

APPENDIX 4

Offsite Habitat Creation and Monitoring Plan

Luxus Homes



ECOLOGYSOLUTIONS

Part of the ES Group

Land at Dowsetts Farm,
Ware

(Associated with
Land at Pines Hill,
Stansted Mountfitchet)

**Off-site Habitat Creation
And Management Plan
(OHCMP)**

March 2023
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1. INTRODUCTION

Background & Proposals

- 1.1.1 Ecology Solutions Ltd were instructed by Luxus Homes in February 2023 to assist with the Off-site Habitat Creation and Management Plan (OHCMP) for the site known as 'Land at Pines Hill, Stansted Mountfitchet', hereafter referred to as the 'application site'. The application site is located on the western side of Stansted Mountfitchet, Essex.
- 1.1.2 The proposals for the application site will see the loss of habitat in order to facilitate the development of new housing, associated infrastructure and landscaping.
- 1.1.3 In order to mitigate these losses of habitats and to ensure a measurable Biodiversity Net Gain (BNG) can be delivered, approximately 2.42ha of off-site land has been identified which would be suitable for the creation of high-value ecological habitats. This off-site land is hereafter referred to as the 'mitigation site'.
- 1.1.4 The mitigation site consists entirely of agricultural grassland, and is bordered by arable field margins and further existing arable land. Beyond these are hedgerows and streams. The mitigation site is located to the north of Ware, Hertfordshire, with a location plan included at Appendix 1.
- 1.1.5 Importantly for the purposes of the BNG offsetting exercise it should be noted that both the application site and mitigation site lie within the same National Character (NCA), NCA 86 - South Suffolk and North Essex Clayland. As set out in the BNG User Guidance¹, off-site habitat provision can be undertaken at a distance from the development site. In order to encourage offsetting within a reasonable radius of the 'impact site', however, off-site habitat creation is penalised if it is deemed to be too far from this location. The 'spatial risk multipliers' are applied based on local planning authority area, National Character Area or Marine Plan Area for intertidal habitats. Table 5-7 of this guidance states that for "compensation inside LPA or NCA of impact site" the multiplier is 1 (ie. unpenalised).
- 1.1.6 The purpose of this OHCMP is to outline high-level habitat creation principles and long-term management that would need to be undertaken at the off-site mitigation land in order to ensure that measurable net gains to biodiversity can be delivered, when considered in combination with the impacts at the main development site.

¹ STEPHEN PANKS A, NICK WHITE A, AMANDA NEWSOME A, MUNGO NASH A, JACK POTTER A, MATT HEYDON A, EDWARD MAYHEW A, MARIA ALVAREZ A, TRUDY RUSSELL A, CLARE CASHON A, FINN GODDARD A, SARAH J. SCOTT B, MAX HEAVER C, SARAH H. SCOTT C, JO TREWEEK D, BILL BUTCHER E AND DAVE STONE A 2022. Biodiversity metric 3.1: Auditing and accounting for biodiversity – User Guide. Natural England

Structure

1.1.7 The contents of this document have been written with reference to published guidance from the Chartered Institute of Ecology and Environmental Management (CIEEM) and with regards to guidance produced by Natural England and Defra in regard to BNG.

1.1.8 The OHCMP is set out as follows:

- Mitigation site baseline;
- Management objectives;
- Monitoring and management responsibilities;
- Biodiversity Net Gain Assessment;
- Results; and,
- Work Programme.

2. MITIGATION SITE BASELINE

- 2.1. The mitigation site was subject to baseline ecological survey work during February 2023. The site was surveyed based around a combination of extended Phase 1 survey methodology and UK Habitat Classification (UKHab) methodology as recommended by Natural England and Defra, whereby the habitat types present are identified and mapped together with an assessment of the general species composition of each habitat recorded at the time. This technique provides an inventory of the basic habitat types present.
- 2.2. Although outside the optimal botanical survey season, given the nature of the site it is considered that reliable habitat assessment was still possible.

Results

- 2.3. The mitigation site measures approximately 2.42 ha and consists of the southern part of a large agricultural field. The mitigation site is bordered to the north by further existing arable land, while to the east, south and west lie arable field margins beyond which are tree lines and a stream to the south.
- 2.4. In order to allow for BNG analysis, all onsite habitats have been assigned a 'best fit' UKHab category.
- 2.5. The following main habitat / vegetation types were identified during the survey work:
- Non-cereal Crop
 - Arable field margins
- 2.6. The location of these habitats is shown on Plan ECO1. A full description is provided below.

Non-cereal Crop

- 2.7. All land within the mitigation site currently comprises agricultural grassland, otherwise classified as non-cereal crop. This is currently dominated by dense Perennial Rye-grass *Lolium perenne* cover.
- 2.8. Physically, the site is open and slopes gently to the south.
- 2.9. The sward itself is uniform in length and relatively featureless. Vegetation coverage is homogenous and there are no significant areas of bare ground or any other 'micro-habitats'.

Arable field margins

- 2.10. The southern and eastern boundaries of the field contain established field margins (measuring approximately 10m at their widest point).

- 2.11. They appear to have been subject to less intense management and over-seeding, and likely have remained in place even when the entire field was used for crop production. As such, they have more species variety compared to the main grassland sward, albeit still remain suppressed and dominated by few grass species including Perennial Rye-grass, Cock's-foot *Dactylus glomerata*, Timothy *Phleum pratense*, Common Nettle *Urtica dioica*, White Clover *Trifolium repens* and Broad-leaved Dock *Rumex obtusifolius*.

3. MANAGEMENT OBJECTIVES

- 3.1. The aims and objectives of this OHCMP are to outline the methodology of habitat creation and long-term management that will create new ecological opportunities within the mitigation site, bolstering it well above that of its current level.
- 3.2. The anticipated timescales of delivery and management responsibilities are also outlined within this document.
- 3.3. The following objectives have been identified:
 - Objective 1: Maintain and enhance newly created habitats within the mitigation site; and,
 - Objective 2: Increase biodiversity by maximising opportunities for flora and fauna.
- 3.4. Appropriate management options for achieving these objectives are set out below.

Objective 1: Maintain and Enhance Newly Created Habitats Within the Site

Overview

- 3.5. The purpose of the habitat proposals will be to create large and continuous areas of high biodiversity value habitats within the identified mitigation site.
- 3.6. Owing to the location and topography of the mitigation site the creation of a species-rich meadow grassland is anticipated to be the most suitable option for the site as well as being complementary with the surrounding areas.
- 3.7. Details of both the initial creation programme as well as longer-term management for the mitigation site are outlined below. Whilst it is anticipated that the measures set out within this document will be the primary method of delivery, it is noted that there remains flexibility on the exact and final specifics of any off-site mitigation plan. Notwithstanding this, based on the information held to date, it is considered that all the measures set out within this document remain both appropriate for the site, as well as entirely deliverable.

Species-rich wildflower grassland overview

- 3.8. The entirety of the site will be used to create a large and continuous area of species-rich meadow grassland (approximately 2.42ha).
- 3.9. These habitats will include a diverse and native species mix which will be of benefit to a range of faunal species, particularly foraging birds and invertebrates, in addition to being of intrinsic ecological value in its own right.
- 3.10. The distinction of grassland type has been identified based on the suitability of existing conditions on site and seeks to create a grassland mosaic which is structurally, botanically and genetically diverse, with local colonisation also to be encouraged and aided.
- 3.11. In order to assist with the creation of the target grassland, the mitigation land will first be prepared for seeding through a nutrient stripping exercise.
- 3.12. Furthermore, to create a species-rich seed mix suited to the local area, the primary creation exercise will look to utilise a locally sourced seed mix. Subject to consultation with the relevant landowners, this could be obtained through methods such as brush-harvesting of seedbanks and / or collection and dispersal of 'green hay'. Instructions relating to this method are included at Appendix 2.
- 3.13. Suitable nearby sites with target botanical characteristics that would be considered appropriate for the provision of the donor seed material include (but are not limited to) Moor Hill Meadow Site of Special Scientific Interest (SSSI) and Hunsdon Mead SSSI.
- 3.14. In addition to this, an appropriate commercial species-rich seed mix could also be used (E.g. *Emorsgate Standard General Purpose Meadow Mixture EM2* / *Emorsgate Special Purpose Meadow Mixture EM3*) to further bolster the donor seed-mix, or replace it if one could not be sourced. This mix will include Yellow

Rattle *Rhinanthus minor*, a hemi-parasite of grass species, to ensure that a proper grassland meadow can establish.

- 3.15. Following the establishment of the grassland, longer-term management will seek to reduce soil fertility over time to encourage a botanically diverse and balanced sward.
- 3.16. The initial creation and longer-term management prescriptions envisaged for the site are outlined in more detail below.

Nutrient stripping (Year 0)

- 3.17. Prior to the sowing of the new grassland habitat, it is considered that the mitigation site would benefit from a nutrient stripping exercise in order to create a more optimal growing medium for the target grassland.

Option 1

- 3.18. Due to the nature of the current arable land and the dominance of undesirable agricultural grass species, at this stage it is considered that nutrient stripping would be best achieved through a total removal of the current vegetation through heavy cuts following by deep ploughing (inversion ploughing). This would invert the typically enriched arable topsoil with the nutrient poor subsoils.
- 3.19. This process would help create a bare and nutrient poor growing medium, suitable for the establishment of a species-rich grassland.
- 3.20. In the event that there is any time lapse between the deep plough exercise and grassland seeding the fields should be kept free of any vegetation growth (arable weeds etc.) prior to sowing. This can be accomplished through repeated shallow ploughing and / or spraying, through the sensitive use of glyphosate-based chemicals.

Option 2

- 3.21. At this stage and given the history of the site, Option 1 is considered the most appropriate and effective methodology in terms of ground preparation.
- 3.22. Notwithstanding this, in the event further assessment work identifies the need for an alternative and more sensitive strategy, the site could instead be prepared through a heavy scarification exercise, following repeated heavy hay cuts (with all arisings removed from site). This would also reduce the nutrient load of the sward as well as create areas of bare ground suitable for sowing.

Creation / Sowing (Year 0/1)

- 3.23. Following suitable site preparation (outlined above), the field would be sown with the identified target seed-mix.
- 3.24. The seed mix mixture would be sown at a rate of 4g/m² (or equivalent for green hay).
- 3.25. All sown seeds should be sown during the Autumn ideally, but early-Spring is also acceptable. All sown seeds should be sown on bare and lightly-disturbed

ground. The seeds should be rolled following sowing to ensure good contact with the soil.

Establishment (Years 1/2)

- 3.26. Management of the grassland swards in the first years will involve regular maintenance in order to ensure that seedling development is successful, and that the growth of competitive weed species is controlled. Where required, weeding will be undertaken by hand. Cuttings should be removed immediately from site. For the first few years, it may be necessary to re-seed areas of wildflower grassland in order to ensure that a sufficient, self-sustainable seed-bank can develop.
- 3.27. Following sowing, the swards will be kept short (for approx. 6 months) such that light can help germination. Swards should be cut three times in the first two years; once each in March, May and September.

Medium to long term management (Year 3+)

- 3.28. Once the perennial meadow has established, it will need to be subject to traditional hay meadow management. Assuming that this will be purely through mechanical means (i.e. cutting using a mower), it should be subject to (up to) three cuts per year.
- 3.29. The first cut should be undertaken during early-Spring (March) to a height of approximately 70mm, and arisings should be removed from site. The grassland will then need to be left alone to grow during the main flowering season between March – August.
- 3.30. The second cut should involve a heavy main summer 'hay' cut, undertaken during August, after flowering. Grassland should be cut to a height of 70mm and all arisings should be left on site for a period of between 5 – 7 days (to allow seeds to drop). After this point, all arisings should be collected and removed.
- 3.31. If required, a third cut can then be considered during winter (November – January) to suppress any undesirable re-growth and to mimic natural grazing.
- 3.32. To provide year round structural diversity and sheltering opportunities, field margins should be left-uncut / cut on a two-year cycle.

Grassland Conclusion

- 3.33. The implementation of new seeding and an appropriate management regime within the grassland, as set out above, would greatly increase the ecological interest of these habitats, well beyond that of the current baseline value.

Objective 2: Increase Biodiversity by Maximising Opportunities for Flora and Fauna.

- 3.34. The targeted habitat creation and the introduction of a management regime to be provided will ensure that a botanically diverse grassland will remain present within the site post-completion. This will be of benefit to several species / groups.
- 3.35. Primarily, this will benefit bird, bat and invertebrate species through enhanced foraging / resting opportunities via diversification of the grassland, which will not only be a resource in its own right, but also increase prey availability, primarily for insectivores.
- 3.36. Additionally, through the safeguarding of the site (for a period of 30-years minimum), it will act as a 'wildlife corridor', connecting other high value habitats in the wider area, thereby increasing dispersal opportunities.
- 3.37. Whilst the site is currently considered sub-optimal to other species groups, such as amphibians, Badgers, reptiles etc., should they be present in the wider area, it is expected that they will also benefit from the proposed habitat management measures for the site.

Management Considerations

- 3.38. All initial creation and longer-term management proposed for the site will be mindful of protected species constraints and relevant wildlife legislation. If required, this will be guided by the results of future assessment work. In any event, considering the proposals strictly relate to beneficial wildlife habitat creation, there is considered to be ample scope to optimise final design to ensure all works remain legally compliant.

4. MONITORING AND MANAGEMENT RESPONSIBILITIES

Personnel Responsibility for Implementation of the Plan

- 4.1. Responsibility for implementation of this OHCMP, as well as for its continuation throughout a 30-year minimum period, will be placed with the land owner who will ensure that management undertaken at the site complies with the prescriptions as set out in this document (or future update documents) in order to ensure proper establishment and long-term condition.
- 4.2. Where required, Ecology Solutions or another suitably qualified ecologist, will be able to advise on any specific questions or queries in regard to any issues concerning ecology or nature conservation which may arise.

Monitoring and Remedial / Contingency Measures triggered by Monitoring

- 4.3. In order to assess the effectiveness of habitat creation, establishment and the 'conditions' of habitats post-development, specific ecological monitoring surveys are proposed. It is proposed that these habitat surveys are undertaken in the following years (post-creation): 1, 3, 5, 10, 15, 25 and, 30.
- 4.4. Habitat monitoring will be based around a combination of extended Phase 1 survey methodology and UK Habitat Classification (UKHab) methodology, as recommended by Natural England and Defra, to allow for the condition assessment of respective habitats.
- 4.5. Based on the results of the programmed survey works, updated management reports outlining any optimisation (if required) to on-going management can be produced. These reports would be issued to the land owner (ie. to provide remedial advice to ensure habitat targets are met), and to the relevant planning authority at agreed pre-determined intervals, the requirements of which will be agreed in a suitably worded legal obligation.
- 4.6. Outside of the formal review process outlined above, it is considered that any ad hoc or additional monitoring and remedial works be undertaken on an 'as required' basis and do not need to be undertaken by a qualified ecologist and could instead be undertaken by the Management Body employed to undertake the duties prescribed elsewhere in the OHCMP. These works will primarily highlight any immediate site-specific problems that may need addressing (such as disease or damage to flora or the presence of invasive species).

5. BIODIVERSITY NET GAIN ASSESSMENT

- 5.1. Based on the recorded baseline of the site, as well as the proposed habitat creation and management measures, a full Biodiversity Net Gain (BNG) assessment using the Defra BNG Metric (Version 3.1) has been applied to the mitigation site.
- 5.2. Any generated units will then be assigned to the main development site, in order to mitigate any residual impacts of the proposed development and additionally ensure that an overall BNG can be provided when considering both sites.

Methodology

- 5.3. The methodology for undertaking the BNG assessment is based on the guidance provided within the Technical Supplement and User Guide published by Defra, in addition to the application of professional judgement.
- 5.4. The Metric works by assigning credits to the habitats located within the Development Site (both baseline and post-development). These credits are then used as a proxy to determine the ecological value of the site.
- 5.5. The respective credit score of each habitat is gauged by calculating key parameters that influence that habitats reported value. These are as follow:
 - Habitat type / distinctiveness;
 - Habitat area;
 - Habitat condition; and,
 - Strategic significance.
- 5.6. For either created or enhanced habitats, the additional main parameters are applied;
 - Habitat target type / distinctiveness;
 - Habitat target condition;
 - Time till target condition; and,
 - Difficulty of creation / enhancement.
- 5.7. The value for hedgerow / treeline habitats and ditch / watercourse habitats are calculated separately, however follow a similar working methodology as those described for area-based habitats above
- 5.8. The recorded baseline and development proposals for the site have been assessed against the above identified parameters and most recent Condition Assessment Criteria (CAC) provided by Defra.
- 5.9. In order to account for the use of UK Habitat Classification system (UKHab) within the Metric, a 'best fit' approach has been taken in order to ensure the most representative Phase-1 habitat type is being utilised for both the baseline and post-development habitats within the Metric. This has been determined using the technical supplements provided within the Metric in addition to guidance published by the UK Habitat Classification Working Group.

6. Results

- 6.1. In line with the above methodology, a BNG assessment using the most recent version of the Defra Metric (v3.1) has been undertaken. The baseline of the mitigation site is described in detail in Section 2 and shown graphically at Plan ECO1, the proposed habitat creation / management measures are described in Section 3, and shown graphically at Plan ECO2.

Strategic / Spatial Significance

- 6.2. The mitigation site has not been identified as being located within areas of strategic or spatial significance. It does lie within land designated as “Rural Area Beyond the Green Belt” within the East Herts District Plan, however this is primarily of relevance to small-scale development and minimising the expansion of village footprints within the area, and is not considered to denote the ecological significance of the site. Whilst not specifically identified as being high spatial significance, the enhancement proposed for the site will perform functions at the landscape scale including facilitating connectivity and improving the seedbank, thereby aiding colonisation of nearby areas with species of benefit to local wildlife.

Area Based Habitats

Baseline Habitat	Baseline Habitat Condition	Baseline area (ha)	Post-development impacts (ha)			Summary Baseline Condition Notes (see Section 2 for detailed notes)
			Enhanced	Lost	Retained	
Non-cereal crops	<i>Condition assessment N/A</i>	1.4355	0	1.4355	0	Seeded agricultural / temporary grassland. Very low species diversity and dominated by few grass species (>95% Perennial Rye-grass). Uniform sward, regularly managed / cut. Absence of micro-habitats. Condition assessment is not considered relevant for this habitat type, effectively a condition of low is applied by default.
Arable field margins cultivated annually	<i>Condition assessment N/A</i>	0.9926	0	0.9926	0	Field margins, containing more variation compared to the interior of the field, however species density is still very low and characterised by dominating / typical agricultural grass species. Condition assessment is not considered relevant for this habitat type, effectively a condition of low is applied by default.

Table 1. Baseline (area) habitats.

Habitat Type	Area (Ha)	Target Condition	Target Condition Notes (see Section 3 for detailed notes)
Other Neutral Grassland	2.4281	<i>Moderate</i>	<p>Created species-rich grassland, utilising suitable seed mix / source of local origin, where possible. Site to be prepared prior to sowing with appropriate nutrient stripping measures.</p> <p>Initial management will ensure proper establishment, encouraging both botanical and structural diversity.</p> <p>Long-term management to include traditional hay meadow management through ecologically timed cutting regime.</p> <p>Monitoring of site will be undertaken to ensure target habitat type and condition are met, with any optimisation to management undertaken based on site condition and results.</p> <p>With these measures it is considered that the grassland will support a range of wildflower and herb species throughout its sward, that bracken, invasive species and physical damage will be absent, and that an appropriate proportion of bare ground can be maintained (1% - 5%). It is possible that the sward structure may not always achieve the required diversity and therefore on a precautionary basis an overall condition of moderate has been selected.</p>

Table 2. Created (area) habitats.

Results Summary (mitigation site only)

- 6.3. The Biodiversity Metric returns the following headlines results for the mitigation site:

BNG Baseline and Post-development Scenarios		
Baseline	Area	Units
Non-cereal crops	1.4355	2.87
Arable field margins cultivated annually	0.9926	3.97
Post-development results	Area	Units
Other Neutral Grassland	2.4281	16.26
Unit change	+9.42	

Table 3. BNG Results (mitigation site)

- 6.4. The proposals for the Dowsetts Farm mitigation site will deliver a net gain of 9.42 habitat (area) units.

Relationship with Main Development Site

- 6.5. These 9.42 units will be used to offset the BNG shortfall associated with the application site (Land at Pines Hill, Stansted Mountfitchet).
- 6.6. In fact, this number of units significantly exceeds the on-site change and so will deliver an uplift in units far in excess of 10% and ensure that significant net gains to biodiversity can be delivered as part of the development proposals.

7. WORK PROGRAMME (MITIGATION LAND ONLY)

Objective	Receptor	Management Prescription and Commencement	Timing, Frequency and Duration of Works	Extent of Works / Objective
<p>MAINTAIN AND ENHANCE RETAINED AND CREATED HABITATS</p>	<p>Species-rich Wildflower Grassland</p>	<p>Ground preparation/Creation/Establishment</p> <p>Years 0 - 2</p>	<p>Ground preparation step-wise cutting regime and inversion ploughing / or managing and scarification of grassland followed by sowing of suitable species-rich seed mix, during Autumn / Spring.</p> <p>First cut of grassland to take place mid-Summer followed by second cut in mid-Autumn.</p>	<p>To allow successful sward establishment</p>
		<p>Long-term management</p> <p>Year 3+</p>	<p>Once meadow is established, grassland will be subject to ecological management. Cuts will be undertaken during Spring (early), Summer 'hay cut' and Autumn/Winter (if required)</p>	<p>To achieve a varied sward.</p>




PLANS

PLAN ECO1

Mitigation Site Baseline



KEY:

-  SITE BOUNDARY
-  NON-CEREAL CROP
-  ARABLE FIELD MARGIN



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10486: PINES HILL
STANSTED MOUNTFITCHET

PLAN ECO1:
MITIGATION SITE
BASELINE



Rev: A
Mar 2023

PLAN ECO2

Proposed Habitat Creation



KEY:

-  SITE BOUNDARY
-  WILDFLOWER GRASSLAND



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10486: PINES HILL
STANSTED MOUNTFITCHET

PLAN ECO2:
PROPOSED HABITAT
CREATION

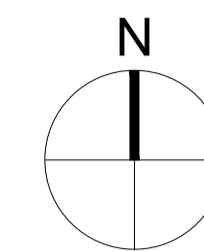
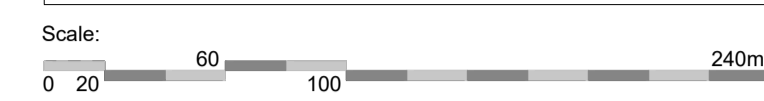
Rev: A
Mar 2023

APPENDICES

APPENDIX 1

Off-site Offsetting Land Location Plan

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 All aspects of the architectural design concerning fire performance / fire safety (whether or not illustrated / annotated) are to be considered as 'For Approval' only, irrespective of the drawing status / suitability.



Land adjacent to Litchfield Farm, Morley Lane, Standon,
 Hertfordshire, SG11 1QZ
 TL 39648 20685

Key
 Proposed location of off-site land for BNG provision

Revision Note & Date			
Rev	Date	Note	
			Amended Checked

ON
ARCH
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URE

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Project Title
Land at Pines Hill
Stansted Mountfitchet
 Client Details
LUXUS Homes

Drawing Title
Site Location Plan (Off-Site BNG Land)

BIM Number			
Scale	Date	Drawn	Checked
1:2500@A1	Feb 2023	SH	JR

Drawing Status
Planning

Project No.	Drawing No.	Status	Revision
002.21	002	-	PO

APPENDIX 2

Brush-Harvested seed collection methodology

Restoring species-rich grassland using brush-harvested seed

Brush-harvested seed taken from a species-rich donor site and spread on a species-poor recipient site is another method of restoring and recreating wild flower grasslands. Good seed sources need to be found and swept for seed throughout the growing season so that early and late flowering plants can be collected. Ask local conservation organisations if they have any brush-harvested seed from a suitable donor site that you may use. It can be a relatively cheap method compared with buying seed mixtures, but the availability of brush-harvested seed may be limited.

Site preparation

- All wildflowers have a range of environmental limits. If soil nutrients, or pH or water levels differ between the donor and recipient, this may affect the germination and spread of the plants. Undertaking soil nutrient tests is a good method to find out whether the land falls within the expected range of tolerance of most plants. If the environmental limits are exceeded, then seeds may not germinate, so it is



important to research the current conditions. If the current conditions are not suitable for restoration, go to the information about stripping soil nutrients or consider wildflowers that can tolerate slightly more fertile conditions.

- Identification of a suitable donor site is important. The donor and recipient sites should have a similar pH, soil texture and moisture. There may be limited germination if seed harvested from calcareous grassland is spread onto acidic soil, for example.
- The future management of the recipient sites needs to be planned before undertaking the restoration. Appropriate fencing, access and water troughs may need to be installed prior to restoration or recreation, if future plans involve livestock grazing. If the site lacks specific minerals essential for livestock, these could be made available using supplements (such as mineral licks).
- Control problem weeds such as docks, thistles and nettles, either by hand-pulling, or spot-spraying (seek advice on suitable products and do not use alongside waterways). It may take more than one year to control these plants and should to be done with enough time for to be effective. Using herbicides after restoration will also kill wildflowers and grasses. The recipient site is not suitable if it has a high weed problem and an alternative site should be chosen.
- Create a short vegetation sward in the recipient field during the preceding autumn and spring, before restoration. The objective is to create bare ground - at least 50% - as all wildflower and grass seed need to touch bare soil. They also require a low level of competition with any vegetation already present to be able to germinate and survive.
- If your recipient site is a grassland, create 50-75% bare ground in July to August, or in March, by:
 - allowing livestock (ponies, cattle and sheep) to graze the recipient field, reducing vegetation growth. The recipient site should not be poached by livestock hooves. Poaching (or pugging) is where cattle, ponies and sheep leave pock-marks with their hooves in grassland, particularly after wet weather, on clay soils with poor drainage. This denudes large areas of any vegetation and can cause damage, particularly compaction. It can also increase weeds such as docks. Livestock should be removed from the field if there is very wet weather or if poaching in gateways or along fence lines starts to become apparent.
 - livestock grazing can be by pulse grazing (increasing, and then decreasing, the number of livestock for a short period of time) or by extensive grazing (a lower number of livestock are allowed to graze for a longer period) to reduce the vegetation cover and create bare ground. This is not an exact science, and livestock should be removed if they start to cause damage or there is not enough fodder. Alternatively, animals could be added to increase the amount of grazing and creation of bare ground.
 - do not supplementary feed livestock (giving them additional hay or silage on top of the vegetation growing in the field).
 - additionally or alternatively, scarify the field using a disc and/or chain harrow. Tine harrows can also be used to remove grass thatch.
 - a combination of livestock grazing and mechanical management is useful in the first instance to create bare ground.



Brush-harvester

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- If your recipient site is an arable field, create bare ground in early July by:
 - cultivating the field but not sowing a crop - leave the ground bare.
 - do not fertilise the land, as wildflowers and grasses want low nutrient levels compared with arable crops.
 - there is no need to graze the recipient site as the bare ground is created through cultivation.
- If the creation of bare ground has loosened large clods of earth then it may be useful to roll the land to flatten it. This will ensure that the seeds are not buried under the clods once the brush-harvested seed has been spread and flattened.
- If there are historical features on your land, consult with the relevant authority on your proposed works, as soil disturbance to create bare ground can be damaging to buried archaeological features.
- Creating bare ground may stimulate problem weeds to grow such as thistles, docks and ragwort which may need controlling. It can also cause soil erosion.

Active restoration / recreation

- Brush-harvested seed should preferably be spread between late-July and early-September, as this is the time when most grassland plants shed seed, or in the spring (March-April):
 - for larger recipient fields, a modified seed hopper could be used to scatter the seeds. It needs to be modified with additional agitators, as brush-harvested seed tends to contain large amounts of extra material such as stalks and leaves termed 'chaff', which can clog up the machine.
 - alternatively, seed can be spread by hand. Seed should be mixed with dry sand or another type of inert biodegradable material to bulk it out, and should be a contrasting colour

with the soil to show where the seed has been spread. The seed should be scattered evenly by hand using a line of people walking in a row across the recipient field. A second scatter at a right angle to the first could be undertaken if there is enough un-spread material at the end of the first scatter. Or, if there are patches of the field which do not look like they have received much material, scatter more seed in these specific locations.

- a ratio of 1:1 to 1:3 should be used for donor site collected seed to spreading seed on the recipient site (ask the suppliers of the brush-harvested seed how much they collected from a hectare of land and divide this by a scaling factor for the amount that should be spread per hectare). Or, around 10-40 kg of brush-harvested seed is spread per hectare. The amount varies depending on how much chaff there is in the seed mixture. A higher ratio/weight of brush-harvested seed is required if there is a lot of chaff in the mixture. Discuss this with the seed supplier and ask how much they recommend spreading per area.
- seed should be scattered on the surface and not drilled into the soil like a crop. This replicates natural processes.
- The brush-harvested seed needs to be put in contact with the soil to germinate. This can either be done by rolling the recipient field straight after the seed has been spread, or by putting out livestock, particularly cattle.
- Following a July-September sowing, vegetation growth should be restricted in the autumn of the first year, to reduce any competition for germinating seeds. This is particularly important in recipient fields that were already under grass as clump-forming grasses, including cock's-foot and Yorkshire fog, can be very competitive and cover newly germinating seeds. Either

livestock, particularly cattle or ponies, can be put into the field to eat the grasses if they are getting high, or an extra cut can be undertaken in late autumn. Neither grazing nor cutting should be undertaken if this will cause ground problems, for example, in wet fields that may be prone to livestock poaching or compaction by heavy machinery.

- Following a March-April sowing, any livestock used to push the seeds into the soil should be taken out of the recipient field. The field should then be 'shut-up' for the growing season and managed as a hay meadow described below.

Post-restoration/-recreation management

- Most grassland wildflowers are perennial. Seeds germinating in the first year of restoration may only form a rosette of leaves and not flower. These plants will bloom from the second year onwards. The exception to this is yellow rattle, which is an annual flower and a hemi-parasite of grasses. It helps reduce the number and vigour of grasses and is a beneficial plant in grassland restoration and recreation.
- If there is a good amount of vegetation growth over the winter, put a low number of livestock back onto the recipient site in the first year following restoration. The objective is just to reduce the vegetation and not to create bare ground. Be careful that the livestock do not nibble young shoots of yellow rattle; they should be removed if this starts to happen.
- During the flowering season of April to July in the first year, do not graze the donor and recipient fields - this will allow flowers to bloom, particularly yellow rattle. This is called 'shutting-up' the fields.
- From mid-July / August onwards take a hay cut from the recipient grassland. Cutting the vegetation too early will

remove any yellow rattle that has germinated and grown before it has had a chance to set seed. Hay making is traditionally undertaken by mowing the field and leaving the cut vegetation to dry. It should be turned at least once a day to aid this process, and loosen seeds allowing them to drop out of the hay. The hay is then baled and taken away to use as fodder over the winter.

- Leaving wide margins uncut around the edge of the fields will provide nectar and pollen for pollinators (bees, hoverflies, beetles, wasps etc.) over the summer and early autumn. Also, cutting hay across the field, or from the centre outwards, allows insects and animals to escape; cutting around the outside of the field first can trap wildlife in the uncut field centre.
- Once the grass has started to re-sprout, it should be grazed by livestock. This is termed aftermath grazing and helps to control the grasses that can be more vigorous than wildflowers.

- If pasture management is desired, the recipient field should be shut-up between April and July/August, followed by livestock grazing into the autumn.
- Livestock should be removed in the autumn if the fields become wet to prevent poaching the ground. An early spring graze could be undertaken if there has been grass growth over the winter period but livestock should be removed for the 'shut' period to allow wildflowers to grow and bloom.

Brush-harvested seed is an excellent method of preserving the local identity of wildflower grasslands and is also an effective technique of enhancing the wildflowers in a species-poor field. It can be a relatively cheap method compared with buying a seed mixture and, if several sweeps of the donor field are made throughout the flowering season, there is the opportunity to collect seeds from early, mid and late flowering plants.



Restoring species-rich grasslands using brush-harvested seed timeline

