non-affected areas, and map the spread throughout the catchment. The aim would be to model the predicted future spread as well as to assess the severity of the impact of the invader on the sampled areas.

The project would comprise both field and desk based work. River invertebrate surveys would be conducted on a selection of control and invaded sites, as well as observation of physical and chemical variables which could be indicative of impacts – eg. turbidity. Students would use currently available data on species distribution to analyse the spread of the species and model possible future dispersal using GIS. Training and assistance with both aspects would be provided.

Key references:

- Bacela-Spychalska K, Rigaud T, Wattier RA (2014) A co-invasive microsporidian parasite that reduces the predatory behaviour of its host *Dikerogammarus villosus* (Crustacea, Amphipoda). *Parasitology* 141:254–258. doi:10.1017/S0031182013001510
- Bovy, H.C., Barrios-O'Neill, D., Emmerson, M.C. et al. (2015) Predicting the predatory impacts of the "demon shrimp" *Dikerogammarus haemobaphes*, on native and previously introduced species. *Biol Invasions* 17, 597–607. <https://doi.org/10.1007/s10530-014-0751-9>
- Environment Agency (2012) Invasive shrimp: *Dikerogammarus haemobaphes*. Interim briefing note. <http://www.nonnativespecies.org/alerts/index.cfm?id=3>.
- Johns, T., England, J. and Sales, C. (2019) The arrival of the Demon Shrimp in Hertfordshire. *Transactions of the Hertfordshire Natural History Society*, 51:1-84.

Theme 2 – Priority species autecological research

Project 2.1: Ash Dieback

Contact: Policy & Research Manager, mike.waite@surreywt.org.uk

Ash Dieback is one of many examples where non-native pathogens have devastated native tree populations (Potter et al., 2011). In the last 20 years, *Hymenoscyphus pseudoalbidus*, a fungus native to Asia, has caused widespread death of Ash (*Fraxinus excelsior*) populations across Europe (Kjaer et al., 2012). In the past 5 years, the arrival of the pathogen in the UK has affected our native Ash populations, which support 953 associated species with no single alternative native tree species (Mitchell et al., 2014). The management of Ash Dieback has been the focus of much media attention, and remains a contentious issue for many conservation organisations.

In Surrey, we need to monitor the short, mid and long-term ecological changes in our woodland reserves as a result of Ash Dieback. Comparisons of the responses in vegetation communities and of potential replacement keystone species, both within and beyond affected areas; and to inform the limits of any public access safety management zones; will all be worthwhile. Such research will also need to be vigilant of any evidence of disease-resistance in individual Ash trees.

The project will involve a mix of field and desk based work, including ecological surveys of reserves in different stages of Ash Dieback. The data would be analysed using statistical software and mapped using GIS. Support would be provided for survey work and species identification.

Key references:

- Kjaer, E.D., McKinney, L.V., Nielsen, L.R., Hansen, L.N. and Hansen, J.K. (2011). Adaptive potential of ash (*Fraxinus excelsior*) populations against the novel emerging pathogen *Hymenoscyphus pseudoalbidus*. *Evolutionary Applications*, 5(3), pp.219-228.
- Mitchell, R.J., Beaton, J.K., Bellamy, P.E., Broome, A., Chetcuti, J., Eaton, S., Ellis, C.J., Gimona, A., Harmer, R., Hester, A.J., Hewison, R.L., Hodgetts, N.G., Iason, G.R., Kerr, G., Littlewood, N.A., Newey, S., Potts, J.M., Pozsgai, G., Ray, D. and Sim, D.A. (2014). Ash dieback in the UK: A review of the ecological and conservation implications and potential management options. *Biological Conservation*, 175, pp.95-109.
- Potter, C., Harwood, T., Knight, J. and Tomlinson, I. (2011). Learning from history, predicting the future: the UK Dutch elm disease outbreak in relation to contemporary tree disease threats. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 366(1573), pp.1966-1974.

Project 2.2: Recovering Small Fleabane to Surrey

Contact: SWT Ecology Services, Isobel.girvan@surreywt.org.uk

Small Fleabane (*Pulicaria vulgaris*) is a UK Biodiversity Action Plan Priority Species, which has experienced a significant decline across the UK due to loss of habitat and declining condition of remaining habitat (JNCC, 2019). As its Latin name would suggest, *P. vulgaris* was formerly widespread in south-east England but is now restricted to a small number of localities in the New Forest, disappearing from neighbouring counties in the past 50 years (FWHT, 2013). The species is restricted to seasonally-flooded pond margins, hollows and grazed damp acidic grassland, declining management of which is often associated with that of commoning as a modern agricultural practice (Lousely, 1976).

P. vulgaris is believed to be locally extinct in Surrey since the early 2000s, after the cessation of grazing on its former stronghold site on Backside Common. This site is a Surrey Wildlife Trust nature reserve where a recovery programme to involve suitable site management, reintroduction and monitoring is the only way back for this unspectacular but no less deserving plant – a good indicator for the ideal management of formerly grazed common land. There is significant evidence that the species is able to recover from dormant seedbank populations, as has been achieved at Backside Common previously, which may provide viable, genetically appropriate propagules for a reintroduction programme (Chatters et al., 2014).

The project will involve a mix of field and desk based work, including ecological surveys of Backside Common and experimental plots to germinate seed bank propagules. The data would be analysed using statistical software. Support would be provided for survey work and species identification. Further interested parties may include the Surrey Botanical Society and Plantlife.

Key references:

- Chatters, C., McGuire, C., Rand, M. and Sanderson, N. (2014) Small Fleabane in the New Forest. [online] . Available at: http://newforestnpa.newforest-zesty.virtual.tibus.net/app/uploads/sites/3/2018/03/Small_Fleabane_report_140213_Final_Report_CC_CM.pdf.
- FWHT (2013) Creating ponds for Small Fleabane *Pulicaria vulgaris* [online] . Available at: <https://freshwaterhabitats.org.uk/wp-content/uploads/2013/09/Small-Fleabane-new-logo.pdf>
- JNCC (2019). Report on the Species and Habitat Review (UK BAP) | JNCC Resource Hub. [online] Available at: <https://hub.jncc.gov.uk/assets/bdd8ad64-c247-4b69-ab33-19c2e0d63736>
- Lousley, J.E. and Surrey Flora Committee (1976). *Flora of Surrey*. Newton Abbot: David & Charles.

Project 2.3: Impacts of grazing on *Hagenella clathrata*, the Window-winged Caddis

Contact: SWT Conservation Manager West

The Window-winged Caddis Fly (*Hagenella clathrata*) is one of the rarest and most threatened caddisfly species in Europe and is known from only a small selection of sites across Northern Europe (Buczynska et al., 2012). It is a UK Biodiversity Action Plan priority species, which relies on lowland wet heath and transitional valley mire habitats, both now highly threatened by climate change. Decline in condition of the habitat is the prevalent cause of the decline of *H. clathrata* (Wallace, 2011). Relatively little research has been undertaken on effective conservation measures, but it has recently been proved that there is a clear co-occurrence of *Hagenella* with other endangered species (van Kleef et al., 2012).

There are two nationally important populations of *H. clathrata* in Surrey; at Whitmoor Common and Chobham Common, both sites which are managed by Surrey Wildlife Trust on behalf of Surrey County Council. The Species Recovery Trust has supported the species' on-going monitoring, but there remains plenty of scope for autecological research into this charismatic species. In particular, the potential benefit of conservation grazing still requires assessment for future conservation strategies. Conservation grazing is widely practiced across Surrey's heathlands, so it is important we understand its impacts on *Hagenella*.

The project will involve a mix of field and desk based work, including ecological surveys of Whitmoor and Chobham Commons. The data would be analysed using statistical software. Support would be provided for survey work and species identification.

Key references:

- Buczyńska, Edyta & Cichocki, Włodzimierz & Patrycja, Dominiak. (2012). New data on the distribution and habitat preferences of *Hagenella clathrata* (Kolenati, 1848) (Trichoptera: Phryganeidae) in Poland – the species from Polish Red Book of Animals. *Annales - Universitatis Mariae Curie-Skłodowska, Sectio C. LXVII.* 25-32.
- van Kleef, H.H., van Duinen, G.-J.A., Verberk, W.C.E.P., Leuven, R.S.E.W., van der Velde, G. and Esselink, H. (2012). Moorland pools as refugia for endangered species characteristic of raised bog gradients. *Journal for Nature Conservation*, 20(5), pp.255-263
- Wallace, I. (2011). *Hagenella clathrata* Contact details Species dossier: *Hagenella clathrata*. [online]. Available at: <https://cdn.buglife.org.uk/2019/07/Hagenella-clathrata-species-dossier.pdf>

Project 2.4: The status of Hazel Dormouse in Surrey

Contact: Conservation Manager Central, katy.fielding@surreywt.org.uk

The Hazel Dormouse (*Muscardinus avellanarius*) is a charismatic species which has undergone well-documented declines in distribution and abundance across the UK, despite being subject to various legal protections (Goodwin et al., 2017). It is a strongly arboreal rodent traditionally associated with coppiced woodland, and in particular Hazel *Corylus avellana* as suggested by its scientific name. It is widely understood that a key component in this decline is changing woodland management practices (Bright and Morris, 2002). Dormice are often assumed to be limited in their dispersal abilities, but there is evidence that they are capable of crossing open land and can persist in landscapes with relatively little woodland (Mortelliti et al., 2013; Buchner, 2008).

Surrey is reliably assumed to be an important county for the Hazel Dormouse and has a national responsibility for its conservation, and there is good knowledge of the localities of several apparently strong populations. County-wide the species' status is still largely assumed however and a standardised random site survey could add considerable confidence to this premise. Correlation with habitat characteristics would also help to inform site management planning, and further the aspiration to manage our Sheepleas nature reserve as an exemplary Dormouse-focused hotspot.

A further output of this project would be to inform the current monitoring scheme for Sheepleas, and the integration of all current learning into a new management plan for this site (and ultimately others). This aspect would largely be a desk-based project involving data analysis and GIS work to consolidate an effective baseline and monitoring plan. Both aspects of this project would be partnered by the Surrey Dormouse Group.

Key references:

- Bright, P. and Morris, P. (2002). Putting Dormice back on the map. *British Wildlife*, 14. 91-100.
- Büchner, S. (2008). Dispersal of common dormice *Muscardinus avellanarius* in a habitat mosaic. *Acta Theriologica*, 53(3), pp.259-262.
- Goodwin, C.E.D., Hodgson, D.J., Al-Fulaij, N., Bailey, S., Langton, S. and McDonald, R.A. (2017). Voluntary recording scheme reveals ongoing decline in the United Kingdom hazel dormouse *Muscardinus avellanarius* population. *Mammal Review*, 47(3), pp.183-197.
- Mortelliti, A., Santarelli, L., Sozio, G., Fagiani, S. and Boitani, L. (2013). Long distance field crossings by hazel dormice (*Muscardinus avellanarius*) in fragmented landscapes. *Mammalian Biology*, 78(4), pp.309-312.

Project 2.5: How best to manage habitat for the Shining Pot-beetle?

**Contact: Policy & Research Manager,
mike.waite@surreywt.org.uk**

The Shining pot-beetle (*Cryptocephalus nitidulus*) is a UK Biodiversity Action Plan Priority species and is considered to be nationally endangered. The beetle has very poor dispersal abilities and is associated with transient mid-succession scrub habitats, meaning that in the modern landscape it has become very difficult for it to persist and colonise new sites (Piper and Compton, 2010). Indeed, this may be to the extent that a lack of mixing between populations is beginning to cause genetic separation (Piper and Compton, 2002). There is also some evidence to suggest that the larvae of *C. nitidulus* have a high mortality rate from hymenopteran parasitism (Piper, 2016).

C. nitidulus is apparently now confined wholly to a limited area of the North Downs in Surrey. The Trust manages a number of sites where the beetle is present, where autecological research has been conducted in the past. Conservation of the species epitomises the challenging management conundrum of the 'scrub versus open chalk grassland' spatial/quantum balance on protected sites.

The majority of the project would entail applied fieldwork, focused on ecological surveys of the stronghold sites of *C. nitidulus* (inc. Headley Warren, Westcott Down, Hackhurst Down and White Down), comparing the management regimes to establish best approaches to maintain and support the beetle. The data would be analysed using statistical software and support would be provided for survey work and species identification.

Key references:

- Piper, R. (2016). *Cryptocephalus nitidulus* Fabricius (Chrysomelidae) larvae and parasitism. *The Coleopterist*, 25 (2): 78.
- Piper, R.W. and Compton, S.G. (2002). Subpopulations of *Cryptocephalus* beetles (Coleoptera: Chrysomelidae): geographically close but genetically far. *Diversity and Distributions*, 9(1): 29–42.
- Piper, R. and Compton, S.G. (2010). Population size and dispersal ability of *Cryptocephalus nitidulus* (Linnaeus, 1758) (Col.: Chrysomelidae). *The Entomologist's Record and Journal of Variation* 122:257–264.

Project 2.6: Rediscovering the spider assemblage at Chobham Common

**Contact: Policy & Research Manager,
mike.waite@surreywt.org.uk**

TChobham Common NNR is allegedly the most biodiverse site for spiders in the UK, including many nationally endangered, rare and scarce species. However, many of these records are now very old. The spider assemblage is moreover a notified feature of its SSSI status. A long-term monitoring project targeted at updating our knowledge of this important assemblage is long overdue.

The project would comprise an over-arching, long-term species recording exercise, designed to fully cover this extensive site within a decade; as well as further focussed autecological studies to ascertain the status of one or more species of conservation importance present on the site, such as *Cheiracanthium pennyi* (Endangered), *Dipoena erythropus* (Vulnerable) and *Araneus alsine* (Nationally Scarce). The project would combine fieldwork and GIS mapping, providing experience on several applied survey methods including sweeping, pitfall trapping and DVAC sampling. Support would be provided for survey work and species identification.

Key references:

- Dodd, S G. (2011). *The Spiders of Chobham Common, Surrey* [VC 17]. Surrey Wildlife Trust Ecology Services.
- Harvey P et al. (2017). A review of the scarce and threatened spiders (Araneae) of Great Britain: Species Status No.22. British Arachnological Society

Theme 3 – Wildlife habitat restoration: Methodology & Evidence

Project 3.1: Quantifying landscape resistance

Contact: GIS & Data Manager, matthew.guiliatt@surreywt.org.uk

Landscape resistance is commonly used in models analysing landscape connectivity for species movements (Zeller et al., 2012). Although much research already exists, and a variety of methodologies have been developed (Van Moorter et al., 2021), there remain many datasets reliant on assumptions and expert opinion rather than quantitative data collected from the field. Further work on the autecology and behavioural responses of these species will provide much needed insight, especially if this is conducted within direct context of the management activity under scrutiny.

Surrey Wildlife Trust have been working on quantifying landscape connectivity for several years, and continue to develop and expand the methodology. Any work to further supplement the efforts to accurately model connectivity for the county would have vast applications throughout the Trust's projects.

There are a variety of approaches to this project. As a possible proxy value for how isolated populations of these species actually are within a fragmented landscape, their degree of interrelatedness may be researched by genetic profiling. Radio-telemetry of tagged individuals is also possible to research their dispersal movements (e.g. Sinsch et al., 2012).

Key references:

- Sinsch, U., Oromi, N., Miaud, C., Denton, J. and Sanuy, D. (2012). Connectivity of local amphibian populations: modelling the migratory capacity of radio-tracked natterjack toads. *Animal Conservation*, 15(4), pp.388–396.
- Van Moorter, B., Kivimäki, I., Panzacchi, M. and Saerens, M. (2021). Defining and quantifying effective connectivity of landscapes for species' movements. *Ecography*, 44(6), pp.870–884.
- Zeller, K.A., McGarigal, K. and Whiteley, A.R. (2012). Estimating landscape resistance to movement: a review. *Landscape Ecology*, 27(6), pp.777–797.

Project 3.2: Monitoring impacts of conservation grazing at Folly Bog

Contact: Conservation Manager West

Conservation grazing has long been used by environmental organisations in the UK to manage a variety of habitats, including heathland. Lowland heathland is an internationally important and protected habitat, and the UK is a key stronghold with 20% of the total European area (English Nature, 2002). The vast majority of practitioners believe that extensive grazing is the most effective management option, but various studies have evidenced a number of negative impacts (Newton et al., 2009). In particular, it has been shown that it can detrimentally impact populations of reptiles, including the Annex 4 protected Smooth Snake *Coronella austriaca* (Reading and Jofré, 2015).

The Trust's nature reserve at Folly Bog on Brentmoor Heath represents one of Surrey's best examples of valley mire on lowland heathland. Knowledge of the hydrology has also benefitted from a long-running dip-well inspection project. There is an ongoing conservation grazing regime effective here, and some correlation of hydrology, grazing impact and vegetation changes has been attempted. However, continuity of this is currently at risk due to staff resourcing and furtherance and refinement of the monitoring approaches could be usefully reviewed, especially in light of the evidence discussed above.

The project will involve a mix of field and desk based work, including ecological surveys of Folly Bog and other heathland sites and review of historic species records. The data would be analysed using statistical software. Support would be provided for survey work and species identification.

Key references:

- English Nature. (2002). *Lowland Heathland: A Cultural and Endangered Landscape*, English Nature, Peterborough, UK.
- Newton, A.C., Stewart, G.B., Myers, G., Diaz, A., Lake, S., Bullock, J.M. and Pullin, A.S. (2009). Impacts of grazing on lowland heathland in north-west Europe. *Biological Conservation*, 142(5):935–947.
- Reading, C.J. and Jofré, G.M. (2015). Habitat use by smooth snakes on lowland heath managed using 'conservation grazing'. *The Herpetological Journal*, 25(4):225–231.

Project 3.3: Impact of Roadside Verge Management on Invertebrates

Contact: Policy & Research Manager, mike.waite@surreywt.org.uk

Whilst there has been some research on the role of roadside verges in promoting biodiversity, it is recognized that there are large knowledge gaps concerning roadside management and its effects on biodiversity (Jakobsson et al., 2018). However, existing research includes a study in the Netherlands that evidenced that mowing roadside verges only twice a year was overwhelmingly beneficial for insect diversity and abundance (Noordijk et al., 2009), as also did a UK based study (Garbuzov, 2014). Given the benefits to biodiversity among a myriad of other ecosystem services, there is an urgent need for additional evidence to support the case for conservation-focused verge management to promote to responsible authorities as well as the general public (O’Sullivan et al., 2017).

In Surrey, there is a mixed approach among various management authorities, providing an opportunity for comparing alternative management approaches. There are also a variety of residential campaigns, such as the Bookham Blue Hearts, which could provide insight into the role of the public and local residents. The Trust is involved with both of these sectors, and supports the belief that with appropriate management roadside verges can sustain and boost local invertebrate populations, while also serving as effective corridors to enhance habitat connectivity in the wider landscape. It is, therefore, important we have robust research to support the case for managing verges for wildlife.

Fieldwork would be conducted to gather data on abundance and diversity of invertebrates, with a comparison between the verges managed by the different borough councils. There is also potential for inclusion of a sociological aspect, gathering information and opinions from councillors and residents. Data would be analysed using statistical software. Support would be provided for survey work and species identification.

Key references:

- Garbuzov, M., Fensome, K.A. and Ratnieks, F.L.W. (2014). Public approval plus more wildlife: twin benefits of reduced mowing of amenity grass in a suburban public park in Saltdean, UK. *Insect Conservation and Diversity*, 8(2), pp.107–119.
- Jakobsson, S., Bernes, C., Bullock, J.M., Verheyen, K. and Lindborg, R. (2018). How does roadside vegetation management affect the diversity of vascular plants and invertebrates? A systematic review. *Environmental Evidence*, 7(17).
- Noordijk, J., Delille, K., Schaffers, A.P. and Sýkora, K.V. (2009). Optimizing grassland management for flower-visiting insects in roadside verges. *Biological Conservation*, 142(10), pp.2097–2103.
- O’Sullivan, O.S., Holt, A.R., Warren, P.H. and Evans, K.L. (2017). Optimising UK urban road verge contributions to biodiversity and ecosystem services with cost-effective management. *Journal of Environmental Management*, 191, pp.162–171.

Project 3.4: Impact of Wildlife Gardening on Invertebrates

Contact: GIS, Research & Monitoring Consultant, ben.siggery@surreywt.org.uk

There appears to be limited research on the actual, quantified contribution of wildlife gardening to biodiversity conservation programmes, but that which exists does indicate that garden vegetation is an important predictor of both invertebrate species richness and abundance (Smith et al., 2006). Additionally, rare species across a number of invertebrate taxa have been found inhabiting urban green roofs (Kadas, 2006). Such evidence can be used to better inform wildlife gardening advice provided by environmental NGOs. For example, domestic gardens are often home to ornamental, non-native plants, which provide significantly less value for native invertebrates (both plant associated and soil-dwelling), than native or near-native vegetation (Sailsbury et al., 2017; Sailsbury et al., 2020). Indeed, there is a clear role for improved science communication and community engagement in changing gardening practices (van Heezik et al., 2012).

Gardens make up over 20,000 hectares of Surrey and are therefore a key element of our land-use, and should be considered as such in landscape-scale conservation. Promotion of wildlife gardening is already a core part of the Trust’s engagement activities, which would benefit from additional research and justification. An annual wildlife gardening survey provides a large existing dataset capturing the spread of garden features across the county and would form the basis for this project.

This would primarily be a desk-based project, utilising the data from the survey mentioned above. Additional work would be undertaken to gather information on species associations with popular garden features. Various methodological approaches could be taken, and flexibility and creativity is encouraged. Assistance would be provided for whichever approach is taken.

Key references:

- Kadas, G. (2006). Rare Invertebrates Colonizing Green Roofs in London. *Urban Habitats*, 4(1), pp.51–66.
- alisbury, A., Al-Beidh, S., Armitage, J., Bird, S., Bostock, H., Platoni, A., Tatchell, M., Thompson, K. and Perry, J. (2017). Enhancing gardens as habitats for plant-associated invertebrates: should we plant native or exotic species? *Biodiversity and Conservation*, 26(11), pp.2657–2673.
- Salisbury, A., Al-Beidh, S., Armitage, J., Bird, S., Bostock, H., Platoni, A., Tatchell, M., Thompson, K. and Perry, J. (2019). Enhancing gardens as habitats for soil-surface-active invertebrates: should we plant native or exotic species? *Biodiversity and Conservation*, 29(1), pp.129–151.
- Smith, R.M., Warren, P.H., Thompson, K. and Gaston, K.J. (2005). Urban domestic gardens (VI): environmental correlates of invertebrate species richness. *Biodiversity and Conservation*, 15(8), pp.2415–2438.
- van Heezik, Y. M., K. J. M. Dickinson, and Freeman, C. (2012). Closing the gap: communicating to change gardening practices in support of native biodiversity in urban private gardens. *Ecology and Society*, 17(1), pp.34–43.

Project 3.5: Optimal conservation prescriptions for agricultural land

Contact: Business and Biodiversity Manager, leigh.thornton@surreywt.org.uk

Agricultural land has great potential to be restored into valuable space for wildlife whilst still providing benefits to the local economy (Newton et al., 2021). The Wildlife Trusts aim to restore 30% of land into good management for nature by 2030, and agricultural land is likely to be a key component of this. Restoration projects are essential to halt environmental degradation and biodiversity loss, and are also vital for optimising a holistic ecosystem service output from former agricultural land (Rey Benayas and Bullock, 2012). It is acknowledged that further research is needed to ascertain the functionality and ecological stability of restored land beyond elevated species richness (Walker et al., 2004).

Surrey Wildlife Trust began management of three ex-agricultural sites in spring 2021, which are designed as SANGs (see project 6.1) and all in need of restoration. Baseline surveys were conducted prior to intervention and the initial improvements are beginning to be appreciated. The aim of this project would be to assess the value of different management prescriptions (grazing, seed-sowing, mowing regimes, rewilding, etc.) in the context of reclaimed agricultural land, and to recommend an optimal management template for similar sites in future.

This would be a field-based research project, involving botanical and faunal surveys of the three sites. Assistance and training would be provided for species ID and surveying.

Key references:

- Newton, A.C., Evans, P.M., Watson, S.C.L., Ridding, L.E., Brand, S., McCracken, M., Gosal, A.S. and Bullock, James.M. (2021). Ecological restoration of agricultural land can improve its contribution to economic development. PLOS ONE, 6(3), p.e0247850.
- Rey Benayas, J.M. and Bullock, J.M. (2012). Restoration of Biodiversity and Ecosystem Services on Agricultural Land. Ecosystems, 15(6), pp.883–899.
- Walker, K.J., Stevens, P.A., Stevens, D.P., Mountford, J.Owen., Manchester, S.J. and Pywell, R.F. (2004). The restoration and re-creation of species-rich lowland grassland on land formerly managed for intensive agriculture in the UK. Biological Conservation, 119(1), pp.1–18.

Project 3.6: The perception and value of conservation grazing regimes

Contact: Business and Biodiversity Manager, leigh.thornton@surreywt.org.uk

Conservation grazing is well established as a management practice for a variety of important habitats, and has been shown to promote both plant and animal diversity (Small, 2010). A plethora of research has evidenced that grazing, in most cases, has a better biodiversity outcome than mowing or manual cutting (Talle et al., 2016). Varied grazing regimes have been implemented across the county, and there is evidence that they result in differing species compositions for both plants and invertebrates (Lyons et al., 2017). Aside from biodiversity benefits, the use of livestock on nature reserves has been seen to contribute to positive public relations, but this particular area requires further research (Harvey, 2002).

Surrey Wildlife Trust uses a variety of animals across its sites, and has achieved excellent results from this – to the benefit of many rare species, such as the Small Blue butterfly and the Straw Belle moth. As above, there is a clear role for research into the outcomes of differing grazing regimes. Much of our grazing is undertaken on public facing reserves, which creates an additional dimension of public understanding of conservation practice. This project aims to review this in the context of Surrey, but crucially to also include the sociological effects such as public perception of and engagement with conservation work.

This project would be largely ecologically field-based but would also include a sociological approach. Fieldwork would involve botanical surveys, in addition to data gathered from questionnaires, interviews and focus groups within relevant demographics. Assistance would be provided in any ecological surveying and species identification.

Key references:

- Harvey, P. (2002). Grazing in the urban environment : An economic and social appraisal of conservation grazing schemes. Masters. Sheffield Hallam University (United Kingdom).
- Lyons, A., Ashton, P.A., Powell, I. and Oxbrough, A. (2017). Impacts of contrasting conservation grazing management on plants and carabid beetles in upland calcareous grasslands. Agriculture, Ecosystems & Environment, 244, pp.22–31.
- Small, R. W. (2010). Conservation grazing: delivering habitat management for conservation with livestock. Journal of the Royal Agricultural Society of England, 171, pp.38–44.
- älle, M., Deák, B., Poschlod, P., Valkó, O., Westerberg, L. and Milberg, P. (2016). Grazing vs. mowing: A meta-analysis of biodiversity benefits for grassland management. Agriculture, Ecosystems & Environment, 222, pp.200–212.

Project 3.7: Monitoring the Effectiveness of Wetland Restoration

Contact: Wetlands Project Manager, glen.skelton@surreywt.org.uk

Restoration of degraded wetland and river habitats is internationally recognised as an important way to enhance biodiversity and ecosystem services (Peh et al., 2014). These restorations also provide improvements in landscape character and opportunities for citizen science and community involvement, alongside accomplishing policy targets (Smith et al., 2014; Prior, 2016). Much research has been assembled surrounding the effectiveness of different restoration interventions, and there is a clear role for additional data in providing further evidence to strengthen restoration efforts (Smith et al., 2013).

This has been at the forefront of Surrey Wildlife Trust's work in recent years with around 30 habitat creation and restoration projects delivered. Despite this momentum, the Trust has been unable to effectively monitor the outcomes of its efforts. Much of the restoration works carried out are supported by best practice guidelines, which focus on improving habitat primarily for fish species. A research project would provide the opportunity to robustly monitor our projects and delivery methods and provide us with quantified evidence regarding the benefits of our interventions, and to guide future management to being more site-specific.

The majority of the project would involve fieldwork, focused on ecological surveys targeting target species across a variety of comparable wetland restoration sites. These sites have been restored over a number of years, and provide an ideal portfolio of case-studies to investigate the temporal impacts and longevity of restoration interventions. Work would contribute to a larger project suite, which would be split by species groups, offering a unique research question for a variety of students to partake. The options for the focus of a single project are listed below:

- Macrophytes
- Invertebrates
- Amphibians
- Wetland birds & mammals

Key references:

- Peh, K.S.-H. , Balmford, A., Field, R.H., Lamb, A., Birch, J.C., Bradbury, R.B., Brown, C., Butchart, S.H.M., Lester, M., Morrison, R., Sedgwick, I., Soans, C., Stattersfield, A.J., Stroh, P.A., Swetnam, R.D., Thomas, D.H.L., Walpole, M., Warrington, S. and Hughes, F.M.R. (2014). Benefits and costs of ecological restoration: Rapid assessment of changing ecosystem service values at a U.K. wetland. *Ecology and Evolution*, 4(20), pp.3875–3886.
- Prior, J. (2016). Urban river design and aesthetics: a river restoration case study from the UK, *Journal of Urban Design*, 21(4), pp.512–529.
- Smith, B., Clifford, N.J. and Mant, J. (2013). Analysis of UK river restoration using broad-scale data sets. *Water and Environment Journal*, 28(4), pp.490–501. Smith, B., Clifford, N.J. and Mant, J. (2014). The changing nature of river restoration. *Wiley Interdisciplinary Reviews: Water*, 1(3), pp.249–261.

Theme 4 – Data capture & recording technology

Project 4.1: Evaluating the accuracy of large scale habitat datasets

Contact: GIS & Data Manager, matthew.guilliatt@surreywt.org.uk

Remotely sensed datasets have an important role to play in conservation and environmental management, and provide invaluable information on habitat extent and condition (Nagendra et al., 2013). In order for these to be produced on national scales and beyond, many assumptions have to be made concerning the basic habitat type and its quality. Reliance on aerial imagery and classification algorithms has meant that inevitably accuracy is lost in the process (Liu et al., 2002). This is primarily due to a lack of resources available for ground survey, but also the infeasibility of doing this on a countywide, let alone national, scale.

Surrey Wildlife Trust have largely been reliant on these large-scale habitat datasets for much of our spatial research, e.g. LandCoverMap 2019 (Morton et al., 2020). Historically, these have had to be manually updated where inaccuracies are identified but it has been unclear for some habitats and land-use types which have higher confidence for the county than others.

A study, or several related studies, could research the strength of reliability of this approach; perhaps by sampling from several sections of the prioritised Biodiversity Opportunity Areas to test accuracy in the first instance, but also for any variance in this between habitat types, or in different parts of the county. Support would be provided for GIS work.

Key references:

- Liu, X.-H., Skidmore, A.K. and Van Oosten, H. (2002). Integration of classification methods for improvement of land-cover map accuracy. *ISPRS Journal of Photogrammetry and Remote Sensing*, 56(4), pp.257–268.
- Morton, R. D., Marston, C. G., O’Neil, A. W., Rowland, C. S. (2020). Land Cover Map 2019 (land parcels, GB). NERC Environmental Information Data Centre. (Dataset). <https://doi.org/10.5285/44c23778-4a73-4a8f-875f-89b23b91ecf8>
- Nagendra, H., Lucas, R., Honrado, J.P., Jongman, R.H.G., Tarantino, C., Adamo, M. and Mairota, P. (2013). Remote sensing for conservation monitoring: Assessing protected areas, habitat extent, habitat condition, species diversity, and threats. *Ecological Indicators*, 33, pp.45–59.

Project 4.2: The use of UAV technology for environmental monitoring and analysis

Contact: Wetlands Project Manager, glen.skelton@surreywt.org.uk

UAV (Unmanned Aerial Vehicle) technology is a rapidly growing industry, with increasingly utilised applications in environmental science and practical conservation. The imagery captured by UAVs can be utilised for a variety of metrics, including vegetation and soil types (Arnold et al., 2013). There are many questions remaining to be answered about its utility in conservation as the technology develops and becomes more commercially available, for example regarding optimal image resolution (Lu and He, 2018).

The Trust wants to develop the potential for using UAV ‘Drone’ technology for flexible, accurate aerial photography to enable more precise interpretation of digital habitat cartography. This will have obvious monitoring applications. A research approach could investigate these possibilities, especially as low-cost UAVs and accompanying sensors are becoming more and more capable of collecting accurate and detailed data (Green et al., 2019).

This project would be mostly desk-based, conducting a thorough literature review and working with acquired drone imagery in GIS software. There would also be opportunities to collect additional data with a UAV, supervised by the Trust’s UAV operator.

Key references:

- Arnold, T., De Biasio, M., Fritz, A. and Leitner, R. (2013). UAV-based measurement of vegetation indices for environmental monitoring. 2013 Seventh International Conference on Sensing Technology (ICST), pp.704–707.
- Green, D.R., Hagon, J.J., Gómez, C. and Gregory, B.J. (2019). Using Low-Cost UAVs for Environmental Monitoring, Mapping, and Modelling: Examples From the Coastal Zone. *Coastal Management*, pp.465–501.
- Lu, B. and He, Y. (2018). Optimal spatial resolution of Unmanned Aerial Vehicle (UAV)-acquired imagery for species classification in a heterogeneous grassland ecosystem. *GIScience & Remote Sensing*, 55(2), pp.205–220.

Theme 5 – People & Wildlife: Monitoring Public Engagement

Project 5.1: Landowner relationships with land designations

**Contact: Policy & Research Manager,
mike.waite@surreywt.org.uk**

Non-statutory sites designated for their biodiversity value (collectively known as Local Wildlife Sites) represent an essential second tier system for protecting such sites, that is long established in the UK (Defra, 2006). Private landowners are central to delivering on these sites, and previous research has shown that there is a clear need for engagement with them and understanding of their motivations to meet the aspirations for these sites (Lawrence and Dandy, 2014).

There are 787 such sites, known in Surrey as Sites of Nature Conservation Importance (SNCI), chosen for various criteria, such as species rarity and diversity (Surrey Nature Partnership, 2019). These include sites on and around campus, such as Cooper's Hill and the River Thames at Runnymede. These diverse sites are selected by the Surrey Local Sites Partnership, which also has a role in monitoring, promotion and support of site management and strategy. These sites have diverse owners and the Surrey Local Sites Partnership does not have the resources to deliver all its activities, so they hope to further engage the owners of these sites. To do this, they would like to understand site owners' knowledge of the designation and its conservation role, their understanding of the ecological interest of their particular sites, as well as their emotive feelings towards stewardship.

This project methodology would be to conduct an attitudinal survey of owners of Sites of Nature Conservation Importance in Surrey. Support will be provided in terms of connecting with appropriate landowners.

Key references:

- Defra. (2006). Local Sites, Guidance on their Identification, Selection and Management
- Lawrence, A. and Dandy, N. (2014). Private landowners' approaches to planting and managing forests in the UK: what's the evidence? *Land use policy* 36: 351-360
- Surrey Nature Partnership. (2019). Policies and Procedures for the Identification & Selection of Sites of Nature Conservation Importance in Surrey & Surrey Local Sites Partnership - Terms of Reference

Project 5.2: Valuation of health and wellbeing benefits on nature engagement

**Contact: Director of People & Wildlife,
aimee.clarke@surreywt.org.uk**

There has been a large amount of research into the health and wellbeing benefits of our interactions with the natural environment, with significant benefits deriving from as little as two hours a week spent in nature (White et al., 2019). In more recent work, it has become apparent that even simple activities (such as appreciating flower-scent) and relatively low levels of nature connectedness are actually critical for improving health and wellbeing (Richardson et al., 2021). Our levels of nature connectedness have clear and intrinsic links with our hedonic and eudaimonic wellbeing (Pritchard et al., 2020). Very useful research could therefore be conducted into local consumers' propensity to pay for the ecosystem services benefitting health and wellbeing, especially as "green prescribing" gains momentum amongst healthcare providers (Thomson et al., 2020).

In-depth, Surrey-centric research into this area of beneficial nature engagement would be desirable to better understand the role for green social prescribing in our county. This research would better inform Surrey Wildlife Trust on how to incorporate optimal health and wellbeing outcomes into our engagement provision, similar to the recommendations made in Richardson et al. (2021). This work could logically be partnered with the Surrey Nature Partnership and the professional health sector.

The project would likely work with current green social prescribing experiments in which the Trust is currently involved, in the Stanwell, Horley and Stoke areas. Methodology would primarily be sociological in nature, and likely involve questionnaires, interviews and focus groups.

Key references:

- Pritchard, A., Richardson, M., Sheffield, D. and McEwan, K. (2019). The Relationship Between Nature Connectedness and Eudaimonic Well-Being: A Meta-analysis. *Journal of Happiness Studies*, 21(3), pp.1145-1167.
- Richardson, M., Passmore, H-A., Lumber, R., Thomas, R., & Hunt, A.(2021). Moments, not minutes: The nature-wellbeing relationship. *International Journal of Wellbeing*, 11(1), pp.8-33.
- Thomson, L., Morse, N., Elsdon, E. and Chatterjee, H. (2020). Art, nature and mental health: assessing the biopsychosocial effects of a "creative green prescription" museum programme involving horticulture, artmaking and collections. *Perspectives in Public Health*, 140(5), pp.277-285.
- White, M.P., Alcock, I., Grellier, J., Wheeler, B.W., Hartig, T., Warber, S.L., Bone, A., Depledge, M.H. and Fleming, L.E. (2019). Spending at least 120 minutes a week in nature is associated with good health and wellbeing. *Scientific Reports*, 9(1).

Project 5.3: Wellbeing impacts of wildlife gardening

**Contact: Forest School Co-ordinator,
neil.jameson@surreywt.org.uk**

Wildlife gardens aim to ensure birds, insects and other wildlife are welcomed into gardens by including attractive plant species and specific features such as hedgehog, bird or insect homes. There is an increasing understanding of the role of greenspaces and nature on individual wellbeing, and also some understanding of the wellbeing value of gardening (Curtis and Fox, 2014; Mumaw et al., 2017). However, there is limited work on the wellbeing benefits of wildlife gardens, even as participation in wildlife gardening increases in the UK (Goddard et al., 2013).

Gardens make up over 20,000 hectares of Surrey and are therefore a key element of our land-use, and should be considered as a core element of the way residents interact with nature in the county. Promotion of wildlife gardening is already an element of the Trust's engagement activities, which would benefit from additional research and justification, especially that which is beyond the scope of biodiversity. The project will investigate which aspects of wellbeing are associated with wildlife gardening, and which characteristics of wildlife gardening people associate with wellbeing benefits.

The outcome of this project would aim to make recommendations to better inform policy documents on wellbeing and greenspace. The methodology is likely to be sociological in nature, via questionnaires and focus groups.

Key references:

- Curtin, S. and Fox, D. (2014). Human Dimensions of Wildlife Gardening: Its Development, Controversies and Psychological Benefits. *Horticulture: Plants for People and Places*, Volume 3, pp.1025–1046.
- Goddard, M.A., Dougill, A.J. and Benton, T.G. (2013). Why garden for wildlife? Social and ecological drivers, motivations and barriers for biodiversity management in residential landscapes. *Ecological Economics*, 86, pp.258–273.
- Mumaw, L.M., Maller, C. and Bekessy, S. (2017). Strengthening Wellbeing in Urban Communities Through Wildlife Gardening. *Digital Commons at Loyola Marymount University and Loyola Law School*.

Project 5.4: Rewilding in local conservation efforts – Value, evidence and public perceptions

**Contact: Business and Biodiversity Manager, Leigh.
thornton@surreywt.org.uk**

Rewilding is an ambitious and powerful new zeitgeist in conservation, which has generated much attention from the general public as well as the scientific community (Jepson and Schepers, 2016). Over the last decade, several flagship Continental rewilding schemes have been implemented and there is now a well-established bank of case studies of the positive impacts rewilding can achieve (Egoh et al., 2021). However, there is a worrying lack of consensus around exactly what rewilding should entail, and the extent to which it is supported by scientific evidence (Nogués-Bravo et al., 2016). Rewilding has emerged as an unavoidably emotional subject, with media-stoked tensions between stakeholders becoming a necessary element of many rewilding projects (Wynne-Jones et al., 2018).

Within Surrey, there have been several rewilding opportunities identified and presented to the Trust, but a carefully contemplated approach should include an anticipation of tensions and any conflicts. Research could be conducted to compare both public and private land-owners' attitudes towards the notion of 'rewilding' schemes and associated flagship species re-introductions.

This project would be largely desk-based, focused on a sociological approach. Data gathered from questionnaires, interviews and focus groups within relevant demographics. There could also be elements of a field-based approach including surveys of rewilded sites.

Key references:

- Egoh, B.N., Nyelele, C., Holl, K.D., Bullock, J.M., Carver, S. and Sandom, C.J. (2021). Rewilding and restoring nature in a changing world. *PLOS ONE*, 16(7), p.e0254249.
- Jepson, P. and Schepers, F. (2016). Making space for rewilding: creating an enabling policy environment. *Rewilding Europe*, Ox.ac.uk.
- Nogués-Bravo, D., Simberloff, D., Rahbek, C. and Sanders, N.J. (2016). Rewilding is the new Pandora's box in conservation. *Current Biology*, 26(3), pp.R87–R91.
- Wynne-Jones, S., Strouts, G. and Holmes, G. (2018). Abandoning or Reimagining a Cultural Heartland? Understanding and Responding to Rewilding Conflicts in Wales - the Case of the Cambrian Wildwood. *Environmental Values*, 27(4), pp.377–403.

Project 5.5: Exploring public wildlife conservation motivations

Contact: Policy & Research Manager, mike.waite@surreywt.org.uk

Conservation NGOs rely on members and donors to support their work. However, these individuals can have diverse motivations for this support, ranging from concerns about the welfare of specific species to more general support for landscape conservation (JNCC, 2020). For example, the well-known Wildlife Trusts in the UK use the badger as their logo, which may generate support from some members of the public. However, badgers are not a species of conservation concern in the UK, and are not viewed positively in some communities, so may discourage other potential supporters.

Understanding what motivates individuals to support specific conservation NGOs and how these motivations align with some or all of an organisation's specific aims and functions can help these organisations to generate effective marketing strategies (Reichenberger, 2021). As a member of The Wildlife Trusts, Surrey Wildlife Trust use a badger as our logo, as described above. There is a strong correlation between the public's opinion and understanding of a species and the success in its conservation (Vincenot et al., 2015), which is particularly relevant when such a species represents the entire organisation. It is crucial for us to understand the motivations of our supporters and generate insights to support our work, and the work of the Wildlife Trusts nationwide. There is flexibility for students to develop and test their own project ideas within this area in collaboration.

Key references:

- JNCC. (2020). A1. Awareness, understanding and support for conservation (<https://jncc.gov.uk/our-work/ukbi-a1-awareness/>)
- Reichenberger, I. (2021). Membership motivations for natural conservation tourist attractions. *Tourism recreation research*. Early online (<https://doi.org/10.1080/02508281.2021.1904695>)
- Vincenot et al. (2015) Public awareness and perceptual factors in the conservation of elusive species: The case of the endangered Ryukyu flying fox. *Global Ecology and Conservation* 3: 526-540
- ns at Loyola Marymount University and Loyola Law School.

Theme 6 – Valuing Nature: Natural Capital & Ecosystem Services

Project 6.1: How can we quantify the potential that newly created SANGS and other restored landscapes offer to the Nature Recovery Network?

Contact: Business and Biodiversity Manager, leigh.thornton@surreywt.org.uk

Suitable Alternative Natural Greenspaces (SANG) are existing open areas identified for improvement, aimed to provide additional provision of accessible open space for local residents. The scheme is part of a mitigation strategy to protect the composite Thames Basin Heaths Special Protection Area (SPA) from encroaching housing developments and to minimise the inevitable impacts of an increased local community on the component sites of the SPA (Allinson, 2018). It was necessitated from research showing that over 5 million visitors a year accessed these sites, and that the vast majority of them were dog walkers – which caused considerable concern regarding disturbance of the ground nesting birds driving the designation (Liley et al., 2005).

The Thames Basin Heaths are a network of internationally protected sites designated for their important populations of multiple rare bird species (Woodlark, Nightjar, Dartford warbler) as well as many nationally rare reptiles and invertebrates (Natural England, 2014). Surrey Wildlife Trust is responsible for the management of a significant area of these heaths and are now also involved in the restoration of sites for SANGS provision. There is a need for research proving the efficacy of these sites to not only offset footfall on the SPA, but also to support local biodiversity recovery programmes, using the opportunity presented by Biodiversity Net Gain obligations and the role of this in progressing the Nature Recovery Network.

The project could involve a mix of field and desk based work, conducting ecological surveys of the SANGS sites under different management prescriptions. The project would be expected to output an evidence based set of recommendations for the role and management of SANGs within a biodiversity, landscape and policy context.

Key references:

- Allinson, E. (2018). The role of suitable alternative natural greenspace strategy in protecting high-value wildlife sites. University of Southampton, Doctoral Thesis, 230pp.
- Liley, D, Jackson, D. & Underhill-Day, J. (2005). Visitor Access Patterns on the Thames Basin Heaths. English Nature Research Report XX. English Nature, Peterborough
- Natural England. (2014). NE530: NCA Profile:129 Thames Basin Heaths, Natural England.

ENDS



surreywildlifetrust.org

© Surrey Wildlife Trust 2021

Registered Charity no. 208123. Surrey Wildlife Trust is a company limited by guarantee, registered in England no. 00645176. Registered office School Lane, Pirbright, Surrey, GU24 0JN

