



Record Centre Survey Unit

Monitoring Strategy for Knepp Castle Estate Wildland Project.

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1. Introduction

The main aim of the Knepp Castle Estate Wildland Project is to put most of the Estate's 3000 acres under as natural a grazing regime as possible, following a staged reversion from largely arable use since 2001 to the present and ongoing. The facilitation of natural processes is seen as the underlying rationale behind this aim.

An initial evaluation of existing biological species data and habitat survey was carried out in early 2005 (Greenaway, 2005). This report was used to drive more focused baseline surveys that were carried out, as far as resources permitted, in the summer of 2005. The results of these surveys were presented in a further report - the Knepp Castle Estate Baseline Ecological Survey (Greenaway, 2006). This presented a broad-brush assessment of the Knepp Estate as close to the beginning of the more natural grazing project as feasible. The report collated all of the 2005 field work but the production of a monitoring strategy was not within its remit.

At the inaugural meeting of the Knepp Project Steering Group on 10th May 2006 a wide range of issues were discussed – ranging from the purely ecological to animal health and husbandry, the economic requirements of the Estate and the imperative need to inform and involve local communities. Following this meeting it was agreed by Tony Whitbread (SWT), Paul Buckland (University of Bournemouth) and Theresa Greenaway (Record Centre Survey Unit) that a monitoring strategy based on the 2005 field work, and considering these other issues was the next step.

2. Analysis & interpretation of historical and baseline surveys

2.1. Summary of historical data

Until the first stage of arable reversion was implemented in 2001, the majority of the Estate was under mixed arable cropping, with amenity and plantation woodland, established hedgerows, polo fields and the remnants of Repton's landscape. Wetland habitat was provided by the River Adur, Lancing Brook, other tributary streams, two large ponds and many smaller ponds.

The species and habitat information existing at the outset of the Knepp grazing project was incomplete in terms of both extent and coverage. The earliest habitat information available is descriptions of the two parts of the

Estate designated SNCIs. Knepp Mill Pond forms part of SSCI H18, and is described on the WSCC SSCI register as 'a large area of open water with well-developed marginal vegetation and extensive tall fen'. River Adur and Lancing Brook make up the rest of SSCI H18, and are described as having 'diverse emergent and aquatic vegetation, including several local species'. In the north of the Estate, SSCI H30 comprises Horsham Common woodland complex, patches of woodland including semi-natural woodland, semi-mature oak plantation, young broad-leaved plantation, conifer plantation, streams and a small herb-rich meadow.

A number of the woodlands in the original deer park were surveyed in 1997 as part of the CSS application (Colston Stone Practice, 2000). This report showed that some of these woodlands had semi-natural characteristics, but many if not all appear to have been managed as broadleaved and conifer plantations.

Knepp Mill Pond and its immediate surroundings were surveyed in 2002 by Chris Blandford Associates as part of an ecological assessment to advise on proposed dredging work, providing species data and vegetation community analysis using the National Vegetation Classification (NVC) (Rodwell, 1991). Eleven community types recognised under the NVC scheme were identified, including one, S11 *Carex vesicaria* swamp, of particular interest as it is an uncommon community in southern England, and two communities that did not fall into NVC categories.

The desk survey showed historical species records dating from the nineteenth century, and the earliest known records are of rare beetles recorded pre-1905. Knepp Mill Pond and its surroundings and the Horsham Common woodland complex (SSCI H30) in the north of the Estate were the best recorded areas of the Estate, with many parts poorly recorded or not recorded at all. At the time of the baseline survey (Greenaway, 2005), 12 Protected Species had been recorded and 26 species on the Sussex Rare Species Inventory were recorded.

It was apparent from a study of these surveys and species records that the baseline biological inventory of the Estate was fairly poor. Species data ranged from casual observations to detailed surveys focussed on relatively small areas of the Estate. In order to assess, over time, the effects that a near-naturalistic grazing regime has on biodiversity, and to inform the monitoring strategy, it was necessary to improve this baseline data.

The survey work of 2005 aimed at augmenting the baseline information and was focussed on four parts of the Estate – Area A (land taken out of arable and reseeded in 2001, grazed since 2002); Area B (land taken out of arable and reseeded in 2004, grazed since 2005); Area C (land taken out of arable in 2004 and largely ungrazed at the time of the baseline survey work) and Area D (land taken out of arable in 2005 plus some semi-improved grassland). Ideally, the baseline work would have been initiated in 2001. As this did not

take place, these four areas were selected to provide as much information about the early stages following arable reversion as possible.

2.2 Baseline data interpretation

The extended Phase I habitat survey carried out by Kate Ryland in 2005 provided as good a baseline dataset of the vegetation across the survey area as near as possible to the start of the Knepp grazing project. This survey was digitised on ArcView GIS by Sussex Biodiversity Record Centre, and a full breakdown of habitat types was presented in Greenaway (2006). Summarising the habitats gives covers of 76% grasslands, 15% woodlands, 1% scrub, 2% wetlands/open water and 6% arable.

A visual record was made by fixed point photography, taken by Rich Howorth (West Weald Landscape Project Officer), along a butterfly recording transect across the Estate.

2.2.1. Grassland

At the time of the baseline habitat survey, the arable reversion fields had undergone a range of treatments from complete reseeding with grass and wild flower mixes to natural regeneration. Some had been grazed for three years whereas other fields had not been grazed at all. Transects set up in areas A, B and C commenced within woodland and extended out into grassland; the two transects in Area D commenced at a hedgeline and extended across pasture. Two-metre contiguous quadrats were surveyed along these transects. It was clear from both fixed-point photographs taken along the transects (held by the Record centre Survey Unit), as well as from the plant species composition along each transect that in 2005 there was a clear distinction between woodland and open grassland. Plotting Ellenberg values for light (L) and nitrogen (F) showed along transects in Areas A and B a predictable trend from shade-tolerant to light-requiring forbs, and also a trend from species requiring higher levels of nitrogen in woodland to those requiring somewhat lower levels in grassland. This is an interesting observation, given that all ex-arable fields have in the past been treated with NPK fertiliser. No clear trends were observed in Area D except that there was a tendency for species requiring higher nitrogen levels towards wetter ground.

In 2005, arable reversion fields showed little scrub development, hedgerow expansion or tree seedling recruitment. Of those woody seedlings that were recorded ash *Fraxinus excelsior* was the most frequent followed by hornbeam *Carpinus betulus*. The two transects positioned in Area A, which was taken out of arable in 2001 and has been grazed since 2002, and one transect in Area B, taken out of arable in 2004 and grazing allowed in 2005, had the most quadrats in which tree seedlings were recorded, although the total number of seedlings in all quadrats where they occurred was low. Hornbeam seedlings were almost all within woodland, whereas ash seedlings occurred within woodland and right out at the furthestmost quadrat in open grassland. Only two oak *Quercus robur* seedlings were found, one in each of two

quadrats along one transect in Area D. Both oak and ash trees are numerous on the Estate.

The scattered distribution of ash seedlings is compatible with the wind dispersal strategy of ash keys. Acorns must either germinate where they fall or rely on other dispersal vectors, notably jays. The almost complete absence of oak seedlings even in the area out of arable for four years might reflect the absence of landscape 'markers', such as isolated bushes or posts, that jays are thought to use when selecting places to bury acorns. It is also possible that acorns have been buried but have subsequently been eaten by mice or voles, or have germinated and have been browsed. However, even severely browsed oak seedlings seldom disappear entirely.

Similarly there was little indication of scrub expansion. Bramble *Rubus fruticosus* agg. was the most abundant of those thorny scrub species likely to form a nursery for tree seedlings, and at this early stage in the Wildland project, did not occur further out into the grassland than along the boundary between woodland and grassland. The one exception to this was in one of the transects in Area D, where this transect finished in a wetter area rather different from the open grassy fields surveyed in the other three areas.

In order to discern whether there was any significant difference between:

- a) Transects at A, B, C & D
- b) transects reseeded with wildflower and grass-seed mix and those not reseeded

it is the intention to utilise Principal Components Analysis. This method operates on the measured variables (the species recorded) to maximise the differences between the transects. Like all multivariate techniques, it involves laborious calculations best performed on computer. Until the appropriate software is accessible, it will not be possible to carry this analysis further. It is also the intention to use this method of analysis to identify significant changes over time of each transect.

In September 2006, a transect comprising 120 two-metre contiguous quadrats was surveyed for tree seedlings and scrub development. This transect commenced at GR TQ15923 23380 north of Pondtail in Area C, and ran 100deg east, crossing both arable reversion and parkland and through two hedges. The rationale behind this survey was that the area was partly grazed by sheep in 2005, but during 2006 has had only cattle. This regime is intended to continue to allow hedgerows to expand into the fields with the development of scrub that will act to protect tree seedlings from browsing or grazing. The full results of this survey are in the Appendix, but are summarised in Table 1.

Table 1. Woody seedling species in transect.							
	Oak		Ash	H'thorn	Bl'thorn	Privet	Rose
Quad	tot	brsed	tot	tot	tot	tot	Tot
4			1				
7			1				
30				4 (shrubs)			
31				3			
40					4		
50	1						
66		1					
78 (hdge)					4	1	
79 (hdge)				3	10	2	1
80					2	2	
105	1						
Total	2	1	2	3 sdling 7 shrub	20 shrub	5 shrub	1 shrub

Table 1 shows that this area starts from a very low baseline of tree / scrub species recruitment into the grassland. There were very few tree seedlings, only 3 oak, 2 ash and 3 hawthorn; with one patch of blackthorn *Prunus spinosa* that was spreading out from a hedge by means of suckers. Only hawthorn was recorded in the first hedge crossed (TQ1595 2345), 4 shrubs and 3 seedlings. Hawthorn, blackthorn, privet *Ligustrum vulgare* and rose *Rosa sp* were recorded as shrubs in the second hedge (TQ1610 2335).

Table 2. Distribution of bramble & coarse herbaceous species						
Quad	Bramble	Rush	Thistle	Ragwort	Bracken	Dock
1						
2						
6						
18						
19						
25						
26						
27						
28						
29						
30						
31						
32						
33						
34						
35						
78						
79						
80						
81						
83						
84						
120						

Total	7	1	16	0	0	13
%	5.8	0.8	13.3	0	0	10.8

NB Quadrats with NONE have been deleted; no quadrat had over 25%.

<25%

An estimation of the cover of bramble and coarse herbaceous species, rush, thistle, Ragwort, bracken and dock, was also made. The results are summarised in Table 2. The low occurrence of thistle, and absence of ragwort, can be ascribed to the dense grass sward over nearly all of the transect except where grazing and walking by rabbits and cattle had worn a bare strip of ground along the sunnier sides of the hedgerows. It will be extremely interesting and instructive to monitor the changes over time along this transect.

2.2.2. Woodland

Consisting of some 177ha in extent, woodland was the second largest habitat on the Estate in 2005. It was made up largely of ancient semi-natural woodland, wet woodland, broadleaved- conifer- and mixed plantation. There are many even-aged mature trees across the estate with some veterans or near veterans especially in hedgerows or more open positions. Much of the woodland has little understorey, but woodland structure was not quantified on in the 2005 habitat survey; neither was the composition of the understorey, beyond comments relating to the introduced rhododendron. Any expansion of understorey to form an ecotone between the rather open woodland and the grassland will therefore start from a sparse baseline.

2.2.3. Scrub and hedgerows

Scrub comprised just 1% of the vegetation in 2005, occurring in scattered strips across the Estate. Hedgerows were estimated to add up to some 65km, with an average width of 2.5m; of this total, 5km was considered intact, 1.2km defunct and 0.8km ancient/species-rich. In addition, there was 2.7km of lines of trees – which may have been either planted deliberately or may represent the remnants of what was once a hedge.

The effect of herbivore activity on scrub and hedgerows is potentially a very interesting facet of the wildland project. It is anticipated that scrub, particularly thorny scrub, might increase and eventually act as a 'nursery' for tree species, in line with Vera (2000). However it is also likely that hedgerows will be vulnerable to both browsing and to negative impacts caused by stock selectively walking alongside. In addition to large herbivores, rabbits are also likely to have an adverse impact on hedges, which are the site of warrens in some places. Hedges are exclusively created and maintained by people in order to delimit fields and property boundaries. Thick, well-kept hedges with a rich diversity of shrubs and standards provide ideal habitat for many bird species, including some species of conservation concern such as linnets, yellowhammers, bullfinches and song thrushes. Hedges are also perceived as

being an intrinsic part of our 'traditional' rural landscape. A lack of maintenance, together with the impacts imposed by pigs, deer, cattle, ponies and rabbits, is likely to mean that hedges across the Estate deteriorate.

If hedges expand into species-rich scrub, then there will be benefits to wildlife and any 'deterioration' would be a subjective assessment of changes to the appearance of the countryside or as a result of a loss of a cultural artefact. If a once-diverse hedge thins to form eventually a line of small trees and standards, then there would be adverse impacts to both hedge-preferring wildlife as well as perceived deterioration to the appearance of a traditional rural feature. The vegetation transects, including those surveyed in 2005 (Greenaway, 2006) and 2006 (S.2.2.1 above), together with fixed-point photography, are aimed at monitoring any changes in scrub extent and hedgerow status.

Unless any loss of intact hedgerow in one part of the Estate is compensated for by the development of a mantle of diverse scrub around woodlands or along hedgerows in other areas, those birds that rely on hedgerows for nesting, dispersal and forage may show population reductions. This, together with what may be considered by some to be a loss of a traditional landscape feature, could be cause for criticism from neighbours and other members of the public, and should be taken into account.

2.2.4. Wetland & running water.

Knepp Mill Pond and surrounding habitat:

Knepp Mill Pond itself is of considerable value as it contains 'Eutrophic Standing Freshwater' and 'Fen' communities (Chris Blandford Assoc., 2003). Both of these are Priority habitats in the UK Biodiversity Action Plan (BAP) and the Sussex BAP. The pond and its immediate surroundings have been the subject of more survey attention in the past, partly due to the need to dredge it as it is silting up. For this reason, no survey resources were expended for field work in 2005, although some voluntary moth recording was undertaken. However, the pond and its surroundings are likely to have considerably more interest regarding a number of groups of invertebrates (such as moths and molluscs) in addition to its known importance for dragonflies and damselflies. Further survey work is recommended before dredging commences. Kneppmill Pond and its immediate surroundings also have considerable importance for overwintering and wetland birds. The varied habitats afforded by this part of the Estate also provide a significant foraging and breeding resource for many other bird species.

R. Adur and tributaries:

Baseline survey work along the River Adur, Lancing Brook and tributaries was carried out partly to inform the grazing project and partly to provide a baseline prior to the re-wilding of the river canal. Wetland habitat diversity is predicted to improve following the proposed river restoration which will be to the advantage of flora and fauna. Already an SNCI because of its diverse aquatic and emergent vegetation, this part of the Estate could in time be used

as a demonstration of what river restoration and low-level grazing on floodplain grassland can achieve.

2.2.6. Species interpretation

Almost 1,000 species of plants and animals were recorded in the 2005 surveys. This is impressive, but gives no indication of the true biodiversity as many more species would undoubtedly be identified if further survey work were undertaken. Most invertebrate groups remain considerably under-recorded, with the possible exceptions of butterflies, dragon- and damselflies. A fair knowledge of amphibian and reptile diversity was achieved, although an estimation of species abundance would require further survey. The breeding bird survey provides a good baseline against which future surveys can be assessed. It will be improved still further by extending the surveys to cover the early spring period, which was not possible in 2005. A reasonable baseline of rodents (mice and voles), shrews and bats has been obtained. In order to evaluate the full impacts of grazing it would also be useful to have an estimation of rabbit population dynamics and roe deer numbers. Vascular plants are fairly well recorded although there is always room for improvement, but mosses, lichens and fungi remain poorly recorded as there were insufficient resources and it was felt that these groups were not a high priority.

The 2005 baseline surveys produced a list of 71 species of conservation interest (Greenaway, 2006). This list included species of Local and National significance, species protected under the Wildlife & Countryside Act and birds on both the Red and Amber list of Conservation Concern. Many of the 71 species were insects likely to benefit from a diverse grassland habitat, which will also benefit birds such as skylark *Alauda arvensis* (Red list) and barn owl *Tyto alba* (Amber list). However, birds such as linnet *Acanthis cannabina*, bullfinch *Pyrrhula pyrrhula*, yellowhammer *Emberiza citrinella* and marsh tit *Parus palustris* (Red list) and dunnoek *Prunella modularis*, nightingale *Luscinia megarhynchos* and willow warbler *Phylloscopus trochilus* (Amber list) require thick, diverse hedgerows and scrub in which to breed, shelter and in some cases forage. Brown hairstreak *Thecla betulae* also requires blackthorn scrub adjacent to taller trees.

Perhaps the most significant in terms of conservation importance are the rush wainscot moth *Archanara algae*, recorded adjacent to Knepp Mill Pond and female Bechstein's bats *Myotis bechsteini* recorded in Great Cockshill Wood. It is likely that there is a nursery colony in or near this woodland; the bat, its roosts and its foraging habitat are protected; further survey work should be carried out to ensure that the nursery roost area is maintained in favourable condition for this species (Greenaway & Hill, 2004). Management aimed at conserving particular taxa is not a prime objective of the wildland project, however, it would not be advisable for the estate to infringe UK or EU legislation

Without doubt, further survey effort across a wider area of the estate would have increased the species list and the list of species of conservation importance. There is prodigious scope for any number of enticing research projects concerning the relationship of any or all of these species with the more natural grazing regime envisaged.

3. Aims of Knepp monitoring strategy

Monitoring can be defined as surveillance undertaken to determine the extent of compliance with a predetermined standard or the degree of deviation from an expected norm. In the case of the Knepp grazing project, this 'norm' is the sum of the attributes, or characteristics, of the land at the point it was taken out of arable production. Surveillance will serve to monitor the deviation away from ex-arable and other biotopes at this point as a result of the implementation of the more natural grazing regime comprising low numbers of cattle, ponies, pigs and deer.

Ecological survey and monitoring will run alongside another main objective of the Knepp Wildland project – the economic necessities its maintenance. The more natural grazing regime that was initiated in 2004 will operate under constraints of UK livestock legislation and the need for an income that will be derived in part from the livestock. The stocking density and budgets for the period 2002-2021 have been produced by the Estate (Wildland Holistic Plan, 2006).

The reasons for instituting an ecological monitoring programme are thus:

- To evaluate the extent to which such a grazing regime drives landscape ecological processes on ex-arable land and evaluate the effects of a more natural grazing regime on a range of habitats including arable reversion and woodland.
- To identify and evaluate the changes in vascular plant composition as a result of the more natural grazing regime.
- To evaluate the effects of a more natural grazing regime on selected groups of fauna, identifying positive and negative impacts on biodiversity of these groups with particular reference to species of conservation interest.
- Use as case study for other projects
- To continue to inform the River Adur Restoration project, any future survey work for which will be funded separately.

Economic monitoring will be carried out by the Estate, with the following aims:

- To assess how far along the gradient towards near-naturalistic grazing can be achieved
- To achieve and maintain satisfactory income for KCE

- Use as case study for other projects

4. Monitoring recommendations

- **Repeat extended Phase I habitat survey.** This should ideally be carried out on 5-yearly intervals. The next survey should thus be in 2010. These surveys will enable long-term monitoring of changes across the whole Estate.
- **Repeat belt transect surveys in Areas A,B,C & D including additional belt transect in Area C.** Ideally, recording the vascular plant species in the original 8 transects should be repeated at 2-yearly intervals, with the next survey to take place in 2007. This would monitor changes in vegetation communities over time across the Estate as the grazing regime develops. The purpose of the additional belt transect in Area C is to focus on scrub development and tree seedling recruitment. The methodology utilised replicates that used in SWT's Butcherland project. However, the funding is limited to the extent that at the time of writing in January 2007, it seems likely that the 8 original transects will not be re-surveyed until 2010. The additional transect in Area C is less time-consuming and should be repeated in 2008 and 2010.
- **Repeat breeding bird surveys.** This should be repeated annually to enable fine-grained monitoring of any positive/negative effects caused by arable reversion and the more-natural grazing on breeding bird diversity. The diversity and performance of breeding birds will be a good indicator of habitat diversity across Knepp. The surveys of 2005 were limited in extent, but even so showed that species of more arable conditions bred in Area D, whereas Area C north of the A272 supported a more woodland suite of species. Changes are to be expected, especially in the event of the rewilding of the river corridor, but the more natural conditions projected should maintain high breeding bird diversity. If there are significant adverse impacts on species of conservation importance, decisions may have to be made to mitigate such impacts. If positive effects can be demonstrated, it will make a **very** useful contribution to public relations.
- **Repeat butterfly transect survey.** This should be repeated annually following the route set out in 2005. Fixed-point photographs at points along this route also established in 2005 should be repeated annually at the same time.
- **Extension of invertebrate survey across the south-west area of the Estate (Area D).** Monitoring changes in invertebrate diversity and biomass is an important aspect of this project. In 2005, invertebrate

data was collected from pitfall traps in Areas A & B, an ant survey in Areas A & B, wetland molluscs and Coleoptera in the River Adur corridor, butterfly transects across Areas A, B & C, a moth survey in Areas A & B plus miscellaneous records. Extending invertebrate surveys into Area D would provide more baseline information on arable-reversion land that has not been reseeded and enable more complete monitoring across the Estate. This would complement the pitfall trap data collected in 2005 and also form part of a projected investigation of Coleoptera communities dating back to mediaeval times, identifying remains extracted from silt cores from the area north of Knepp Mill pond.

There is currently (January 2007) no funding for invertebrate monitoring and therefore this is dependent on voluntary or student effort. Further invertebrate surveillance is likely to involve pitfall trap methodology, but this does produce an overwhelming quantity of material to be sorted and identified. PB proposes that invertebrate surveys could form part of a number of student projects including subjects suitable for PhDs. The particular issue of invertebrate monitoring needs to be discussed further. It has the potential to form an important component of the monitoring strategy but only if the field work and identification can be carried out and the results analysed and made available to the project in the form of either data or publications.

- **Evaluation of pig foraging and its impacts.** Monitoring the effects of pig-foraging in order to assess the extent pigs can be enabled to exhibit a near-natural herd structure and behaviour is a priority. However, a natural herd structure including the presence of a Tamworth boar may not be possible due to the anticipated high reproductive rate.

As well as the ecological importance, such monitoring can inform an assessment of the potential for income from excess piglets. Antonio Uzal (University of Bournemouth) is working on pig foraging dynamics at Knepp and a publication is in preparation.

- **Additional early season survey work along the river corridor.** The restoration of the River Adur project contributed to the 2005 survey work and will fund a further vascular plant survey in early spring 2007 to complement the high summer survey of 2005.
- **Water vole and water shrew survey** will continue as part of the duty of the Sussex Otters and Rivers Project Officer.

5. Costed programme

Costed Knepp Monitoring Programme 2006-2011 (modified & prioritised)						
Action	When	Days	Repeats	Total days	Rate (£)*	Cost
Phase1 habitat Su & mapping	2010	12	0	12	300.00	£ 3,600.00
8 Belt transect surveys	2,010	10	0	10	300.00	£ 3,000.00
1 new belt t'sect N. Hammer Pond	2007 & 2010	2	2	4	275.00	£ 1,100.00
Scrub & tree seedling recruitment	2006 2008 & 2010	2	3	6	250.00	£ 1,500.00
Spring vasc plant R.Adur	2007	3	0	3	275.00	£ 825.00
Butterfly Su & fp photography	2006 - 2010	2	5	10	200.00	£ 2,000.00
Invertebrate surveys	As opportune			<i>students</i>	0.00	£ -
Breeding bird survey	2007 - 2010	7	4	24	225.00	£ 6,000.00
Pig foraging dynamics	2006 onwards?			<i>students</i>	0.00	£ -
Water vole & water shrew surveys	2006 onwards?			<i>SORP</i>	0.00	£ -
Monitoring strat. & annual reports	2006 - 2010			22.5	200.00	£ 4,500.00
Project management	2006 - 2010			11	200.00	£ 2,200.00
Digitising maps & other peripherals	2006 - 2010			3.5	200.00	£ 700.00
Total (excl VAT)						£ 25,425.00

*Rates for repeats will increase by 2010

Annual breakdown of costs					
	2006-2007	2007-2008	2008-2009	2009-2010	2010-2011
Phase1 habitat Su & mapping					£ 3,600.00
8 Belt transect surveys					£ 3,000.00
1 new belt t'sect N. Hammer Pond		550			£ 550.00
Scrub & tree seedling recruitment	500		500		£ 500.00
Spring vasc plant R.Adur		825			
Butterfly Su & fp photography	400	400	400	400	£ 400.00
Breeding bird survey		1500	1500	1500	£ 1,500.00
Monitoring strategy & annual reports	1200	700	700	700	£ 1,200.00
Project management	800	200	200	200	£ 800.00
Digitising maps & other peripherals	200	100	100	100	£ 200.00
	£ 3,100.00	£ 4,275.00	£ 3,400.00	£ 2,900.00	£ 11,750.00

Please note that this is an **estimated** amount for the repeated surveillance and some of the project management costs. It is open to discussion, and is likely to change as priorities, funding and other resources permit or dictate. A case could be made to monitor other groups:

- moths
- bats
- cattle foraging & habitat utilisation by means of radio collars.
- impact on woodland ground flora (bluebells)etc.
- soil nutrient status, changes over time
- invertebrates & lichens of parkland trees

Should additional funds be available, then the monitoring programme will be extended accordingly. On the other hand, if funds do not meet the above estimated costing, then the monitoring programme will have to be curtailed.

6. Funding

The ideal situation would be to confirm a five-year funding plan with an integrated strategy to extend this to 2020/21 in line with the Wildland Holistic Plan – Stocking Density and Budgets (KCE 2006). Planning a realistic monitoring programme with no idea of the availability of future funding can mean that the resultant programme is either too cautious or far too optimistic. To date, English Nature, Sussex Wildlife Trust and Knepp Estate itself have made significant contributions in terms of time and money, with smaller financial contributions from Sussex Otters and Rivers Project. Valuable time and effort has been put into the Knepp project by many others.

By December 2006 it had become clear that funding for monitoring was likely to be extremely limited. English Nature, prior to its renaissance as Natural England, funded additional survey work in 2006. As things stand in January 2007, all future survey work, plus project management, reports and so on, will need to be within what the Knepp Estate itself is able to fund. Priority will therefore be given to those groups likely to fluctuate very widely in response to environmental change, such as breeding birds, and to those where we simply cannot predict the likely scale of change – for example, the rate of vegetation change along selected transects or other specific points.

7. Discussion

The Knepp grazing project is envisaged as a long-term change in land use and management. It has excited the interest of those in a number of disciplines both in the UK and mainland Europe. Many experts have given their time, advice and support, and many have carried out both commissioned and voluntary field survey work. However, switching from arable to more natural grazing presents problems as well as benefits, and one of the difficulties is that there is little precedent for such schemes in lowland England. How many animals should be the aim? What are the targets and how will we know when we have reached – or failed to reach – them? Will legislation concerned with the production of cattle and pigs for human consumption have a significant impact on the more natural grazing objectives? Will a more natural grazing regime be compatible with the need to make a realistic income from the Estate? Will there be changes in biodiversity that can be classed as increases or will present species of conservation interest decline? Will adjacent neighbours support the project? Will it matter if

they do not? Will there be sufficient funding to ensure the monitoring continues for 5, 10, 10+ years?

To address the economic needs of the estate and to answer some of these questions, at the time (October 2006) of drafting this report, the draft of the Knepp Wildland Holistic Plan – Stocking density and Budgets (Sept 2006) had just been produced. The area of land in the project, some 250ha in 2002/3, has now risen to c.450ha and is projected to rise to c.1,200ha by 2013/14. According to stocking density turnover predictions, this gives 0.19 livestock units per ha in 2006/7 rising steadily to 0.34 in 2017/18 and remaining at this level thereafter.

In 2005, the Knepp Estate consisted of 76% grasslands, 15% woodlands, 1% scrub, 2% wetlands/open water and 6% remaining in arable. The habitat survey is projected to be repeated in 2010, and the results should be extremely interesting. In the interim, predictions can be made regarding vegetation changes by repeating surveys of contiguous quadrats of the belt transects. With no specific habitat-mix as a target, how changes driven by the proposed stocking densities (KCE September 2006) differ from the baseline vegetation will make a useful contribution to our knowledge on the impacts of more natural grazing. It could however be useful to model a number of scenarios and medium-term outcomes – if for no other reason than to ensure that all involved in the scheme are fully aware of the possible outcomes, what the landscape might look like and the predicted impacts of each possible outcome on biodiversity, public opinion and KCE economic prosperity.

The Knepp project provides an extremely valuable opportunity to study more natural grazing from a variety of perspectives. As more natural processes are being used to drive ecological changes, it is anticipated that these changes could be very gradual – for instance a diverse mantle of scrub could take an unknown number of years to develop between what was once arable land and managed plantation woodland. Meanwhile, hedges may become over-browsed and gappy. Livestock will have seasonal preferences and may not always behave predictably. The information derived from this Wildland project will be very valuable to other projects – conservation grazing, protected landscape management, organic farming, landscape ecology and so on, but the information will not be of full use unless a long-term, scientifically robust monitoring programme is carried out and the results fully evaluated and interpreted.

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