

Arable reversion to species-rich grassland: site selection and choice of methods

The reversion of arable land to permanent grassland is a major work area funded through Environmental Stewardship. There are a number of reasons why arable land is reverted to grassland. This note focuses on the creation of species-rich grassland, that is, grassland comprising species characteristic of semi-natural grassland communities, in particular wild flowers. Other notes provide guidance on establishing a species-rich sown sward and the early management of a species-rich sward.

Key points

- Sites must be carefully selected to ensure that their reversion to grassland delivers environmental benefits.
- Knowledge of soil type, pH and nutrient status is essential.
- Reverted swards can be very different from conventional grass leys. Productivity may be affected and the impact on the existing farming system must be considered.
- Areas of existing semi-natural habitat can be linked, creating larger, more coherent blocks. This can help species adapt to climate change
- Additional grazing can be provided which may aid the management of other habitats, for example by allowing stocking rates to be reduced, or by making grazing of small areas of semi-natural grassland more viable.

Why revert arable land?

Arable reversion can have a number of environmental benefits including ecological, landscape, archaeological and resource protection benefits.

Ecological benefits

- It may provide opportunities for the re-creation of species-rich grassland and other valuable habitats such as wetland and heath.
- Habitats can be created to benefit specific species, such as wet grassland for wading birds and wildfowl.
- It can provide a buffer from fertiliser run-off and sprays, for example alongside Sites of Special Scientific Interest (SSSIs), rivers and other important wildlife areas.



Yellow-wort in re-created chalk grassland

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Landscape benefits

- Arable reversion can be used to unify fragmented areas of permanent grassland in open downland or hill farmland landscapes.
- An arable/grassland balance can be restored in mixed farming landscapes in small to medium sized fields.
- The lush pastoral landscape character of lowland valley landscapes can be reinforced.
- The view from a public view point can be improved, for example by reverting a highly visible field on an open hillside that perhaps contains a copse or several field trees.

Archaeological benefits

- Arable reversion can protect archaeological features from damage caused by cultivation.
- It can also enhance the setting of a historical feature.

Resource protection benefits

- Arable reversion to grassland can help prevent or reduce the risk of soil erosion and run off.

Carbon storage benefits

- Carbon will rapidly accumulate in soil that has been in long-term arable cultivation when it is reverted to grassland and left undisturbed. This accumulation will continue for many decades and is valuable in combating climate change.

Agricultural considerations

From an agricultural point of view arable reversion can be used to:

- bring less profitable areas out of cultivation, for example steeper, wetter or more remote land, or land with very poor soil;
- provide additional forage area; and
- enable wider changes to the farming system.

Often those areas, which are less profitable to cultivate, provide the greatest environmental benefits when reverted to grassland.

There is evidence that animals grazing extensively on semi-natural species-rich swards

may benefit from a higher mineral intake and lower worm burdens.

Where fencing and water supplies are being introduced, or re-introduced, capital grants or standard payments may be obtained. Such works should increase the value of the farm.

Potential effects on productivity

Choosing to revert arable land to permanent species-rich grassland is a major decision and a long term commitment, particularly where there will be little or no fertiliser input.

Where land has been in arable cultivation for many years reversion can be followed by a period of low productivity known as the lean years. This is caused by a shortage of nitrogen and it may be many years before nitrogen builds up and the sward is as productive as permanent semi-natural grassland.

Environmental Stewardship scheme objectives and management requirements will not normally be the same as those of a conventional grass ley. Any seed sown will usually have to be selected from a list of species or agreed in advance, and the use of inorganic fertilisers is not normally permitted, although a light application of well rotted farm yard manure in the first year can, in some cases, boost organic matter content and aid establishment.

As a result, the reverted sward is unlikely to be as productive as a conventional ley. The yields of hay or silage are unlikely to be as high and the sward may not be suitable for the existing livestock system.

For example, the slow spring growth of these swards often makes them unsuitable for a sheep flock lambing in March and their lower digestibility may cause rejection by livestock, particularly sheep, that are accustomed to ryegrass/clover swards.

Livestock systems may need to be modified, for example by moving to later lambing, changing breeds and/or introducing mature cattle.

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Legislative implications

Environmental Impact Assessment (Agriculture) Regulations

At the end of an agri-environment agreement land managers wishing to return the land to cultivation or other intensive use may need to apply to Natural England for an EIA screening decision if the land has not been cultivated for more than fifteen years and it is greater than 2 ha in size.

Two categories of land could fall within the scope of the Regulations:

- **Uncultivated land** - This is land that has not been subject to physical or chemical cultivation in the last fifteen years. Physical cultivation would include ploughing, sub-surface harrowing, discing, tining etc whereas chemical cultivation is defined as any chemical enhancement of the soil through applications of fertilisers, manures or lime etc.
- **Semi-natural areas** - These include habitats such as calcareous grassland, species rich neutral grasslands, heathland, moorland and scrub (a full list can be found in Annex 1 of the EIA Guidance). For the purpose of the Regulations, Natural England will not consider land under habitat creation options under agri-environment schemes to be semi-natural for at least fifteen years after the last physical or chemical cultivation (not including any manure applied to semi-natural meadows or wetlands as part of a traditional management regime).

When a land manager applies for an EIA screening decision Natural England will make an assessment of whether the work will have a significant effect on the environment. Only where a significant environmental effect is likely will permission to proceed with the work not be granted.

A significant effect is usually considered to be a loss of more than two hectares of UK Biodiversity Action Plan (BAP) Priority Habitat or a significant population of a BAP Priority Species. Many arable reversion sites will not contain BAP Priority Habitats or Species.

In making our decision Natural England will take into account agricultural operations over the last 15 years, including ploughing and reseeded.

In most cases we will seek to retain land already in agri-environment agreements by offering to renew agreements at the end of the ten years.

By seeking to renew agreements in this way we are clearly signalling that we wish to continue the existing public investment in the protection and restoration of these habitats.

Further information is given at www.naturalengland.org.uk/ourwork/regulation/eia/default.aspx.

Countryside and Rights of Way (CROW) Act

The CROW Act seeks to give the public access to land identified by Natural England as 'open country' and 'registered common land'. The former is defined as land which appears to consist wholly or predominantly of mountain, moor, heath or down (MMHD).

The existing mapping methodology contains descriptions of MMHD and includes the requirement that the land is of an open character.

In general open country is likely to include unimproved or semi-natural grassland but exclude improved and semi-improved grassland. However, the existing maps are due to undergo a statutory review, which should be completed by 2015 and the methodology will be reviewed as part of this. For more information see www.naturalengland.org.uk/ourwork/enjoying/places/openaccess/mapping.aspx.

After ten years in agreement it is possible that arable reversion could match the prevailing description of MMHD. Any such cases would be open to consideration during the statutory review process.

There is an ongoing requirement for the CROW maps to be reviewed within 10 years of each map issue. Any land subject to arable reversion or otherwise allowed to revert to a semi-natural

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state is increasingly likely to become identifiable as MMHD in the future.

Any registered common land will be mapped as such for the purposes of CROW irrespective of the appearance of the land or the extent of agricultural improvement/reversion. Land may also be dedicated for public access by the owner under Section 16 of CROW.

Ancient Monuments and Archaeological Areas Act 1979

Archaeological sites that are designated as Scheduled Monuments are of national importance and are protected under the Ancient Monuments and Archaeological Areas Act 1979.

If, after six years under grassland, a land manager wishes to return a reverted site containing a Scheduled Monument back to cultivation, they will require Scheduled Monument Consent from the Secretary of State for the Department for Culture, Media, and Sport who would be advised by English Heritage.

Eligibility of land for arable reversion

Environmental Stewardship Scheme payments are only likely to be available to revert land that has been in arable cultivation, temporary grass ley and/or set-aside, for the 5 calendar years prior to the proposed start date of your agreement.

To qualify for funding under Environmental Stewardship arable reversion must provide environmental benefits, such as those outlined above, and meet the scheme objectives. The scheme objectives may vary between geographical areas and will need to be discussed and agreed with your Natural England Adviser.

Site objectives

Assess the existing environmental interest of the land and consider how it may be affected by arable reversion. The land may already be of value for rare arable plants or farmland birds, in which case other options such as continuing with

the existing arable regime, or entering the land into Environmental Stewardship Scheme arable options may be more appropriate.

Consider which environmental features could be protected or enhanced by arable reversion. For example, there may be archaeological features on the site or adjacent wildlife habitats. A field which has been under set-aside may have developed a sward of botanical interest. A field which is poorly drained may have potential for habitat creation for wading birds and wildfowl.

Selecting sites for species-rich grassland

Site selection is very important where the objective is to create species-rich grassland. This is a very difficult habitat to create and there have been many failures. A decision key to help identify the potential of a site for creation of species-rich grassland is shown in the *Higher Level Stewardship Farm Environment Plan Manual*, Third Edition March 2010, p.36. It is reproduced at the end of this note. The main factors to consider are:

- soil nutrient status and pH;
- weed burden;
- location; and
- management options.

Soil nutrient status and pH

Knowledge of soil nutrient status and pH is very important for setting site objectives and it provides a valuable baseline for judging progress and diagnosing problems. It is essential for assessing the potential of a site for the re-creation of species rich habitats. The most important aspects are:

- When trying to create botanically diverse habitats, soil phosphorus (P) status is critical. Where available P is high, growth of grasses and white clover is likely to be vigorous, making it difficult for wildflowers to compete.
- For other objectives, for example wet grassland creation for birds, protection of archaeological features, or buffering important wildlife areas, soil P will not be as important.

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In general when attempting to create species-rich grassland P index:

- 0 is ideal;
- 1 is satisfactory;
- 2 is marginal; and
- 3 or above is unsuitable.

Knowledge of soil total nitrogen (N) status is useful for judging the history of a field, and the likelihood of problems of low productivity. Total soil N is closely related to organic matter. Low organic matter and total N indicate long term arable cultivation.

Knowledge of soil pH and inherent soil type assists with determining an appropriate seed mix and target vegetation type.

If a soil analysis is not available, it should be determined using the methods outlined in Technical Information Note TIN035 *Soil sampling for habitat recreation and restoration in agri-environment schemes*. Further guidance on interpreting soil analysis results is given in Technical Information Note TIN036 *Soils and agri-environment schemes: interpretation of soil analysis*.

Weed burden

Weeds can be a major obstacle to successful arable reversion. Species such as common couch, broad-leaved dock, stinging nettle and creeping thistle can be very difficult to eradicate and may cause problems with sward establishment.

The use of herbicides once the sward is established may be detrimental to any desirable plant species that have colonised or been sown. The weed burden must be reduced to a manageable level prior to arable reversion being undertaken and entry into an agri-environment scheme may have to be delayed until this has been achieved.

Methods of reducing the weed burden are outlined in Technical Information Note TIN067 – *Arable reversion to species rich grassland: establishment of a sown sward*.

Location

In terms of location, the best fields to select are those which are adjacent to existing species-rich grassland or are linked to such grassland by the movement of livestock and/or machinery.

Linkages to other semi-natural habitats on the farm are also important. Isolated sites surrounded by arable land or improved grassland are unlikely to be colonised by desirable plant species or to be used by a wide range of associated invertebrates and mammals.

Management options

The management options available on a site may determine the site objectives and the suitability of the site for reversion. For example the establishment and maintenance of species-rich grassland will be much easier if livestock form part of the management.

Livestock, in particular cattle, play an important role by trampling in seed and creating patches of bare ground where it can germinate and establish without too much competition. This is important for both increasing the diversity of grassland and maintaining it.

Livestock are also important where sites are being managed for birds. Creating the right sward structure for ground-nesting birds is very difficult using mechanical means alone.

Choice of methods

The most appropriate method for establishing a sward will depend on a number of considerations, including:

- the objectives;
- the time scale for establishment;
- the location in relation to important wildlife habitats; and
- the availability of suitable seed.

Natural regeneration

Allowing the sward to regenerate naturally is a low cost method and may be attractive where one or more of the following apply:

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- The soil seed-bank contains species typical of the target vegetation type. This will often only occur when the field has been in semi-natural grassland within the last three to five years.
- The field has fragments of species-rich grassland within it, or such swards are immediately upslope or upwind and/or livestock move between the two areas.
- The field is under set-aside and has already been colonised by a range of desirable species.
- The field is wet or seasonally inundated, as species will colonise during the flooding period.
- The import of seed is to be minimised (for example on sites close to an SSSI or other existing areas of semi-natural grassland) and/or there is no appropriately sourced seed available for sowing.
- There is archaeological interest and cultivation needs to be minimised.

However, natural regeneration has many drawbacks, including:

- There is a longer period of low productivity and/or poor quality herbage for livestock.
- It is usually a slow process taking at least five to ten years and the results are unpredictable.
- There is a greater risk of soil erosion and nutrient leaching.
- There is a greater risk of weed problems.

Therefore, it is recommended that natural regeneration should only be undertaken on sites with the greatest potential where there is high commitment to success.

Natural regeneration can be supplemented with oversowing or spreading hay in order to add additional seed and speed up sward establishment. See Technical Information Notes TIN063 – *Sward enhancement: diversifying grassland by spreading species-rich green hay* and TIN064: *Sward enhancement: diversifying grassland by oversowing and slot seeding*

Sowing a seed mix

This is the quickest means of establishing a sward and is the method used on most arable reversion sites. The seed mixture sown on any

particular site should be determined by the site objectives, proximity to existing semi-natural grassland and other factors such as soil type and future management. Information on establishing a sown sward is provided in Technical Information Note TIN067: *Arable reversion to species rich grassland*:

Grass swards are sometimes established on set-aside by under-sowing in the preceding arable crop. The resulting sward will usually include a high proportion of species such as ryegrass and white clover which would not be suitable for semi-natural grassland. As a result, the sward may have to be ploughed up or sprayed off and reseeded with a suitable seed mix.

Spreading hay

Spreading hay can be an effective method of establishing a sward. Freshly cut 'green hay' taken from nearby species-rich grassland is a good means of introducing a range of local wildflower and grass species and can be cheaper than buying a commercial seed mix.

'Green hay' is herbage which is cut at, or just before, the hay stage and which is collected immediately without prior wilting or turning. It is preferable to dry hay as it contains higher numbers of seed from a wider range of species. Dry hay is dominated by grass seeds.

Spreading hay may be a good method where there is archaeological interest and disturbance to the ground needs to be minimised. Although bare ground is necessary, there is no need to create a fine seed bed prior to spreading hay.

Information on hay spreading to enhance existing grassland is given in Technical Information Note TIN063 – *Sward enhancement: diversifying grassland by spreading species-rich green hay*.

Further information

Natural England Technical Information Notes are available to download from the Natural England website: www.naturalengland.org.uk. In particular see:

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- Technical Information Note TIN067: *Arable reversion to species rich grassland: establishment of a sown sward*
- Technical Information Note TIN068: *Arable reversion to species rich grassland: early management of the new sward*
- Technical Information Note TIN035: *Soil sampling for habitat recreation and restoration in agri-environment schemes*
- Technical Information Note TIN036: *Soils and agri-environment schemes: interpretation of soil analysis*
- Technical Information Note TIN038: *Seed sources for grassland restoration and re-creation in Environmental Stewardship*
- Technical Information Note TIN060: *The use of yellow rattle to facilitate grassland diversification*
- Technical Information Note TIN063 – *Sward enhancement: diversifying grassland by spreading species-rich green hay*
- Technical Information Note TIN064: *Sward enhancement: diversifying grassland by oversowing and slot seeding*

For further information contact the Natural England Enquiry Service on 0300 060 0863 or e-mail enquiries@naturalengland.org.uk.

This note does not supersede prescriptions in agri-environment scheme agreements. If there is any conflict between the information in this Technical Information Note and your agreement please contact your Natural England Adviser.

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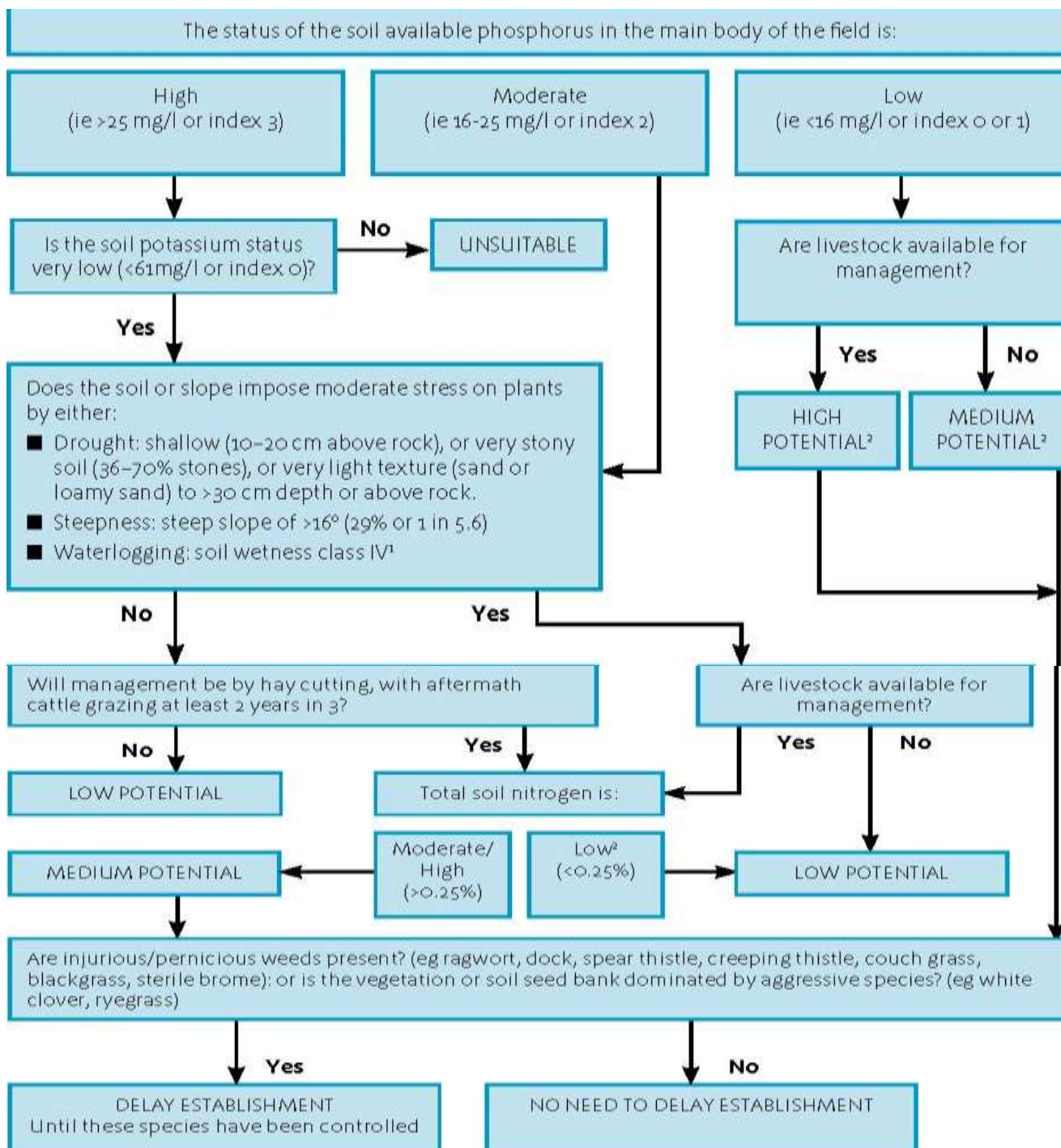
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Key to the potential of arable land for reversion to species rich grassland taken from *Farm Environment Plan (FEP) Manual* Third Edition February 2010



¹ Soils with wetness class IV are waterlogged for long periods in winter.

² Soils low in total soil nitrogen (<0.25%) are likely to give a very unproductive sward and the land manager should be warned of this.