

Is Environmental Stewardship working for rare and threatened plants?

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Summary

Of the 1556 vascular plant species that are native (including archaeophytes) to the UK 40% are recorded as Threatened and/or Nationally Rare or Scarce. The majority of this threatened flora is found within the productive landscape. Environmental Stewardship (ES) now provides the best and most available tool for recovering rare plant populations in England. Through analysis of the potential for ES to deliver for the rare plants of the SW it became clear Entry Level Stewardship could only deliver for 15% of species (the majority being arable plants) although it receives 72% of the total ES funding. Higher Level Stewardship has the potential to deliver some or all of the needs of 89% of species. However the scheme is limited by funding and the complex requirements of many rare plants (some requiring both a holistic and micro-management approach and some requiring contrasting management approaches within the same habitat) means targeted delivery and expert knowledge and advice is required.

Key words: Environmental Stewardship, rare and threatened vascular plants

Introduction

There are 1407 vascular plants that are native to the UK and additional 149 archaeophytes (naturalised in the UK prior to AD 1500), a total of 1556 species. Of these, 632 (40%) are recorded as Threatened and/or Nationally Rare or Scarce (JNCC 2008). The declines and current status of a large proportion of these species can be attributed to habitat loss and changes in land management as a result of modern farming practices. As a result, the majority of British flora that is threatened with extinction is found within the non-wooded, productive landscape (with only 11% of threatened vascular plants found in woodland). With agri-environment schemes being the principal tool available for conservation of biodiversity within farmland, Environmental Stewardship (ES) now provides the best and most available option for recovering rare plant populations and conserving the diversity of plant habitats in England. The annual allocation for Environmental Stewardship was £235.2 million in May 2009, with 72% of these funds going into Entry Level Stewardship (ELS) (Natural England, 2009). With our wild plants forming the foundation of biodiversity and creating the habitats we are so keen to protect, it is essential that we ensure that all of this investment is delivering for not only the widespread species, but also for rare and threatened plants. However, with 634 (44%) of vascular plants experiencing significant decline (Preston *et al.*, 2002) and a 240% increase (62 to 212) in UK BAP priority vascular plant species following the 2008 review, there is huge concern that although the framework for habitat conservation is in place through ES, the specialist needs of our most threatened plants are not being met.

It is understood that ELS has been designed as a broad and shallow scheme that aims to improve overall biodiversity within the farmed environment. We also appreciate that the scheme is being stretch to deliver multiple objectives in addition to conservation of biodiversity, such as enhancing landscape quality and protecting our natural resources. There is great concern, however, that the design of the scheme is so shallow and low-impact in order to achieve maximum farmer engagement that valuable habitat conservation is not being achieved. Entry Level Stewardship remains too focused on linear, boundary features, with minimum impact on farmers and minimum gain for biodiversity. Conversely, Higher Level Stewardship (HLS) holds the potential for both effective habitat and species conservation, but with such an imbalance of funds between the two tiers of the schemes, there is real concern that ES is not delivering sufficiently for rare and threatened plants.

This paper represents a predictive exercise, gauging how effective ES *could* be at saving rare plants within the farmed landscape, by identifying the needs of individual species and assessing how effectively these can be delivered by ES options. Some examples are then provided to test these predictions, although there is a considerable need for more extensive monitoring and gathering of evidence to really test if ES is delivering for rare plants in the field.

An additional outcome of this exercise is to highlight any specific management requirements of rare plants that are currently not being met by the existing ES options available, and to suggest prescriptions that could meet these species needs.

Materials and Methods

This study focuses on the rare and threatened vascular plants of the south-west England region, for this area is thought to be representative of much of the country as a whole, inasmuch as it supports extensive areas of ancient, modern (i.e. post Parliamentary inclosure) and upland productive non-wooded landscapes.

A total of 319 taxa that are Nationally Rare, Nationally Scarce, Near Threatened and Threatened have been analysed (Preston *et al.*, 2002; JNCC, 2008)¹. The environmental and management requirements of the individual species have been assessed and, where applicable, ES options have been identified that have the potential to meet the needs of these species (Natural England, 2008). For example:

- Corn Marigold (*Chrysanthemum segetum*) (VU) [*Archaeophyte*], is an annual species of annually or occasionally cultivated arable land, particularly light sandy or loamy soils. If well targeted there are options available within ELS and HLS that will meet the needs of this species. The options allocated to this species are EF11 uncropped cultivated margins for rare arable plants, and EF9/EF10 conservation headlands (harvested and unharvested) (both ELS); and HF20 cultivated fallow plots/margins for arable plants and HF14 unharvested conservation headlands (both HLS).
- Borrer's Saltmarsh-grass (*Puccinellia fasciculata*) (VU) [Native], will benefit from moderate grazing of upper saltmarsh communities. This relatively simple holistic management approach can be provided under the HP5/6 maintenance/restoration of coastal salt marshes within HLS. There are no suitable options under ELS to manage this habitat.
- Pigmy Rush (*Juncus pygmaeus*) (EN) [Native], an annual species of seasonally-flooded trackways across heathlands on the Lizard peninsula, typically near the boundary of Tall Heath (serpentine or gabbro) and Short Heath (granite-derived loess). Survival largely dependant on trackway systems still being periodically rutted by vehicles, but will also benefit from wider grazing of the heathland matrix by cattle or ponies. ELS does not have the potential to meet the specialist needs of this species, nor provide wider management of the habitat in which

¹The full species analysis spread-sheet is available on request, we were unable to include it with this paper due to a lack of space.

it occurs. There are options within HLS, EK15/16 maintenance/restoration of grassland for target features and HO1/2 maintenance/restoration of lowland heathland that will provide the holistic grazing management of the wider habitat, but it is essential that within the HLS prescription there is also delivery of the micro-habitat requirements of this species (the regular use of trackways to provide the rutting required).

The first two species provide examples where essentially a single ES option could deliver the management needs, whereas the Pigmy Rush requires a more complex combination of options or management approaches in order to deliver both the holistic habitat management and species specific micro-habitat needs. As part of the overall analysis, this split of species with relatively simple needs compared with those with complex, multiple requirements has been drawn out.

Species that do not have the potential to be conserved through an ES scheme nor will benefit from any specific management have also been identified. For example, Maidenhair Fern (*Adiantum capillus-veneris*) (NS) [Native], occurs in damp caves and oozing sea cliffs, on limestone: accordingly, it is deemed to require no specific management.

Results

Can Environmental Stewardship deliver for rare and threatened plants?

Of the 319 species that were analysed 32 (10%) are found in self-regulating habitats such as sea cliffs, on beaches and within deeply shaded, or naturally open, woodland. Therefore the core populations of these plants do not require, nor would particularly benefit from, any specific management within an ES scheme. It is essential however the habitats within which they occur remain protected, for example from damage due to overuse by humans. The 32 species are as follows:

<i>Adiantum capillus-veneris</i>	<i>Limonium recurvum</i>
<i>Asplenium trichomanes ssp. pachyrachis</i>	<i>Matthiola sinuata</i>
<i>Brassica oleracea</i>	<i>Meconopsis cambrica</i>
<i>Calystegia sepium ssp. roseata</i>	<i>Mespilus germanica</i>
<i>Carex muricata ssp. muricata</i>	<i>Monotropa hypopitys</i>
<i>Centaurium tenuiflorum</i>	<i>Neottia nidus-avis</i>
<i>Cephalanthera damasonium</i>	<i>Parapholis incurva</i>
<i>Coincya wrightii</i>	<i>Polygonum maritimum</i>
<i>Cystopteris diaphana</i>	<i>Potamogeton nodosus</i>
<i>Draba muralis</i>	<i>Ranunculus pencillatus ssp. pencillatus</i>
<i>Epipactis leptochila</i>	<i>Rumex rupestris</i>
<i>Hymenophyllum wilsonii</i>	<i>Salsola kali ssp. kali</i>
<i>Inula crithmoides</i>	<i>Silene nutans</i>
<i>Isatis tinctoria</i>	<i>Tilia platyphyllos</i>
<i>Lathyrus japonicus</i>	<i>Trichomanes speciosum</i>
<i>Leucojum aestivum ssp. aestivum</i>	<i>Zostera marina</i>

In addition there are four woodland species (*Bromopsis benekenii*, *Helleborus foetidus*, *Hordelymus europaeus* and *Melittis melissophyllum*) that due to the types of woodland within which they occur are more likely to benefit from a Woodland Grand Scheme (WGS) rather than ES.

Therefore, excluding the 36 species detailed above, it was identified that ES had the potential to deliver some or all of the needs of 283 (89%) species, potentially improving their chances of survival within the managed productive landscape.

Of the 283 species that could benefit from management under an ES management agreement, only 49 (17%) have the potential to have some or all of their management requirements met by an Entry Level Stewardship scheme option. Furthermore, it is important to note that the suitable management prescriptions available under ELS are equally, if not better, met by HLS scheme options. Of the 234 remaining species that could only be managed under an HLS agreement, 32 plants would require a more complex prescription of multiple management techniques (both micro and holistic) with some requiring capital works options (noted as HLS+) (Fig. 1).

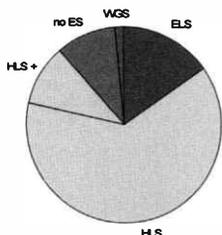


Fig 1. The potential for ES to deliver the management requirements of rare and threatened plants - the split between the two tiers of the scheme.

Of the 49 species that have the potential to be conserved via management under an ELS scheme 82% are arable plants that benefit from the specific group of cultivated margin options. The majority of these arable species are archeophytes (73%) with only 11 arable species being native to the UK (Figs 2 & 3).

<i>Adonis annua</i> (arc)	<i>Chenopodium bonus-henricus</i> (arc)	<i>Fumaria purpurea</i> (nat)	<i>Misopates orontium</i> (arc)
<i>Anagallis arvensis</i> ssp. <i>foemina</i> (arc)	<i>Chenopodium murale</i> (arc)	<i>Fumaria vaillantii</i> (arc)	<i>Myosurus minimus</i> (nat)
<i>Anthemis arvensis</i> (arc)	<i>Chenopodium urbicum</i> (arc)	<i>Galeopsis angustifolia</i> (arc)	<i>Papaver argemone</i> (arc)
<i>Anthemis cotula</i> (arc)	<i>Chrysanthemum segetum</i> (arc)	<i>Galeopsis speciosa</i> (arc)	<i>Ranunculus arvensis</i> (arc)
<i>Apera spica-venti</i> (arc)	<i>Euphorbia exigua</i> (arc)	<i>Galium tricornerutum</i> (arc)	<i>Scandix pecten-veneris</i> (arc)
<i>Briza minor</i> (arc)	<i>Filago pyramidata</i> (arc)	<i>Gastroidium ventricosum</i> (nat)	<i>Scleranthus annuus</i> (nat)
<i>Bromus secalinus</i> (arc)	<i>Filago vulgaris</i> (nat)	<i>Lathyrus aphaca</i> (nat)	<i>Scleranthus annuus</i> ssp. <i>annuus</i> (nat)
<i>Bupleurum rotundifolium</i> (arc)	<i>Fumaria muralis</i> ssp. <i>neglecta</i> (nat)	<i>Lithospermum arvense</i> (arc)	<i>Silene gallica</i> (arc)
<i>Camelina sativa</i> (arc)	<i>Fumaria occidentalis</i> (nat)	<i>Lolium temulentum</i> (arc)	<i>Vicia parviflora</i> (nat)
<i>Carum carvi</i> (arc)	<i>Fumaria parviflora</i> (arc)	<i>Lythrum hyssopifolium</i> (arc)	<i>Viola tricolor</i> ssp. <i>tricolor</i> (nat)

Fig. 2. Forty arable species that would benefit from cultivated margin options under ELS when occurring within the arable habitat. (arc – archaeophyte, nat – native).

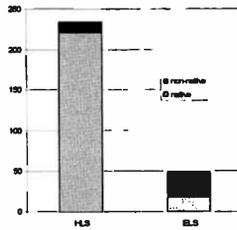


Fig. 3. The potential for ELS and HLS to deliver for native and non-native rare and threatened vascular plant species of SW England.

The remaining nine non-arable plants would only benefit in part from management under ELS, this being management of boundary features (hedge bases and ditches) (Fig. 4). It should be noted that although suitable management options are available under ELS, there is a high level of targeting required to ensure they are located at sites holding the plant populations that are at the greatest risk. Therefore targeted advice and guidance is required.

<i>Callitriche truncata</i> (nat) – ditch	<i>Arum italicum</i> ssp. <i>neglectum</i> (nat) – hedge	<i>Fallopia dumetorum</i> (nat) – hedgebank
<i>Mentha suaveolens</i> (nat) – ditch	<i>Geranium purpureum</i> (nat) – hedge	<i>Nepeta cataria</i> (arc) – hedgebank
<i>Allium ampeloprasum</i> (arc) – hedge	<i>Pyrus cordata</i> (nat) – hedge	<i>Sorbus devoniensis</i> (nat) – hedgebank

Fig. 4. Nine species that would benefit in part from management of boundary features within options under ELS – either ditch, hedgerow or hedgebank management.

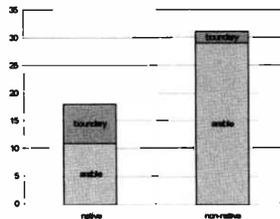


Fig. 5. The split of habitat options under ELS that would meet the management requirements of native and non-native species.

Meeting the management needs of rare and threatened plants

Of the 283 species that can benefit from ES, 81% occur largely in a single habitat type whereas 17% occur in two types of habitat and 2% (five plants) can crop up in three different habitat types. Therefore for advisors and landowners to understand how to provide the correct management conditions for these species across the landscape, far more detailed species information needs to be made easily available. In addition at least 32 species would require a secondary level of micro-habitat management either via capital works options (e.g. scrape creation, pond creation and restoration and scrub and bracken management) or additional site-specific management prescriptions written into an agreement via an ES advisor. A significant proportion of grassland, heathland and fenland species would also benefit specifically from the cattle grazing supplement.

Two particular management requirements were identified that are currently not permitted or not suitably available under HLS scheme options. Thirty species require heavy prolonged levels of grazing in order to create ruts and poached areas during winter. For example: *Ranunculus tripartitus* requires long continuity (over years) of heavy grazing by cattle or ponies, potentially all year round, of damp mildly acid grasslands on heaths and commons; it also benefits from

occasional rutting / poaching of seasonally flooded trackways, shallow pools and hollows. The plant particularly favours well trampled 'pinch points'.

Secondly, 23 species require regular ground disturbance which may be in addition to one off scrapes provided under capital items, or in some cases the creation of scrapes would be too extreme and lighter levels of disturbance is required. For example: *Hypochaeris glabra* requires periodic disturbance of sandy soils in heathland districts (e.g. Purbeck) and on coastal dunes; it often performs well in reverting / fallow arable; permanent grassland sites would benefit from periodic cultivation and moderate to high levels of grazing by cattle or ponies.

Environmental Stewardship – are rare plants getting value for money?

Based on £235.2 million annual value of ES from May 2009 (Natural England 2009), the split of spend between ELS and HLS is 72% to 28%. It is understood that the conservation of biodiversity is only one of five ES objectives, and that rare and threatened plants are just one element of biodiversity as a whole. However, to illustrate the imbalance of funds compared with potential for delivery if you consider only 15% of rare and threatened species having the potential to benefit from ELS, this would effectively equate to an annual investment of £3.47 million per species, almost 12.5 times the level of funding available to the remaining, predominantly native, group of plants that can benefit from management under HLS. In addition to this, less than 5% of agreement holders have been adopting the cultivated margins (Boatman et al. 2007) that can deliver for the majority of rare plants under ELS, thus further tipping the balance. It is important to note that this imbalance with plants is likely to similarly apply to animals as well, with most of our rarer birds and butterflies relying on quality semi-natural habitats that can be better delivered by HLS. Accordingly, whilst HLS is clearly far better equipped to deliver rare species conservation, the imbalance in funds puts limits on delivery.

Discussion

Entry Level Stewardship and rare and threatened plant conservation

It is understood that the intention of ELS is to provide a widespread improvement in overall biodiversity with largely common species benefiting from the management prescriptions delivered due to the lack of targeting or management advice. But with such high levels of funding being allocated to the scheme it remains disappointing that only 15% of the rare and threatened species analysed in this study have the potential to benefit, and the conservation of these would in most instances be better delivered by HLS. In short, habitat management under the higher tier scheme has the potential to deliver for both the rare and threatened, as well as widespread and common species. Rare plants of the arable habitat are clearly the one group that can benefit from ELS management with arable plants making up 82% of the group of species that could benefit from management under this scheme. We are, however, still faced with the ongoing problem that the options that can meet the needs of this relatively small group of species have received low uptake by farmers with less than 5% of schemes including appropriate cultivated margins (Boatman et al., 2007). However, where cultivated margin options have been targeted towards rare species and high quality communities the results have been impressive. For example, the successful conservation of Cotswold Pennycress (*Thlaspi perfoliatum*) within an EF11 cultivated, uncropped margin option in its last remaining arable site at a farm in Upper Strensham in Worcestershire resulted in the appearance of thousands of plants. Nevertheless, all other extant populations of Cotswold Pennycress occur in other disturbed habitats such as small borrow pits, quarries, railway cuttings and tracksides that require heavy grazing and physical disturbance to retain open areas allowing the development of self-sustaining populations of the species. Such habitat management can only be delivered within HLS.

If it is accepted that arable plants are the only group of rare plants that can be most effectively delivered by ELS, then continued effort is required to encourage farmers to choose the high value cultivated margins that allow natural vegetation to regenerate, through provision of advice on site selection, improved guidance for weed management, and increasing the points value associated to these cultivated options.

Higher Level Stewardship and rare and threatened plant conservation

On paper Higher Level Stewardship has good potential to meet the management requirements of many rare and threatened plants. However there remain three key areas that limit its delivery:

1. Limited funding
2. Need for targeted delivery supported by expert advice
3. Complexity of species management, with some requiring both a holistic wider habitat approach combined with additional micro-habitat needs. It is also not always possible to take a uniform habitat approach with multiple species within a single habitat requiring contrasting management approaches.

Limited funding

The limitations on HLS funding in comparison to ELS has constrained the delivery of this more productive scheme, exacerbated by often complex and, at times unattainable, entry requirements. A high level of flexibility has been built into HLS and the finite number of agreements due to limited funds, has resulted in the scheme's potential not being maximised to ensure priority species are being conserved within targeted habitats. Two key areas need addressing: firstly the ability for multiple land holdings to group together under one agreement in order to ensure more cohesive delivery across a landscape. Secondly, the scheme currently offers the potential to fill the gap between ELS and a full, multi-objective HLS agreement, allowing targeted priority species and habitat needs to be met via more tailored option prescription. Landowners and advisors need to be prepared to test the scheme in order for it to deliver on wider scale for biodiversity. However, the limits on funding and pressures on NE staff have constrained this kind of dynamic use of the scheme.

Targeted delivery and expert advice

The HLS scheme is largely focused around habitat management, with species conservation often only a secondary concern. There is good potential to provide guidance on delivering for groups of priority species so that habitat management is better focused at the quality of the vegetation being restored or maintained, rather than just the quantity of habitat under agreement. Indicators of success are often focused around species delivery; therefore there is a need to ensure advisors have the knowledge and expertise to develop habitat prescriptions that can meet multiple species needs.

Threatened arable plants can be quite successfully grouped within their priority arable habitat depending on their preferred soil type and germination timing, allowing expert guidance to be targeted at priority communities. However this expert knowledge needs to be easily accessible to advisors and they need to have the knowledge on how to implement it on the ground. For example, at some arable plant sites prescriptions have historically been to highly focussed on delivering the correct management year-on-year for particular species, with the result that the quality of the habitat has suffered as farmers and advisors have not had the knowledge required to adjust the management approach to ensure both the diversity of priority species and the wider plant community are being managed successfully (e.g. spring germinating species unable to tolerate continual autumn cultivation and excessive pernicious weed burdens building up due to a lack of weed control via rotation, herbicide use or topping). This kind of on the ground fine tuning relies on knowledge, regular monitoring and a long-term commitment to manage quality habitat. There is the potential to provide similar guidance for other groups of species within grassland, heathland and woodland, ensuring a species focused approach to habitat conservation: thus species of tightly grazed acid grassland within heathland (such as Chamomile (*Chamaemelum nobile*) may not benefit from HLS schemes where grazing intensities are low over an extensive area .

Complexity of species management

The species analysis for this study highlights the fundamental fact that meeting the needs of rare and threatened plants is often highly complex. Two key aspect need to be addressed: firstly that

multiple species can exist within the same habitat in the same locality, yet can have contrasting management demands. Management for one species can be highly detrimental to another. This is another example of where expert knowledge and a species approach to deliver quality habitat is essential.

The second aspect is the particular need of certain species for both a holistic approach to wider habitat management e.g. grazing, hay cutting, omitting chemical inputs, plus an additional, secondary requirement at a micro-habitat scale. Clear gaps exist within existing HLS prescriptions in the provision of these micro-habitat needs. In particular, two key micro-habitat management requirements of significant groups of species have been identified that are currently not easily available under current prescriptions; the first being the allowance of heavy prolonged periods of grazing in order to create ruts and poached areas. It is understood that this kind of management has potential to ‘clash’ with cross compliance requirements for soil and resource protection, though derogations or special measures may need to be considered at particular sites in order for such conditions to be permitted and for the rare species to survive. The second is the need of a number of species to experience regular light to moderate ground disturbance (outside of the arable habitat). Prescriptions should be amended or have additions made allowing light to moderate levels of regular disturbance to limited areas within grasslands, heathlands, woodlands and other habitats, so that the necessary conditions are provided for plants that require these types of early-successional habitats. This could be met by the allowance of periodic capital works to create scrapes on a rotational basis.

To conclude plants provide the basis of life in our countryside, both the widespread species that form the vegetation within habitats, together with the scattering of rare and threatened species that add the interest and provide the indicators of balance and quality.

Environmental Stewardship represents perhaps the best mechanism available to conserve and protect both our widespread and rarer species, but at the present time available funding focuses too much on the ELS scheme that has very limited potential to deliver for rare and threatened plants. HLS does have the flexibility and has the potential to provide advice and support required, but limits on funding have constrained the scheme’s potential, and there remains a lack of species targeting within the largely habitat-based approach to the scheme.

For Stewardship to deliver the best value for money with regard biodiversity, the scheme needs to take better account of species, be driven by the delivery of quality habitat on the ground (and not quantity of ES option under agreement), and be highly targeted at our most valuable biodiversity areas. The English countryside can not be defined by options and the flexibility of the schemes available need to be challenged to allow a more flexible approach where the holistic and micro-habitat management delivery is achieved together. The schemes can no longer be driven through a desire to keep farmers happy in order to meet agreement uptake targets: if we really want to protect and enhance the little wildlife-rich countryside that remains, then schemes need to benefit the landowners that truly desire to improve the wildlife value of the land in their custodianship, rather than those who just see ES as another income stream, maximising profit whilst minimising conservation effort.

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