



Forestry Commission Scotland
Coimisean na Coilltearachd Alba

Strategic Guide for the Conservation Management of Open Habitats on Scotland's National Forest Estate

Contents

Contents	2
Aim	3
Introduction	4
Current work	5
FES Habitat Action Plan survey.....	5
Advice and guidance.....	6
Training.....	7
Open priority habitats and their distribution on the NFE	8
Minimising impacts on open priority habitats in new planting	10
Managing existing open priority habitats	13
Prioritising resources.....	13
Prioritising resources across habitat types.....	14
Special Areas of Conservation and Sites of Special Scientific Interest.....	17
Grazing.....	17
Habitat survey management recommendations.....	19
Open priority habitat restoration	20
Managing existing open priority habitats	23
Managing open priority habitats on the national forest estate in the uplands.....	23
Managing open priority habitats on the national forest estate in the lowlands.....	26
Managing open priority habitats on the national forest estate on the coast.....	29
Access and interpretation	30
Priorities for the future	31
Appendix 1: A summary description of open priority habitats on the national forest estate	32
Open priority habitats on the national forest estate in the uplands.....	32
Open priority habitat types on the national forest estate in the lowlands.....	37
Open habitat types on the national forest estate on the coast.....	40
Appendix 2: Illustrations of open priority habitats on the national forest estate in Scotland	41
Appendix 3: Designated sites on the national forest estate in Scotland with open habitat notified features	85

Aim

The “Strategic Guide for the Conservation Management of Open habitats on Scotland’s National Forest Estate” gives a summary description of the wealth of open habitat interest found in the publically owned forests managed by Forest Enterprise Scotland on behalf of Scottish ministers. The report outlines principles for the management of these habitats, providing a framework for their conservation.

This report provides strategic high level guidance for Forestry Commission Scotland staff, principally those working in Forest Districts, but also for land agents and those involved in acquisitions. It will also be a useful vehicle to inform stakeholders of our activities and to engage in discussions on how best to deliver biodiversity objectives for open priority habitats.

For habitats such as lowland raised bogs, coastal sand dunes and blanket bog separate, more detailed strategic plans will follow. For those habitats where strategic plans would be less appropriate, i.e. those which only occupy a few sites, or where other management objectives cross over several habitats, more specific guidance is given.

The scope of the guide covers all open habitats of conservation importance, defined as the UKBAP priority habitats, hereafter referred to as “open priority habitats” and also habitats which are notified features in designated sites. Open habitat within forests defined by management, e.g. roadsides, rides, riparian areas or dynamic open ground created by felling are not specifically dealt with, except where priority habitats occur and only if conservation management would be appropriate. Other specific policies for these areas apply.

The wealth of open habitats on the NFE are a great resource, not only in respect of their contribution to biodiversity, but also in terms of the many other benefits they convey to the people of Scotland and those who visit Scotland. This report deals primarily with maintaining and improving the biodiversity benefits of our open priority habitats. Other ecosystem services, e.g. flood alleviation, green house gas sequestration are out-with the scope of the report and are dealt with by other policies and guidance.

Introduction

The publically owned forests managed by Forest Enterprise Scotland on behalf of Scottish ministers, also known as the national forest estate (NFE), in Scotland extends to 654,000 ha. Most of the NFE i.e. 67% is woodland, but a significant area, approximately 217,000 ha or 33% is composed of open habitat. In contrast 11% of the Scottish NFE is comprised of native woodland¹.

Much of the open habitat on the NFE is upland with extensive tracts of hill ground, particularly in the north and west of Scotland. There are smaller, scattered areas of open habitat in the lowlands; the importance of these should not be underestimated as they provide refugia for rare lowland priority habitats much reduced in the wider lowland landscape through land use changes, primarily agricultural improvement.

There are 18 SAC's and 48 SSSI's which are at least partly designated for open habitat interest on the national forest estate, with 58 SAC and 74 SSSI open habitat interest features between them. The total area of SAC's containing open habitat interest features on the national forest estate is 21,920 ha. The total area of SSSI's containing open habitat interest features on the national forest estate is 26,883 ha. Not all of these areas will be open habitat however as some designated sites have both open habitat and native woodland interest features. There is considerable overlap between SAC's and SSSI's on the national forest estate, i.e. similar areas being designated for similar interest features within both SAC and SSSI designations, but not all SAC's with open habitat notified features are SSSI's with equivalent notified features and vice versa. By contrast, wetland RAMSAR sites with notified open habitat features only occupy 2,024 ha of the national forest estate over three sites.

There is significant open priority habitat interest out with designated sites. Much of the open area corresponds to UK Biodiversity Action Plan priority habitats, some of which are exceptionally good examples, hosting a range of rare species.

This document sets out a strategic outline for open habitat management on the national forest estate in Scotland based on nature conservation considerations. All relevant open priority habitats and management themes are considered at a general level. As open priority habitats are extensive on the NFE and the conservation actions outlined in this document ambitious, it will take many years to deliver this programme. Work will progress at varying speeds for each priority habitat, based on ecological priority, interaction with other objectives and resource availability. The open habitat strategy will be delivered through a variety of means, including separate action plans for appropriate habitats, site specific conservation work and the interweaving of conservation objectives into wider FES business.

¹ Figures derived from the Forest Enterprise Scotland Sub-compartment Database. Native woodland defined as regionally native tree species including planted native species. Figures are subject to change through disposals and acquisitions.

Current work

FES Habitat Action Plan survey

The extent and distribution of the various open priority habitats on the NFE is not yet fully described. Since 2005 a survey of all significant open ground has been progressing to map open habitats. Up to April 2013 approximately 130,000 ha's or 60% of open ground has been surveyed and the survey is on course to complete in five to seven years. Initially the survey recorded the proportion of each open habitat in each survey polygon. Additionally since 2009 the National Vegetation Classification communities associated with each open priority habitat have also been recorded, providing additional information on the type and condition of habitats present. Observations on threats to priority habitats are also made and recommendations for management. Particularly important habitats are also highlighted in the survey. Approximately 70,000 ha were surveyed using the original, basic method between 2005 and 2009. Since 2009 a further 60,000 ha have been surveyed using the revised method, which will continue to be used in all future survey.

An ecological contractor conducting open ground habitat survey for Forest Enterprise



Scotland, Glen Roy Forest, Lochaber 9th July 2009.

The open habitat survey data is generally delivered by the contractors in a paper map and excel data table format and also includes a summary report. All of the original survey data will be stored in a shared folder in each district. To make the data more accessible and usable, it is captured in a GIS format. Up until early 2011 the data was stored in the Forest Enterprise Scotland GIS Sub-compartment database. 49,000 ha, approximately 43% of the survey data collected so far, was captured in this format. Later in 2011 an “open habitat spatial data model” was developed to store the survey data in a format which could include all the additional attributes collected in the revised survey method. This is the current vehicle for capturing open habitat survey data and the data previously captured in the SCDB will be transferred into this format and edited to include the additional attributes. FES may explore the development of a habitats module within Forester GIS in the longer term.

Advice and guidance

Each forest district in Scotland has an Environment Team, generally comprising an “Environment Lead” or main officer with responsibility for conservation and a small team of conservation staff. These people represent and are the main contact for open habitat issues, along with other environmental issues in the day to day running of the Forest District. The wider Forest District team including Planning Foresters, Deer Management Officers and Harvesting Foresters also contribute to open habitat conservation as guided by the Scottish Forestry Strategy, UK Biodiversity Action Plan, the Strategic Guide for the Conservation Management of Open habitats on Scotland’s National Forest Estate and other relevant policy.

To support the Forest District teams three Ecologists with a national remit are employed to provide technical advice on specific aspects of nature conservation, including the FES Open Habitats Ecologist. An important part of the support provided by the Open Habitats Ecologist are site visits to assess the management requirements of specific open habitat areas. Reports are produced which cover topics such as avoiding tree planting on significant open priority habitats; site specific habitat management such as ditch blocking and/or scrub removal and conservation grazing. The reports include maps defining management areas; descriptions of the habitats, vegetation and species present; recommendations for management and target notes with photos.

Many of the recommendations in these reports are being implemented resulting in many examples of positive management of open habitats on the ground throughout the NFE, building on previous open habitat conservation work delivered by Forest District staff.

Training

Formal and informal training is also delivered to Forest District staff by the Open Habitats Ecologist and other members of staff. Three two day training courses on open habitat identification and management have been delivered to date, the most recent was in Perthshire in 2010 with previous courses held in Dumfries & Galloway and Speyside including adjacent areas three or four years prior. These courses were aimed at Forest District conservation staff. More general environmental awareness courses for Civil Engineering staff, including open habitats as well as other conservation topics, were held at Mabie and Inshriach Forests in 2009. Other similar courses will be delivered in the future when required. Forest District Staff can discuss any such requirements with the Head Office Environment Manager.

Another important aspect of training is informal learning by discussions between the Open Habitats Ecologist and Forest District staff, including joint field visits to discuss the management of specific open habitat areas as detailed above.

An easy guide to the identification of priority habitats has been produced for FES staff.

Open priority habitats and their distribution on the NFE²

The below table provides a quick summary of which open priority habitats occur on the NFE in Scotland and their distribution therein. More detail is provided on these aspects in Appendix 1 and Appendix 2. Habitats are listed within categories, in estimated order of abundance.

Upland habitats

Upland heathland	Widespread and abundant.
Blanket bog	Widespread and locally abundant.
Upland flush, fen and swamp	Widespread, usually small areas.
Oligotrophic and dystrophic loch	Widespread, especially in north and west uplands.
Upland calcareous grassland	Local, widely scattered in upland areas, usually small areas.
Inland rock and scree habitats	Widespread in north and west, small areas.
Montane heaths and willow scrub	Local in north and west, high altitude only.
Limestone pavement	Very rare, three sites only.
Calaminarian grassland	Very rare, Glenfiddich and Blackwater Forest only.

Lowland Habitats

Lowland raised bog	Local in south and east, medium to small areas. Many afforested examples.
Lowland fen	Uncommon, widely scattered in lowland areas, usually small areas, but a few large extents.
Purple Moor-grass and Rush pasture	Uncommon, widely scattered in lowland areas, usually small areas.
Lowland dry acid grassland	Uncommon, widely scattered in lowland areas, small areas only.
Lowland heathland	Uncommon, widely scattered in lowland areas, small areas only.
Open mosaic habitats on previously developed land	Uncommon, scattered in lowland areas, particularly Scottish Lowlands district.
Lowland meadow	Rare and local in lowland areas, small areas only.
Reedbed	Rare and local in lowland areas, small areas only.
Lowland calcareous grassland	Very rare, very small areas in Dumfries & Borders only.
Eutrophic standing water	Possibly present in some lowland lochs.
Upland hay meadow	Only small patches known, including at Glen Righ, Lochaber. No whole field examples present.

Arable field margin

Transiently present in recent acquisitions before planting. May be retained on a few sites, particularly starter farms.

Coastal habitats

Coastal sand dune

Uncommon on coast: Moray, Tay, North Highland & Galloway districts. Much of previous extent on NFE afforested.

Maritime cliff and slope

Uncommon, scattered around west coast and islands only.

Coastal vegetated shingle

Very rare, one large example in Lossie Forest only.

Coastal saltmarsh

Rare on coast, Moray and West Argyll districts for example.

Saline Lagoon

Very rare or absent, Knapdale? Only.

Habitats which don't exclusively occur in one of the above groupings

River

Widespread, linear areas.

Pond

An unknown proportion of small water bodies will meet the UKBAP priority habitat definition.

Mesotrophic loch

Rare and local, Tay, Dumfries & Borders and West Argyll districts for example.

Habitats that are currently thought not to occur on the national forest estate, but which occur in Scotland²:

Coastal and Floodplain Grazing Marsh

Possible but unlikely in acquisitions.

Traditional orchards

Possible but unlikely in acquisitions.

Machair

Possible but very unlikely in acquisitions.

Mudflats

Possible but very unlikely in acquisitions.

Seagrass beds

Possible but very unlikely in acquisitions.

² Terrestrial, freshwater and relevant intertidal habitats only. Not including afforested sites unless mentioned specifically.

Minimising impacts on open priority habitats in new planting

The Scottish Government has committed to establishing 10,000 hectares of new woodland per year in response to climate change legislation and targets. With this wider aim in mind, FES has a target to provide 1,000 ha of woodland expansion area each year.

To meet the above target FES has an acquisitions process acquiring new ground for woodland planting which will deliver multiple benefits against seven objective areas: climate change, timber, business development, community development, access and health, environmental quality and biodiversity.

The above process will inevitably result in the loss of open habitats, but considering FES's biodiversity duties and objectives the loss of open priority habitats will be avoided, minimised and mitigated as far as possible. The UKBAP has targets for conservation, including targets ([listed here](#)) for maintaining the overall area of each priority habitat.

FES has been considering in detail the impact of new woodland planting on a site by site basis in the above expansion programme. This will continue on the basis outlined below:

The Estates Advisor or Forest District Manager, who are generally the first officers to deal with a potential acquisition, will initially consider the open priority habitat interest on each potential acquisition site. If the officer is fully confident the site has no open priority habitat interest i.e. wholly consists of improved pasture and/or intensive arable farmland in the lowlands or dry acid grassland and/or Bracken in the uplands then there is no further requirement to consider open priority habitats in the acquisition process. If however there is a possibility of potential open priority habitat interest then a habitat survey will be required to assess this. Potential open priority habitat interest includes any rough grazing or wetlands in the lowlands and any vegetation including dwarf shrubs, calcareous grassland, bogs or other wetlands in the uplands. Often open priority habitats are not apparent to a non vegetation ecologist, so the precautionary approach will be applied and in most cases, i.e. excluding those exceptions defined above, any potential acquisitions will be referred by the above officers to the FES Open Habitats Ecologist who will screen them against aerial photography and 1:25,000 OS maps to make an initial assessment of potential open priority habitat interest.

Any acquisitions with potential open priority habitat interest will be surveyed using the FES HAP Survey methodology. This survey will cover at least all areas with potential open priority habitat interest. The site will be surveyed if at all possible before purchase. If survey wasn't undertaken at this stage there would be a risk of purchasing land with significant open priority habitat interest, potentially unsuitable for woodland planting on biodiversity grounds. If a site is surveyed before acquisition and the open priority habitat constraints reduce the area which can be planted beyond a level which makes the site

tenable for woodland expansion then the potential acquisition may be rejected at that stage, unless delivery against other key objectives justify the purchase of the site. In some cases, due to the speed of land sales, it will only be possible to survey the open habitats once the site has been purchased. In such cases there will be an obligation to survey at least all areas with potential open priority habitat interest before the forest design plan is produced so that the plan can fully take account of this interest. If at the post purchase stage a large proportion of the acquisition is found to have significant open priority habitat interest and the site is therefore not suitable for woodland expansion the site may be sold, or managed by FES to deliver biodiversity and other compatible objectives.

FES will aim to acquire sites with low open priority habitat interest if possible. This will reduce potential conflicts between maintaining the extent of open priority habitats and maximising the area planted on each acquisition. Despite this, it is likely that in most acquisitions there will be at least some areas of open priority habitat and these should be fully considered in the forest design plan. If at all possible areas of open priority habitats should be maintained as open ground. If this is not possible, for overriding reasons relating to other objectives, then any planting on open priority habitats should be designed in discussion with the FES Open Habitats Ecologist to target planting away from the most important areas of open priority habitat if possible. Separate more detailed guidance will be issued for forest district planning and environment staff on considering open priority habitats in woodland expansion, using the FES Habitat Spatial Data Model GIS system.

In the case of wetland priority habitats it may also be a requirement for the maintenance of condition of the habitat that a buffer of unplanted ground be left around it. This is particularly the case for uncommon fen or bog habitats or those with high species interest. Again appropriate ecological advice should be sought in these cases. The future maintenance of unplanted open priority habitat should also be considered in the forest design plan. In some cases the removal of grazing may be beneficial to the condition of the open priority habitat at least in the short to medium term, i.e. where blanket bogs or upland heathland have previously been heavily grazed. The grassland priority habitats will usually require grazing to maintain their condition and extent. Where possible FES will try and maintain or reinstate grazing to the latter areas and other habitats where this would be beneficial and practical.

There are however some important caveats to the above:

In all assessments consideration will be given to the quality of open priority habitats and if relevant, their scope for recovery. For example poor condition, marginal open priority habitats with poor prospects of condition improvement, being less of a constraint to woodland expansion. Where an open priority habitat could be replaced by a more valuable (in ecological terms) native woodland type, the loss of open priority habitat would generally be considered appropriate. For example an area of dry heath adjacent to an existing native pine wood, where encouragement of natural regeneration or native pine planting is being considered. These cases will be looked at on a site by site basis and informed by appropriate ecological advice.

The above approach will also be applied to new planting in existing FES managed areas, the only difference being that planning staff would normally initially consider the case.

Managing existing open priority habitats

Prioritising resources

As outlined elsewhere in this strategy there is a wealth of open priority habitats on the national forest estate and many varied opportunities for their conservation. This includes many potentially worthwhile opportunities to restore open habitats from plantation. Given the diversity of habitats, varied conservation opportunities and finite budgets it is important to prioritise our actions to deliver appropriate, cost effective work to realise the best ecological potential of the NFE.

Considering all aspects of open habitat conservation the following key objectives are suggested in order of priority:

- Protecting existing significant open priority habitat from afforestation.
- Maintaining and achieving favourable condition of notified open habitat features on designated sites.
- Maintaining and achieving good condition of significant, but non designated existing open priority habitat.
- Restoring open priority habitats from plantation in key areas where it is appropriate and worthwhile to do so.

Preventing habitat loss is perhaps the most pressing need in conservation, although, due to current policies, it is now progressing more slowly than in previous decades. The first priority should be to avoid loss of significant open priority habitat interest by afforestation, including acquisitions and woodland expansion on existing FES managed land. It does not make good strategic sense to restore new habitat from plantation if existing high quality open priority habitat continues to be lost. This would obviously result in net habitat loss, both by area and condition. Restored habitat, due to damage by afforestation, is usually less valuable than equivalent existing open habitat. It is also more cost effective to avoid habitat loss and maintain areas of significant open priority habitat, where the only direct cost to conservation is survey and assessment, than to engage in habitat restoration from plantation, which is often expensive, involving uneconomic felling.

Maintaining existing open priority habitats in good condition is the second most important priority and will be focussed on the most valuable sites first, in particular SAC's and SSSI's. Again this is generally more cost effective than restoring habitat from plantation and results in a better end product, in terms of habitat quality.

Despite the lower order of priority in the above analysis open habitat restoration from plantation is still important and appropriate for limited habitats and situations. This is explained further in the relevant section.

The above high-level priority analysis is a general guide only and site specific ecological priority will be applied in all aspects of our work, as far as possible. This will be informed

by expert opinion based on established ecological assessment criteria including for example, naturalness, diversity, rarity, size, fragility, position in an ecological unit etc. There will be cases where restoration at a particular site is more important than protecting a relatively unimportant example of a habitat from neglect for example.

The FES Portfolio Analysis will contribute at a high level towards prioritising open priority habitat conservation work. The Portfolio analysis is an analytical tool to inform decision making within FES. Consistent data has been gathered and presented on all aspects of public benefit for each forest. This will identify and describe the significance of each forest in terms of existing assets and future potential in regards to the delivery of the seven key themes of the Scottish Forestry Strategy and the National Forest Estate Strategic Plan.

Various environmental parameters are included in the portfolio analysis, the following are particularly relevant to open priority habitats:

- Designated areas, SSSI's, SAC's and SPAs.
- Quality of significant open priority habitats.
- Environmental potential in relation to open priority habitats.

A score is given for each of the individual parameters in each forest and the total score for each forest is calculated. The relative value of each forest will be used to inform decisions such as informing the acquisitions and disposals process; monitoring benefit delivery by the national forest estate; identifying special places and identifying forests with potential given appropriate investment.

Prioritising resources across habitat types

As there are many different open priority habitats on the national forest estate in Scotland it is also useful to consider how FES might prioritise work across different habitat types. An initial attempt has been made to do so, which is necessarily subjective. The purpose of this analysis is to provide a starting point for guiding strategic work and budgeting on open priority habitats, including generating debate on how we prioritise and rationalise limited resources across these habitats. This approach will be refined over time as work progresses and more information becomes available.

Firstly, the relative stake FES has in the management of each open priority habitat was considered. This was defined by estimating the relative proportion of the total national resource of each habitat occurring on the national forest estate. Consideration was also given to the degree of impact FES could make in the management of each habitat and the total area of each on the national forest estate. The habitats were then grouped into three tables; those where FES has a relatively large, moderate or small stake in managing. Habitats were then listed in approximate order within each table, in terms of the estimated stake FES has in the management of each.

Secondly, the relative resource that may be required to manage each open priority habitat was considered. This was defined by estimating the total extent of the

management area of each habitat on the NFE and the average management cost per unit area for each. Each habitat was roughly grouped into one of three categories: high, moderate or low in terms of their estimated resource requirement.

Open priority habitats in which FES has a relatively large stake in managing

Habitat	Relative resource requirement
Blanket bog	High – Large management areas and high management costs.
Lowland raised bog	High – Moderate management areas and high management costs.
Upland heathland	High – Large management areas with moderate management costs.
Upland flush, fen and swamp	Moderate – Moderate management areas with moderate management costs.
Coastal sand dunes	Moderate – Small management areas with high management costs.
Coastal vegetated shingle.	Low – Very small management area with high management costs.

Open priority habitats in which FES has a relatively moderate stake in managing

Habitat	Relative resource requirement
Oligotrophic and dystrophic loch	Moderate – Moderate management areas with moderate management costs.
Rivers	Moderate – Moderate management areas with moderate management costs.
Montane heath	Low – Moderate management areas with low management costs.
Lowland fen	Moderate – Moderate management areas with moderate management costs.
Upland calcareous grassland	Moderate – Moderate management areas with moderate management costs.
Purple moor-grass and rush pasture	Moderate – Moderate management areas with moderate management costs.
Inland rock and scree habitats	Low – Moderate management areas with low management costs.
Pond	Moderate – Moderate management areas with moderate management costs.
Limestone pavement	Low – Very small management areas with high management costs.
Calaminarian grassland	Low – Very small management area with low management costs.

Open priority habitats in which FES has a relatively small stake in managing

Habitat	Relative resource requirement
Maritime cliff and slope	Low – Moderate management areas with low management costs.
Lowland dry acid grassland	Low – Small management areas with moderate management costs.
Montane willow scrub	Moderate – Small management areas with high management costs.
Open mosaic habitats on previously developed land	Low – Small management areas with moderate management costs.
Mesotrophic loch	Low – Small management areas with moderate management costs.
Arable field margin	Low – Small management areas with low-moderate management costs.
Reedbed	Low – Small management areas with low management costs.
Lowland heathland	Low – Small management areas with low management costs.
Lowland meadow	Low – Small management areas with moderate management costs.
Upland hay meadow	Low – Small management areas with low management costs.
Lowland calcareous grassland	Low – Small management areas with moderate management costs.
Eutrophic standing water	Low – Small management areas with low management costs.
Coastal Saltmarsh	Low – Small management areas with low management costs.
Saline lagoon	Low – Small management areas with low management costs.

Special Areas of Conservation and Sites of Special Scientific Interest

The priorities in managing existing areas of open habitat are the SAC's and SSSI's. Here FES will maintain open habitat notified features that are currently in favourable condition and move those that are currently in unfavourable condition into unfavourable recovering and ultimately favourable condition.

The Scottish Government had a key target of achieving 95% of notified features on designated sites (SAC, SSSI and RAMSAR) in favourable condition, or recovering with the necessary management in place, such that SNH predicts, using expert judgement that the land will in due course reach favourable condition. FES met this target for notified features on designated sites on the national forest estate by the target date of 2010 and will continue to monitor the situation and plan work to achieve a high percentage on the national forest estate.

Grazing

Grazing of open habitats is an important tool, which if managed correctly can maintain habitats in good ecological condition or improve the condition of those which are neglected. Conversely grazing which is designed to deliver other objectives, without due consideration of nature conservation can be damaging to the ecological condition of open priority habitats and in extreme cases, result in their loss. Overgrazing can cause the conversion of upland heathland into degraded acid grassland and poach blanket bogs causing negative changes in vegetation composition and loss of soil organic carbon for example.

FES lets out certain open areas for grazing and in some cases also directly manages stock to deliver specific objectives. FES will consider open priority habitat objectives in grazing leases in a prioritised programme of reviews. FES land agents or other appropriate staff will consult with the FES open habitats ecologist and forest district environment staff. Open habitat survey data for each area, where available, will be used to agree appropriate ecological objectives for the grazing programme, if open priority habitats are present. A suitable stocking type, density and period for the area will be agreed between the above parties and considered by the land agent in the lease renewal as appropriate.

For all sites where FES manages stock directly similar reviews will be undertaken to identify the environmental objectives relevant to each area and agree these with the Forest District team and FES Agricultural Adviser.

The FES HAP survey will be used to identify neglected areas of habitats where introducing conservation grazing would be most beneficial. Lowland enclosed grassland priority habitats will be considered, i.e. purple moor-grass and rush pasture, lowland dry acid grassland, lowland meadow, lowland calcareous grassland and upland hay meadow. In the uplands upland calcareous grassland will be considered. The practicalities and costs of grazing neglected examples of these sites will be reviewed by the FES

agricultural advisor and a prioritised programme for conservation grazing will be enacted where feasible.



Conservation grazing of Purple Moor-grass and Rush Pasture using Highland Cattle, Blackwater Marshes SSSI, Cowal & Trossachs Forest District. Jeff Waddell, 21st July 2011.

Where deer are the main grazers, the FES Deer Management Officers (DMO's) will be involved in similar reviews with Forest District Environment staff and the open habitats ecologist. Resulting Deer population targets will be embedded in Deer Management Plans.

Habitat survey management recommendations

The FES HAP survey since 2009 has collected standardised observations on threats to priority habitats, both in the general survey mapping open priority habitats and the section highlighting particularly important examples of habitats. These observations are not particularly detailed and are not prioritised beyond a subjective high/medium/low threat level based on the surveyors opinion. They do however flag up issues that need to be considered and if appropriate action taken to remove or reduce the threat to priority habitats.

The habitat survey so far has highlighted that coniferous regeneration is the most common threat to open priority habitats. Invasive species (primarily *Rhododendron ponticum*) and problems related to herbivore impacts, i.e. high deer numbers or domestic stocking levels are also fairly frequently recorded as threats.

The environment lead for each forest district will monitor the threats affecting open priority habitats in each forest as information becomes available and incorporate appropriate action into relevant plans. The work required to tackle these threats will be prioritised and enacted as resources allow. Threats to habitats recorded in the section highlighting particularly important examples of habitats will usually be prioritised for action first.

Open priority habitat restoration

Open priority habitat restoration from plantation forestry is an important part of FES's conservation work. It tends to be relatively expensive in comparison to work to maintain the extent and condition of existing open priority habitats. In many cases it will involve uneconomical felling, i.e. where the income from timber is less than the cost of harvesting it due to poor tree growth. These situations tend to be the best ecological opportunities for bog restoration for example, due to the relatively reduced modification of bog hydrology by forestry.

Work to maintain the extent and condition of existing open priority habitats described elsewhere will tend to be a higher priority than open habitat restoration, not only due to cost effectiveness but also due to ecological priority. Existing habitats of high ecological importance tend to be more important than the potential value of equivalent restored habitats. Restored habitats often retain lasting impacts on their condition due to historic forestry management.

There are however notable exceptions to the above and the following considerations apply:

- 1) Priority habitats which have had a significant percentage of their previous total extent lost to historic afforestation, and/or
- 2) Priority habitats for which the afforested area on the national forest estate is much greater than the open area, and/or
- 3) Priority habitats where worthwhile examples can be restored from forestry plantations.
- 4) Priority habitats which if restored would also deliver other benefits, i.e. ecosystem services.

In all restoration cases the benefits of woodland removal will outweigh the benefits of retaining woodland cover.

Relevant priority open habitats will have programmes for restoration drafted to consider restoration opportunities and priorities in line with the Scottish Government's policy on the control of woodland removal. Those areas which are least affected by afforestation and which, if restored would create good examples of open priority habitats are generally the most suitable for restoration. If other objectives, such as soil carbon storage in the case of bog restoration can be delivered, this can also add to the case for restoration.

If the above considerations are applied to open priority habitat restoration on the national forest estate in Scotland, three open priority habitats in particular appear most suitable, i.e. lowland raised bog, blanket bog and coastal sand dunes. These three habitats will therefore be the main strategic priorities for open habitat restoration. Significant areas of these habitats were planted up decades ago when society and government had different objectives. The importance of nature conservation and climate

change were less well known and a strategic timber reserve was an urgent priority. In current times these habitats are much less likely to be considered suitable for planting, on account of their high biodiversity value, carbon storage importance and often poor soil conditions for tree growth.

Within each of the above three open priority habitats there is a complex range of conditions which means that some sites are better candidates for restoration than others. Restoration costs also vary between individual sites on account of the different work required for restoration. The most degraded sites are not suitable candidates for restoration on account of the high restoration cost and potential low ecological value of the restored habitat.

FES will draft strategic action plans for the above three habitats primarily dealing with restoration. Candidate restoration sites will be assessed for each habitat, prioritised for restoration and restoration prescriptions described. As there are many potential restoration sites for each habitat and the cost of operations is often expensive, work will be prioritised and progress as funding allows.

Lowland raised bogs will be dealt with first and a plan is already complete and being enacted. Coastal sand dunes will be dealt with next and blanket bogs will be dealt with last. Existing partnership work between FC, SNH and RSPB has progressed on the latter habitat already in the Flow Country. Any current or planned restoration work for obviously high priority sites will not be delayed in the meantime because of the lack of strategic plans, but should be discussed with the FES Open Habitats Ecologist.

As always, ecological assessments of habitat quality, both current and potential, will inform the priority order of restoration, within each strategy.

Open priority habitat restoration tends to be subject to the problem of tree regeneration. Once a plantation is felled to restore open priority habitat there tends to be an initial phase of prolific tree regeneration. This is usually labour intensive and expensive to deal with and may take years to control properly and thus successfully restore the open habitat. FES will investigate ways for dealing with this problem, in a bid to deal with it more efficiently.

In the case of both blanket bogs and lowland raised bogs the problem of peat cracking is also a serious consideration. The drying effects of forestry, drainage and peat cuttings if present can seriously compromise the hydrology of the habitat. The mechanism for this is the formation of sub surface peat cracks, through the above drying effects. The longer the site is left un-restored, particularly if the trees are growing well, the more likely cracks are to form. The process is progressive and will reach a point where it becomes impossible to restore a functioning bog hydrology even if the trees are removed and ditches dammed.

Although the above three habitats are suitable for a strategic approach to habitat restoration there are other open priority habitats where restoration may also be appropriate and these are best dealt with on a site by site basis, i.e. individual opportunity basis. These include the very rare habitats such as coastal vegetated shingle at Lossie Forest Moray and limestone pavement plus associated upland calcareous

grassland at Lassintullich Forest in Rannoch. They also include habitats which are generally not suitable for restoration, but where exceptions may occur, for example some very wet fens where drainage has failed may not be too adversely affected by afforestation and provide important habitats if restored.

Managing existing open priority habitats

Managing open priority habitats on the national forest estate in the uplands

Upland heathland and Blanket Bog

These habitats are relatively widespread on a Scottish scale, but very restricted globally, with a relatively high proportion of their area in Scotland. The focus of conservation work for these habitats will be on removing non native regeneration, including exotic conifers and *Rhododendron ponticum* primarily. Native tree species regeneration will also be tackled on blanket bogs in cases where conversion to native woodland would result in the loss of a more valuable open habitat, i.e. most cases except where bog woodland formation would be beneficial. Due to the large extent of the habitats, the amounts of regeneration and cost of clearing it this work will need to be prioritised in each district. Sites designated for upland heathland or blanket bog interest will be tackled first, afterwards areas where regeneration affects the less common heathland communities or good examples of blanket bogs, will be tackled next using threats to important habitats highlighted in the FES HAP survey. Once the above priority sites have been tackled the work can be extended if resources allow to removing non native coniferous regeneration from the rest of the resource.

Grazing leases will be reviewed in all areas affecting these habitats. If necessary and possible, grazing leases will be modified to deliver benefits to habitat condition. Muirburn will continue on the Arran Moors SPA following the muirburn code and designated sites management plan. This is the only area of upland heathland on the NFE with a significant and continuous programme of muirburn. Bracken encroachment of upland heathland will be monitored through repetition of the FES HAP survey where required on a (roughly) ten year basis. Control will be considered in areas where encroachment is identified by survey or staff observations.

Areas of existing plantation will not normally be considered for upland heathland restoration on the basis of that objective alone and there will be no strategic programme for upland heathland restoration from plantation. The habitat is widespread in open areas and the focus of conservation work will be on maintaining these. There may be individual cases where relatively small scale restoration from plantation is carried out, for example to connect existing high quality examples of the habitat. Restoration of upland heathland may be a secondary objective in areas felled for wind farms and should be a consideration in such schemes where ecologically appropriate. Suitable sites where plantation can be felled to create worthwhile blanket bog will be considered as part of a strategic programme for restoration. The strategic programme for blanket bog habitats will also prioritise sites for blocking drains and moor grips. Until the strategy is produced individual sites can be restored on a case by case basis provided these have been assessed as worthwhile candidates by an appropriate ecologist.

Upland flush, fen and swamp

This is a variable habitat and conservation action will need to be targeted at the best examples and rarest types accordingly. Again regeneration can be a problem and a similar control programme will need to be delivered on the most important sites at least. In the case of this habitat sites will also need to be protected from native species regeneration in cases where conversion to native woodland would result in the loss of a more valuable open habitat.

Those open sites which have been adversely affected by drainage will be identified through the FES HAP survey and the most important examples prioritised for ditch blocking etc as resources allow.

Grazing leases will be reviewed in all areas affecting these habitats. If necessary and possible, grazing leases will be modified to deliver benefits to habitat condition.

There will be no strategic programme for upland flush fen and swamp restoration from plantation as most afforested examples will have had their hydrology permanently destroyed by afforestation. There will be some exceptions to this, i.e. the very wet basin fens and valley fens where historic forestry drainage and tree growth have failed. These sites will be identified by conservation staff. The relatively small number of good opportunities will be restored once they have been confirmed as such by an appropriate ecologist.

Nutrient enrichment arising from forestry operations including harvesting may be an issue in some important fen catchment areas and if so will need to be reduced. In some cases the succession of non woody vegetation may be an issue, for example the spread of Common Reed into sedge fen habitat hosting rare plant species.

Oligotrophic and dystrophic lochs and rivers

No specific guidance is given for these habitats here as measures to protect these habitats are included in the [Forests and Water Guidelines](#).

Inland rock and scree habitats

Most examples are presumably in relatively good condition because of a relative lack of grazing and burning. Grazing, particularly deer impacts, and coniferous regeneration will be an issue on some sites and any cases identified by survey or staff observations will be prioritised for action as resources allow.

Montane heath and willow scrub

Montane heaths are threatened by overgrazing and trampling, all-terrain vehicles, burning, nitrogen deposition and climate change. There is no site specific action FES can take to tackle the latter two factors and overgrazing is probably the most common threat. For grazing leases which affect montane heath the condition of the habitat will be

considered. If necessary and possible the grazing prescriptions will be changed to reduce damage to the habitat. If deer grazing levels are an issue then the DMO will include appropriate action in deer management plans.

In a small number of sites, such as the Merrick in Galloway for example, illegal recreational use of all terrain vehicles may be damaging the habitat. FES will cooperate with the police in tackling this issue.

Montane willow scrub is an extremely rare habitat, with only eleven recorded sites on the NFE. FES will survey these in detail to identify the alpine Willow species, count the populations of each and assess the condition of the habitat. If browsing is identified as a threat at any site appropriate measures will be taken to reduce its impact if at all possible. Where possible material will be propagated to form an ex-situ conservation collection which will be used to increase existing populations or create new populations at appropriate sites.

Upland calcareous grassland

The main threat to this habitat on the NFE is thought to be under grazing. Low grazing levels or lack of grazing results in a build up of vegetation litter and soil nutrients, creating a rank, relatively species poor sward. This can benefit some species such as palatable tall herbs, but in most cases is undesirable in conservation terms. For grazing leases which affect upland calcareous grassland the condition of the habitat will be considered. If necessary and possible, grazing prescriptions will be modified to benefit the condition of the habitat. For currently neglected sites, where it is ecologically appropriate to do so, FES will endeavour to introduce appropriate conservation grazing.

Mesotrophic loch

Measures to protect this habitat are included in the [Forests and Water Guidelines](#). Eutrophication, primarily during and after harvesting operations could potentially be a threat to this habitat. There are only a few examples of this habitat on the NFE, or on which the NFE forms a major portion of the catchment. In these cases low impact ground preparation methods for planting or restocking, such as mounding or other methods will be used. Following the Forests and Water Guidelines will deliver favourable status for this habitat. Additional measures during and after harvesting operations could be considered in certain cases, such as using straw bales in drainage ditches.

Limestone pavement

At Lassintullich Forest in Rannoch a significant area has been clear felled to restore this habitat. Brash will be removed from sensitive parts of the site and appropriate grazing introduced. Suitable conservation grazing will also be introduced for this habitat at Benmore Forest and woodland expansion avoided. The management requirements of the example at Broadford are not currently known, but will be investigated.

Calaminarian grassland

There is only one example of this very rare habitat on the NFE at Blackwater Forest in Moray. The focus for conservation of this habitat will be on protecting it from damage from quarrying and forestry vehicles. FES aims to expand this habitat by quarrying to create new serpentine exposures, perhaps the first time ever attempts have been made to deliberately expand this habitat.

Managing open priority habitats on the national forest estate in the lowlands

Lowland raised bog

As discussed elsewhere in this document this habitat is one where a relatively large proportion of its total area has been afforested historically. Significant areas of forest on the NFE are currently in the process of restoration to open lowland raised bog habitat at Longbridgemuir near Dumfries and Flanders Moss near Aberfoyle and a large programme of ditch blocking has been delivered at Coalburn Moss SAC in South Lanarkshire, so much important work is already underway.

A FES lowland raised bog strategy has been produced, which outlines the conservation priorities for this habitat. It includes a prioritised list of sites for restoration and the development of a similar list of currently open sites requiring scrub control and ditch blocking measures. Conservation grazing will be introduced on some appropriate sites where this would deliver benefits to the condition of the habitat including helping to control tree regeneration.

Lowland fen

The main factors affecting this habitat on the national forest estate are historic drainage, scrub invasion and in some cases lack of grazing or nutrient enrichment. The focus of work for this habitat will be on existing open areas as in most cases the hydrology of historically afforested examples is beyond worthwhile restoration. In a few cases however, including very wet valley or basin mires where drainage and tree growth have failed there may be exceptions that are worthy of restoration.

This is a variable habitat with a wide range of topographies and vegetation communities. The most important examples will be identified through the FES HAP survey and staff observations and conservation programmes delivered on a site by site basis. In most cases this work will consider restoring a natural hydrology through ditch blocking if ditches are present. Vegetation control will also be an issue on most sites, including controlling unwanted tree regeneration. Native tree species regeneration will also be controlled where the ecological importance of the open habitat is deemed to be more valuable than the creation of wet woodland habitat by an appropriate vegetation ecologist.

Nutrient enrichment arising from forestry operations including harvesting and ground preparation could be an issue in some fen catchment areas and may need to be reduced. In some cases the succession of non woody vegetation may be an issue, for example the spread of Common Reed into sedge fen habitat hosting rare plant species. Most examples will be un-grazed and unless the site has been grazed historically and/or grazing would deliver conservation benefits grazing will not be considered.

Unimproved enclosed lowland grasslands (i.e. Purple moor-grass and rush pasture, Lowland dry acid grassland, Lowland meadow, Upland hay meadow and Lowland calcareous grassland)

The FES HAP survey and staff observations will be used to identify neglected areas of the above habitats. The practicalities and costs of grazing neglected areas will be reviewed and a prioritised programme for conservation grazing will be enacted, where feasible. For grazing leases which currently affect these habitats the condition of the relevant habitats will be considered. If necessary and possible the grazing prescriptions will be changed to deliver benefits to the maintenance and condition of the habitat.

Lowland heathland

This is not a common or extensive habitat on the NFE in Scotland. The relatively small number of sites are best considered on a case by case basis, rather than the subject of a national strategy.

The focus of conservation work for this habitat will be controlling tree and scrub regeneration to maintain existing areas of the habitat. A small number of cases may be appropriate for restoration of the habitat from existing forest, especially where this would enlarge existing open areas of the habitat, for example at Devilla Forest near Clackmannan. Grazing the small extents will be difficult and perhaps not ecologically desirable unless suitable grazing could be introduced, that reduced tree regeneration but not the cover of dwarf shrubs.

Open mosaic habitats on previously developed land

The focus of work for this habitat will be ensuring that new planting in and around urban areas will avoid examples of this habitat with significant biodiversity interest. There are few examples of this habitat currently on the NFE and perhaps only a small amount of these have significant biodiversity interest, therefore direct conservation work will only occur on a very few sites. This will involve creating and maintaining early successional habitats through regeneration control and perhaps also some controlled disturbance if ecologically appropriate. Examples on disused railways will be protected from forest track development as far as possible.

Reedbeds

As no significant examples of the habitat are currently known, no work is planned.

Eutrophic standing waters

As no significant examples of the habitat are currently known, no work is planned. Measures to protect this habitat are included in the [Forests and Water Guidelines](#).

Ponds

There are many ponds on the NFE but it is currently unknown how many of these qualify as examples of the priority habitat because the definition is complex. Specific survey work to assess against the BAP criteria, in areas with ponds suspected to be of high nature conservation importance could therefore be useful.

In some areas of the NFE many ponds have been created over the last few decades which have added useful habitat and species interest in areas that would otherwise be lacking in this respect. Recently opened up areas on the edges of restock sites, which were previously forested for example. Further pond creation along these lines will be encouraged where inexpensive and particularly where it could deliver benefits to uncommon/rare species or result in species rich ponds.

Pond creation work should only be undertaken after the existing habitat and species value of the site has been assessed, so as not to damage existing ecological interest. There will be less of a need for ecological assessments on areas which were previously plantation, but areas which are existing open habitats (particularly existing wetlands), will need botanical assessments confirming low habitat and botanical interest before ponds are dug.

Arable field margins

There are few examples of this habitat on the NFE and those that do occur are usually only transiently present on lowland acquisitions, before afforestation. There is scope to maintain or create valuable arable wildflower habitat in open areas including along the edges of new planting in this situation. This would be a new and novel combination of habitats, but there is no ecological reason why high arable wild flower interest cannot be delivered in open ground particularly around the edges of new forestry planting. Only one acquisition site has been identified so far where there is good scope to create this habitat, Gourdie Forest near Dundee, on account of its relatively rich arable flora and recent acquisition. It is suggested here that some of the margins are left open and ploughed annually, with no herbicide applications or sowing to create a rich example of this habitat. The development of this habitat will also be encouraged as appropriate on FES starter farms.

Managing open priority habitats on the national forest estate on the coast

Coastal sand dunes

The most important topic for work in this area will be on maintaining existing areas of open dune, i.e. protecting these areas from scrub invasion. Work will be prioritised to target the most ecologically important areas first and proceed as resources allow. The ecological value of scrub will be considered before removal as some stands may be ecologically important.

A significant area of this habitat was lost to historic afforestation and therefore a strategic national plan will be developed for restoring this habitat from plantation in key areas. Restoration will be focussed on dunes which are most likely to develop natural geomorphological processes and/or which are thought to be capable of developing the most valuable dune habitats. Some plantations on dunes have developed significant habitat and species interest and these will need to be carefully considered to avoid dune restoration in inappropriate areas. Restored dune areas will likely suffer from recurrent regeneration and this will need to be tackled.

Grazing may be considered in some areas if ecologically appropriate and practical. Dune woodland of native broadleaved tree species will be considered as a habitat and if ecologically appropriate developed on some sites.

Maritime cliff and slope

The extent and condition of this habitat on the NFE is currently poorly known and no suitable sites for conservation work have yet been identified. Removal of grazing and subsequent vegetation changes including scrub control are probably the main threats in Scotland. There may be some sites where FES can consider scrub control and grazing. Hard engineering and development threats to this habitat appear to be less of an issue in Scotland in most areas.

Coastal saltmarsh

Only very small extents of this habitat occur on the NFE and any threats they face are poorly known and probably largely out with the control of FES.

Coastal vegetated shingle

One large example is currently known on the NFE at Lossie Forest, Moray. This has recently been the subject of scrub control work. Similar work will progress as agreed with SNH in the SSSI management plan.

Access and interpretation

The open habitats on the national forest estate are a great asset to the people of Scotland and those who visit in terms of their recreational and aesthetic qualities. The dunes and beach at Tentsmuir Forest are often busy with visitors in the summer months for example. The more remote and rugged terrain of Glen Affric and Glenmore Forests offer opportunities to explore upland and mountain habitats for the more adventurous, or, at the very least, form an important part of an inspiring view to the casual sightseer.

The public recreation benefits provided by the open habitats on the national forest estate will be considered. Suitable sites, which are ecologically robust, will be sensitively developed to facilitate public access and enhance the visitor experience. Interpretation of open habitats will also be considered for some sites, where good opportunities exist to do so.

Priorities for the future

The below list summarises some of the key areas of FES's conservation work on open habitats and provides targets and dates where appropriate.

FES HAP Survey all acquisitions and other new planting areas to inform purchase (if possible) and design plan.	Ongoing.
Maintain at least 95% of notified features on designated sites in favourable or unfavourable recovering condition.	Ongoing.
Deliver at least 32 open habitat conservation advisory days to Forest Districts each year.	Ongoing.
Embed open habitat conservation management in Forest Design Plans and Work Plans, based on advisory work and survey.	Ongoing.
Review open habitat objectives in grazing leases.	Ongoing.
Publish FES Lowland Raised Bog Strategy.	2012
Publish FES Coastal Sand Dune and Shingle Strategy.	2013
Complete survey of Montane Willow Scrub on the national forest estate.	2014
Open habitats training course for forest district environment staff.	2014
Publish FES Blanket Bog Strategy.	2015
Publish FES grazing strategy for lowland enclosed grassland and upland calcareous grassland.	2016
Complete open habitat survey of all FES managed open ground.	2019
Complete GIS capture of open habitat survey of all FES managed ground.	2020 ³

As the conservation priorities for open priority habitats on the national forest estate are fairly well established, the current guidance is likely to remain relevant for a number of years. It is therefore recommended that a substantial review of the current strategy will not be required until 2022 and thereafter on a ten year basis.

As policies affecting open habitats are likely to change and adjust over time and as we are increasingly understanding the nature of open habitats on the national forest estate as more survey data becomes available, it is suggested the strategy should have a minor review every five years, the next being in 2017.

³ Work on data capture has already begun. Survey data will usually be captured the year after survey and made available the year after digitisation at the latest, and before each forest design plan is reviewed if possible.

Appendix 1: A summary description of open priority habitats on the national forest estate

Open priority habitats on the national forest estate in the uplands

Upland heathland

The most abundant open priority habitat on the NFE in Scotland is upland heathland, which probably occupies much greater than 50% of the open hill ground. In the relatively dry climate of the east the heathland is “dry heath” and dominated by dwarf shrubs, predominantly Heather. Observations from the FES open habitats ecologist and FES habitat survey contractors indicate the dry heath on the NFE often has a higher cover of dwarf shrubs than the average extent of dry heathland out with the NFE and in that respect is in good condition, i.e. it has been less subject to grazing and burning, which can reduce the extent of dwarf shrubs. By a similar mechanism, lack of trampling, there can also be a high cover of lichens, particularly in the north-east, compared with privately managed dry heath. There are of course exceptions to this generalisation.

In the west “wet heath” prevails, with Deer-grass and Purple-moor-grass co-dominating the vegetation with dwarf shrubs. Again, dwarf shrub cover can be relatively high under low grazing pressure, indicating good condition heath, but conversely Purple Moor-grass can become dominant with lack of grazing, degrading the condition of the heathland. The above dry heath/wet heath pattern is repeated throughout most of the upland heathland extent, but there are also variations on the theme, where the less common heathland vegetation communities add to the diversity. There are wet heaths flushed with calcareous ground water in Glen Roy Forest, Lochaber and a scattering of small extents of base rich dry heath with Wild Thyme *Thymus polytrichus* in several sites.

FES has a stake in managing seven SAC's and three SSSI's with notified upland heathland interest features. The relevant SAC's are Ben Nevis, Sunnart in Lochaber, Merrick Kells in Galloway, the Cairngorms, Kinloch and Kyleakin Hills on Skye and the Strathglass Complex in Inverness-shire all of which are designated for their “dry heaths” and “wet heathland with Cross-leaved heath”. Caithness and Sutherland Peatlands are designated for “wet heathland with Cross-leaved heath” only.

The relevant SSSI's are Ben Lomond in the Trossachs, Kielderhead in the Borders and Kinloch and Kyleakin Hills, all are designated for “Sub-alpine dry heath”. The latter is also designated for “Sub-alpine wet heath”.

Blanket bog

Blanket bog is the second most abundant open priority habitat on the NFE in Scotland and perhaps occupies 20-35% of upland open areas. It can be locally abundant forming large extents in the west and north. It also extends to the south and east in smaller, but still significant amounts. In the east the blanket bog is often co-dominated by Heather, Hare's-tail Cottongrass and *Sphagnum capillifolium*. In the west similar vegetation occurs, but there are also wetter examples with Deer-grass and *Sphagnum papillosum*. There are some particularly fine examples of blanket bog on the NFE, Lon Leanachan in Lochaber for example has an important patterned mire where two of the rarer Bog-mosses, *Sphagnum austinii* and *S. fuscum* are frequent.

FES has a stake in managing eight SAC's, twelve SSSI's and two RAMSAR sites with notified blanket bog interest features. The relevant SAC's are the Merrick Kells in Galloway and Caithness and Sutherland Peatlands both designated for "blanket bog" and "depressions in peat substrates". The Cairngorms, Ben Nevis, Kinloch and Kyleakin Hills on Skye and the Strathglass Complex in Inverness-shire are all designated for "blanket bog". Monadh Mhor on the Black Isle and the Strathglass Complex are notified for "bog woodland", a habitat with an element of blanket bog. Dun Moss and Forest of Alyth Mires near Blairgowrie are designated for "active raised bog", which is best considered within the blanket bog habitat as its an upland raised bog or intermediate bog.

The following SSSI's are designated for "blanket bog": Ben Klibreck, Grudie Peatlands, West Borgie and West Strathnaver in the north Highlands; Blood Moss, Cairnsmore of Fleet, Ellergower Moss and the Merrick Kells in Galloway; Forest of Alyth Mires; Kielderhead Moors in the Borders and Lon Leanachan in Lochaber. Blanket Bog interest features are the most represented open habitat within SAC's and SSSI's on the NFE. The two RAMSAR sites designated for "blanket bog" are Silver Flowe in Galloway and the Caithness and Sutherland Peatlands.

Upland flush, fen and swamp

Upland flush, fen and swamp is also widespread and frequent, but typically occupies small extents and perhaps occupies less than 5% of the upland open areas. This habitat contains a wide range of mire types from stony bryophyte flushes and springs to valley and basin mires on deep, fen peat. Most of the examples on the NFE will be acid flushes of the Star Sedge-Bog-moss type, including those dominated by Rushes. There are several notable occurrences of the rarer mire types and these often have considerable vegetation and species interest. Redfordgreen Forest in the Scottish Borders has mesotrophic basin mire fens with the nationally rare Narrow Small-reed and nationally scarce Fibrous Tussock-sedge for example.

FES has a stake in managing six SAC's and eight SSSI's with notified upland flush fen and swamp interest features. Amongst the SAC's The Cairngorms and Ben Nevis are designated for "high altitude plant communities associated with areas of water seepage". Onich to North Ballachulish Woods in Lochaber and Mortlach Moss in Aberdeenshire are designated for their "base rich fens". Caithness and Sutherland Peatlands and Monadh

Mhor are notified for their “very wet mires often identified by an unstable “quaking” surface”.

Amongst the SSSI's four sites are notified for “springs (including flushes)”: Kinrive – Strathroy in north Highland; Loch Battan, near Inverness, Pass of Lenny Flushes in the Trossachs and Schiehallion in Rannoch. Additionally Loch Battan is also designated for “open water transition fen” and “valley fen”, whilst Mortlach Moss in Aberdeenshire is designated for “basin fen” and Onich to North Ballachulish woods and shore are designated for “alkaline fen”.

Oligotrophic and dystrophic lochs plus rivers

Oligotrophic and dystrophic lochs are also widespread with many examples in the north and west. Rivers are also widespread. Three SAC's are designated for lochs types which overlap the trophic range of this priority habitat: Taynish and Knapdale Woods in Argyll, The Merrick Kells in Galloway and Caithness and Sutherland Peatlands SAC are all designated for “clear water lochs with aquatic vegetation and poor to moderate nutrient levels” the former two SAC's are also designated for “acid peat-stained lochs and ponds”. Within SSSI's Four sites are designated for “oligotrophic loch”, i.e. Ben Klibreck, north Highland; Black Water Marshes in the Trossachs; Loch Eck in Cowal and Loch Shiel in Lochaber. Knapdale Woods designated for “loch trophic range” also probably includes oligotrophic loch habitat.

Inland rock and scree habitats

Inland rock and scree habitats are scattered, mainly in the north and west, but usually only occupy small areas of cliff ledge or scree. The specific habitats included in this type include the base rich rocks with Spleenwort fern species at Glen Elg Forest, Lochalsh and the tall herb nutrient rich ledges with Globeflower and Melancholy Thistle at Loch Shiel, Lochaber.

There are three SAC's and three SSSI's with notified features relevant to this habitat. Amongst the SAC's Ben Nevis is designated for its “plants in crevices in base rich rock”, “tall herb communities” and “base rich scree”; The Strathglass Complex in Inverness-shire is designated for the former two features plus “plants in crevices in acid rock” and “acidic scree”, whilst the Merrick Kells in Galloway is designated for the latter two features.

The SSSI's are Ben More – Stob Binnean, near Crianlarich, designated for “tall herb ledge”; Haw Craig – Glenarbuch in the Kilpatrick hills, designated for “inland rock” and Kinnoull Hill by Perth, designated for “rocky slopes”.

Montane heath and willow scrub

Montane heaths and willow scrub are two distinct high altitude priority habitats, lumped together in the UKBAP. Montane heaths are quite local, restricted to high altitudes. Perhaps the most extensive example on the NFE is on the Clunes Hills, Lochaber, where

Woolly-fringe Moss dominates windswept summit ridges. There are also examples elsewhere including at Glenmore Forest, Speyside. Both of these sites have Trailing azalea amongst their alpine flora. Further north the habitat occurs at relatively low altitudes, for example there is Arctic Bearberry heath at Achnashellach and procumbent Heather heath at Benmore Forest, North Highland.

Two SAC's are designated for features within this habitat: the Merrick Kells in Galloway for its "montane acid grassland" and the Kinloch and Kyleakin hills on Skye for its "alpine and subalpine heaths".

Four SSSI's are designated for montane heaths: Schiehallion in Rannoch is designated for its "montane assemblage". Kinloch and Kyleakin Hills on Skye; Ben Klibreck in north Highland and Ben More – Stob Binnean, near Crianlarich are all designated for "alpine heath". The latter site is also designated for "alpine moss heath and associated vegetation". The notified alpine heath features probably do not occur on the portion of the SSSI on the NFE in all the above cases however.

Montane willow scrub is rarer still, restricted to a very few small populations of alpine willow species in corries or on crags. There are eleven recorded sites in total distributed as follows: Cowal & Trossachs Forest District (four sites), Galloway Forest District (two sites), Tay Forest District (two sites), Inverness Ross & Skye Forest District (one site), West Argyll Forest District (one site) and Lochaber Forest District (one site). Some of the sites are made up of more than one population of alpine willows. It is likely there will be other currently unknown sites on the NFE, but even so the number of sites and total extent of this habitat will still be extremely small. The main species is Downy Willow with fourteen recorded populations; Whortle-leaved Willow has four recorded populations whilst Mountain Willow and Wooly Willow have one recorded population each. No SSSI's on the NFE are designated for montane willow scrub.

Upland calcareous grassland

Upland Calcareous Grassland is another local and scattered habitat. Lack of grazing in upland areas has probably reduced the extent and condition of this habitat on the NFE, but several examples do exist such as at Strathyre West Forest in the Trossachs and Benmore, North Highland. The most significant known example occurs at Allean Forest in Perthshire. The distribution of this habitat is currently poorly known, so other important examples may occur.

Two SAC's have relevant notified features, both Ben Nevis and the Cairngorms SAC are designated for "species rich grassland with Matt-grass in upland areas". Only one SSSI, Schiehallion in Rannoch is designated for its "sub-alpine calcareous grassland".

Mesotrophic loch

Mesotrophic Lochs i.e. lochs with middle levels of the main plant nutrients, but which can often have relatively high levels of minor nutrients such as calcium, are rather rare but examples exist in the Scottish Borders, Tay and West Argyll.

Three SAC's are designated for "clear water lochs with aquatic vegetation and poor to moderate nutrient levels": the Merrick Kells in Galloway, Caithness and Sutherland Peatlands and Taynish and Knapdale Woods SAC. Mesotrophic lochs may not necessarily be present within these SAC's on FES managed land, as the notified feature covers both mesotrophic and oligotrophic lochs.

FES has a stake in managing three possibly relevant SSSI's the Lake of Menteith SSSI designated for its "mesotrophic loch". Knapdale Woods and Morton Loch are both designated for their "loch trophic range", which may include mesotrophic loch habitat.

Limestone pavement

Limestone Pavement is extremely limited in extent and only occurs in three areas Rannoch in Lassintullich and Allean Forests; Benmore Forest in North Highland and Broadford Forest, Skye. Species such as the nationally scarce Hair-sedge are present. Lassintullich includes part of the Schiehallion SSSI, designated for its "limestone pavement" interest feature.

Calaminarian grassland

Calaminarian Grassland i.e. sparse vegetation on rocks rich in heavy metals is known from one site only in Blackwater Forest, Moray, where a relatively large area of this habitat is present. No SAC's or SSSI's on the NFE are designated for Calaminarian grassland.

Open priority habitat types on the national forest estate in the lowlands

Lowland raised bog

Lowland raised bogs are local in the south and east occupying medium to small areas, with most examples being afforested. The four largest areas of this habitat are: Lochar Mosses (Dumfries), the Flanders Moss complex (Aberfoyle), Carnwath Mosses and Coalburn Moss (both Lanarkshire). The latter is the largest open area of this habitat, the previous three are afforested or in restoration.

FES has a stake in managing three SAC's and five SSSI's relevant to this habitat. The SAC's are Solway Mosses North near Dumfries, Coalburn Moss in South Lanarkshire and North Shotts Moss in the central belt all of which are designated for both "active raised bog" and "degraded raised bog".

The following SSSI's are designated for "raised bog" interest in the lowlands: Coalburn Moss in South Lanarkshire; Longbridgemuir near Dumfries; Loch Macanrie in the Trossachs; Lockshaw Moss in Fife and Hassockriggs and North Shotts Moss.

Lowland fen

Lowland fens are fairly uncommon with a widespread scattered distribution. There are a few relatively large examples such as Blackwater Marshes in the Trossachs and Kyle of Sutherland Marshes, both of which are SSSI's. Non designated examples elsewhere include valley mire fens at Old Merdrum near Rhynie, Banchory Woods, Deeside and Strathyre in the Trossachs. Glen Righ in Lochaber has an outstanding example of a lowland valley mire fen.

FES has a stake in managing one SAC and eight SSSI's relevant to this UKBAP habitat type. The single SAC is Dam Wood in the Black Isle designated for its "base rich fen". Amongst the SSSI's three of these sites are designated for "Flood-plain fen", i.e. Black Water Marshes in the Trossachs; Loch Eck in Cowal and Kyle of Sutherland Marshes. South Laggan Fen in Lochaber; Black Water Marshes and Loch Lubnaig in the Trossachs are designated for "Open water transition fen". Loch Macanrie in the Trossachs and Spey Bay in Moray are designated for "Hydromorphological mire range" and Dargavel Burn near Greenock is designated for its "valley fen" interest.

Purple moor-grass and rush pasture

Purple Moor-grass and Rush Pasture is probably the most abundant unimproved lowland grassland habitat, although it is not common, being widely scattered with generally small extents. The only extensive example is in the Kyle of Sutherland, but important examples also occur at Strathyre and Blackwater Marshes in the Trossachs and Yair in the Tweed Valley. The Kyle of Sutherland site is designated as a SSSI for its "floodplain fen" which includes extensive areas of fen meadow, within the Purple Moor-grass and Rush Pasture habitat type. There are no relevant SAC's on the national forest estate.

Lowland dry acid grassland

Lowland dry acid grassland is quite uncommon occupying widely scattered small areas only. There are small un-grazed extents of this habitat in lowland forest clearings near Aberdeen. A relatively large example of several hectares occurs at Thornylee in the Tweed valley, which has had conservation grazing recently reinstated. No SAC's or SSSI's on the National Forest Estate are designated for Lowland dry acid grassland.

Lowland meadow

Lowland Meadows are very rare and possibly no unimproved examples exist. A moderately species rich semi-improved example of neutral lowland grassland occurs on the Water of Ae, Dumfriesshire. There is also another example on the Water of Minnoch, Shalloch Forest, Galloway. Perhaps the best site is at Savary Bridge, Lochaline South Forest in Lochaber. No SAC's or SSSI's on the National Forest Estate are designated for lowland meadow habitat.

Upland hay meadow

No examples of this very rare habitat are known, which occupy a whole field, instead small patches are present along river banks in a couple of areas. The finest known examples occur in Glen Righ, Lochaber where there are many small species rich patches, adding up to a significant area along the banks of one river. Elsewhere it has been recorded at Glen Doll. There is also an area of unmanaged neutral grassland in the Tima Valley, Dumfriesshire, which may be derived from this habitat. There are no designated examples present.

Lowland calcareous grassland

Lowland calcareous grassland is an extremely rare habitat with probably less than a hectare occurring. Two sites are known, one at Thornylee in the Tweed Valley and one at Craik near Hawick, both of which have Common Rock-rose. No SAC's or SSSI's contain this interest feature.

Lowland heathland

Lowland heathland is quite uncommon occupying widely scattered small areas only. Devilla Forest near Clackmannan has small extents of both wet and dry lowland heath for example. FES has a stake in managing two SSSI's with "lowland dry heath" interest, i.e. Kinnoul Hill by Perth and Lochmill Loch in Fife.

Open mosaic habitat on previously developed land

Open mosaic habitat on previously developed land is a diverse habitat, both in its various types and origins and its high associated species diversity. There are many small

stone quarries used to source material for forestry roads, some of which are now disused. As most of these are on acid rock they tend to be floristically uninteresting. More diverse examples include a disused sand quarry with fluctuating water levels at Heathhall Forest, Dumfries and a disused quarry with vegetated mine spoil at Croy Forest, Cumbernauld. In the Scottish Borders an old railway junction and track bed also host this habitat. No SAC's or SSSI's contain this habitat as a designated feature.

Reedbeds

Reedbeds are another rare habitat. There are probably quite a few small patches of Common Reed scattered around. Paddockmuir Forest on the Tay estuary is adjacent to the largest Reedbed in the UK, but little if any of the habitat occurs in the forest.

Eutrophic standing waters

This habitat may occur in some lowland lochs.

Ponds

There are many areas with ponds on the NFE; a large proportion of these will have been dug for conservation in the last few decades. The priority habitat description is complex and it is not currently known how many ponds meet these criteria. There is an interesting cluster of long established, apparently naturally formed ponds at the Hill of Alyth, which are floristically quite rich, containing Lesser Marshwort for example. There are also a good scatter of relatively recently created ponds in Dumfries and Borders Forest District, at least three of which contain Stoneworts, indicators of clean water conditions.

Arable field margins

This habitat is present transiently in a few new acquisitions before the site is afforested, most of these are quite species poor. Gourdie Forest, a recent acquisition near Dundee is the best known site for arable wild flowers and has the best known potential currently to maintain and develop this habitat on the NFE.

Open habitat types on the national forest estate on the coast

Coastal sand dunes

Coastal sand dunes are uncommon being restricted to the few coastal forests and occur mainly on the east coast. Much of its former extent has been afforested on the NFE, but significant open areas still exist at Culbin and Lossie Forests, Moray plus Tentsmuir in Fife. A variety of sub habitats occur including decalcified fixed dune dominated by heather and lichens; calcareous dune grassland with wild thyme and slacks with curved sedge. Some restoration of the habitat has been undertaken at all of the above sites.

FES has a stake in managing one SAC, five SSSI's and one RAMSAR site which are designated for their coastal sand dune interest. Dornoch Firth and Morrich More SAC is designated for its "coastal dune heathland" and "dunes with Juniper thickets".

The dune SSSIs are Culbin Sands, Culbin Forest and Findhorn Bay in Moray; Morrich More near Tain; Morton Lochs in Fife; Torrs Warren – Luce Sands in Galloway. Lower River Spey in Moray is designated for its "River shingle/sand". The RAMSAR notified dune interest occurs at Dornoch Firth and Loch Fleet.

Maritime cliff and slope

Maritime cliff and slope is also uncommon and is scattered in the coastal forests on the west coast and islands. No particularly notable examples are known but the habitat is currently poorly known on the NFE.

Coastal saltmarsh

Coastal saltmarsh is rare and scattered in the coastal forests including both east and west coasts. No particularly notable examples are known.

FES has a small stake in managing three SSSIs with "saltmarsh" notified interest: Culbin Sands, Culbin Forest and Findhorn Bay and Spey Bay in Moray plus Morrich More near Tain.

Coastal vegetated shingle

Coastal vegetated shingle is extremely rare globally, but one large example occurs at Lossie Forest, Moray. FES has a stake in managing one SAC and three SSSIs, all in Moray, which are designated for interest relevant to this habitat. The SAC is the Lower River Spey – Spey Bay which is notified for its "coastal shingle vegetation outside the reach of waves".

The SSSIs are Culbin Sands and Culbin Forest, Findhorn Bay and Spey Bay are both designated for "Shingle". The latter site is also designated for its "hydromorphological mire range", which includes mires formed in slacks in coastal vegetated shingle. Lower River Spey is designated for its "River shingle/sand".

Appendix 2: Illustrations of open priority habitats on the national forest estate in Scotland

Upland heathland



Extensive wet heath landscape with abundant Purple Moor-grass, Loch Trool Forest, Galloway Forest District. Jeff Waddell 2008.

Upland heathland



Wet heath with abundant Deer-grass, North Dalchork Forest, North Highland Forest District. Jeff Waddell 18th August 2010.

Upland heathland



Flushed wet heath with locally frequent Broad-leaved Cottongrass, Glen Roy Forest, Lochaber Forest District. Jeff Waddell 9th July 2009.

Upland heathland



Heather dominated dry heath with abundant lichens, Balloch Forest, Moray & Aberdeenshire Forest District. Jeff Waddell 22nd July 2009.

Blanket bog



Heather-Hare's-tail Cottongrass Blanket Bog with deep peat on steep ground, Borgie Forest, North Highland Forest District. Colin Wells, 17th October 2010.

Blanket bog



Dubh Lochan in Blanket Bog, Dyke Forest, North Highland Forest District. Jeff Waddell, 19th August 2010.

Blanket bog



Blanket bog and pool system. Rannoch Moor, Tay Forest District. Jeff Waddell, 3rd August 2011.

Upland flush fen and swamp



Extensive valley mire sedge fen, Glen Righ Forest, Lochaber. Jeff Waddell 15th September 2010.

Upland flush fen and swamp



Basin mire sedge fen, Redfordgreen Forest, Dumfries & Borders Forest District. Jeff Waddell 5th August 2009.

Upland flush fen and swamp



Basin mire sedge fen, Mortlach Moss SAC, The Bin Forest, Moray & Aberdeenshire Forest District. Jeff Waddell 21st July 2009.

Oligotrophic and dystrophic loch



Oligotrophic or dystrophic loch, Glen Affric. Jeff Waddell 22nd September 2010.

Oligotrophic and dystrophic loch



*Relatively nutrient poor Loch with aquatic vegetation including Water Horsetail.
Loch Eck, Cowal & Trossachs Forest District. Jeff Waddell, 20th July 2011.*

Rivers



*River Carron, Achnashellach Forest, Inverness, Ross & Skye Forest District. Jeff Waddell
23rd July 2008.*

Inland rock and scree habitats



Spleenwort fern crevice vegetation, Glen Elg Forest, Inverness, Ross & Skye Forest District. Jeff Waddell 22nd September 2009.

Montane heaths and willow scrub



Montane heath, Kirrereoch Hill, looking over to the Merrick, Shalloch Forest, Galloway Forest District. Ben Averis 14th September 2009.

Montane heaths and willow scrub



Alpine heathland vegetation with frequent Woolly-fringe Moss. The Merrick, Galloway Forest District. Jeff Waddell, 20th September 2011.

Montane heaths and willow scrub



Montane willow scrub, Coire Fuar, A' Chrois, Glen Croe Forest, Cowal & Trossachs Forest District. Tim Rafferty, 30th August 2010. Tall herb ledge vegetation of the inland rock and scree habitat is also present.

Upland calcareous grassland



Lassintullich Forest, Tay Forest District. Jeff Waddell 23rd July 2010.

Upland calcareous grassland



Upland calcareous grassland with abundant Wild Thyme, Lassintullich Forest, Tay Forest District. Jeff Waddell 23rd July 2010.

Upland calcareous grassland



Upland calcareous grassland with frequent Alpine Bistort, Strathyre Forest, Cowal & Trossachs Forest District. Jeff Waddell 8th July 2009.

Mesotrophic loch



Crooked Loch, Redfordgreen Forest, Dumfries & Borders Forest District. Jeff Waddell 5th August 2009.

Limestone pavement



Lassintullich Forest, Tay Forest District. Jeff Waddell 23rd July 2010.

Calaminarian grassland



Extensive outcrop of serpentine rock with calaminarian grassland vegetation, Blackwater Forest, Moray & Aberdeenshire Forest District. Jeff Waddell, 4th July 2011.

Lowland raised bog



Gow Moss, Ordiequish Forest, Moray & Aberdeenshire Forest District. Jeff Waddell 18th May 2010.

Lowland raised bog



*Coalburn Moss SAC, Lesmahagow Forest, Scottish Lowlands Forest District. Jeff Waddell
31st July 2008.*

Lowland fen



Floodplain fen, Blackwater Marshes SSSI, Achray Forest, Cowal & Trossachs Forest District. Jeff Waddell 1st September 2010.

Lowland fen



Valley mire fen, Old Merdrum, Clashindarroch Forest, Moray & Aberdeenshire Forest District. Jeff Waddell 19th May 2010.

Lowland fen



Nutrient rich lowland fen with frequent Reedmace. Weddensbury Forest, Tay Forest District. Jeff Waddell, 5th August 2011.

Purple moor-grass and rush pasture



Lesmahagow Forest, Scottish Lowlands Forest District. Jeff Waddell 8th September 2008.

Lowland dry acid grassland



Blackmiddens, Clashindarroch Forest, Moray & Aberdeenshire Forest District. Jeff Waddell 19th May 2010.

Lowland dry acid grassland



Relatively unimproved lowland enclosed grassland with abundant Pignut. Lochaline South Forest, Lochaber Forest District. Jeff Waddell, 9th June 2011.

Lowland meadow



Craigshields, Kirkland Forest, Dumfries & Borders Forest District. Jeff Waddell 25th June 2009.

Lowland meadow



Relatively unimproved, species rich neutral meadow vegetation. Savary Bridge, Lochaline South Forest, Lochaber Forest District. Jeff Waddell, 9th June 2011.

Upland hay meadow



River bank with unimproved neutral grassland on alluvial soil. Wood Crane's-bill is frequent in upland hay meadow vegetation. Glen Righ Forest, Lochaber Forest District. Jeff Waddell, 15th June 2011.

Lowland calcareous grassland



Unimproved pasture with Common Rock-rose and Wild Thyme on old ant hills. Thornilee Forest, Dumfries & Borders Forest District. Jeff Waddell, 12th September 2011.

Open mosaic habitats on previously developed land



*Disused sand quarry, Heathhall Forest, Dumfries & Borders Forest District. Jeff Waddell
25th June 2009.*

Open mosaic habitats on previously developed land



Site of old buildings with a rich ruderal flora, Gourdie Forest, Tay Forest District. Jeff Waddell 22nd July 2010.

Ponds



Pond in floodplain fen with White Water-lily, Strathyre Forest, Cowal & Trossachs Forest District. Jeff Waddell 8th July 2009.

Ponds



Pond with a rich flora including Lesser Marshwort, Hill of Alyth, Westfield Forest, Tay Forest District. Jeff Waddell 22nd July 2010.

Arable field margins



Arable field margin with Scentsless Mayweed, Gourdie Forest, Tay Forest District. Jeff Waddell 22nd July 2010.

Arable field margins



Arable wild flowers, Gourdie Forest, Tay Forest District. Jeff Waddell 22nd July 2010.

Coastal sand dunes



Fixed dunes with scrub and tree regeneration, Tentsmuir Forest, Tay Forest District. Jeff Waddell 22nd July 2010. Since this photo was taken tree regeneration and encroaching scrub has been removed from this area to improve the condition of the open dune habitats.

Coastal sand dunes



*Mobile dunes with slack formation, Tentsmuir Forest, Tay Forest District. Jeff Waddell
22nd July 2010.*

Coastal vegetated shingle



Stabilised banks of shingle, out with the reach of waves, with dry heathland, Juniper scrub and Scot's-pine woodland. Lossie Forest, Moray & Aberdeenshire Forest District. Jeff Waddell, 6th July 2011.



Appendix 3: Designated sites on the national forest estate in Scotland⁴ with open habitat notified features⁵

Cowal & Trossachs Forest District

Ben Lomond SSSI

- Sub-alpine dry heath.
- Upland assemblage.

Ben More – Stob Binnein SSSI

- Alpine heath.
- Alpine moss heath and associated vegetation.
- Tall herb ledge.

Black Water Marshes SSSI

- Flood-plain Fen.
- Oligotrophic Loch.
- Open water transition fen.

Lake of Menteith SSSI

- Mesotrophic Loch.

Loch Eck SSSI

- Flood-plain Fen.
- Oligotrophic Loch.

Loch Lubnaig Marshes SSSI

- Open water transition fen.

Loch Macanrie SSSI

- Hydromorphological mire range.
- Raised Bog.

Pass of Lenny Flushes SSSI

- Springs (including flushes).

⁴ Includes only designated sites with approximately >5% of their area on the national forest estate or if <5% then the area on the national forest estate >100ha.

⁵ Only interest features which are known to occur or may possibly occur on FES managed land are listed.



Dumfries & Borders Forest District

Kielderhead Moors: Carter Fell to Peel Fell SSSI

- Blanket Bog.
- Sub-alpine dry heath.

Longbridge Muir SSSI

- Raised Bog.

Solway Mosses North SAC

- Active raised bog.
- Degraded raised bog.

Galloway Forest District

Arran Moors SSSI

- Upland assemblage.

Blood Moss SSSI

- Blanket Bog.

Cairnbarer SSSI

- Upland assemblage.

Cairnsmore of Fleet SSSI

- Blanket Bog.
- Upland assemblage.

Ellergower Moss SSSI

- Raised Bog.

Merrick Kells SAC and SSSI

- Blanket Bog (SAC and SSSI).
- Depressions on peat substrates (SAC).
- Dry heaths (SAC).
- Wet heathland with Cross-leaved Heath (SAC).
- Plants in crevices on acid rocks (SAC).
- Acidic scree (SAC).
- Montane acid grasslands (SAC).
- Acid peat stained lochs and ponds (SAC).
- Clear water lochs with aquatic vegetation and poor to moderate nutrient levels (SAC).
- Upland assemblage (SSSI).

Silver Flowe RAMSAR site

- Blanket Bog.

Torrs Warren – Luce Sands SSSI

- Sand dunes.

Inverness, Ross & Skye Forest District

Affric – Cannich Hills SSSI

- Upland assemblage.

Cairngorms SAC

- Blanket Bog.
- Species rich grassland with Matt-grass in upland areas.
- Dry heaths.
- Wet heathland with cross-leaved heath.
- High altitude plant communities associated with areas of water seepage.
- Bog woodland.

Dam Wood SAC and SSSI

- Base rich fens (SAC).
- Lowland wet heath (SSSI).
- Springs (including flushes) (SSSI).

Kinloch and Kyleakin Hills (Monadh Chaol Acainn Is Cheann Loch) SAC and SSSI

- Blanket Bog (SSSI and SAC).
- Alpine heath (SSSI).
- Alpine and subalpine heaths (SAC).
- Subalpine dry heath (SSSI).
- Dry heath (SAC).
- Subalpine wet heath (SSSI).
- Wet heathland with Cross-leaved Heath (SAC).

Monadh Mhor SAC

- Very wet mires often identified by an unstable “quaking” surface.
- Bog woodland.

Northern Corries, Cairngorms SSSI

- Upland assemblage.

Loch Battan SSSI

- Springs (including flushes).
- Open water transition fen.
- Valley fen.

Strathglass Complex SAC

- Blanket Bog.
- Bog woodland.
- Dry heath.
- Wet heathland with Cross-leaved Heath.
- Plants in crevices on base rich rock.
- Tall herb communities.
- Plants in crevices on acid rocks.
- Acidic scree.

Lochaber Forest District

Ben Nevis SAC and SSSI

- Blanket Bog (SAC).
- Species rich grassland with Matt-grass in upland areas (SAC).
- Dry heath (SAC).
- Wet heathland with cross-leaved heath (SAC).
- High altitude plant communities associated with areas of water seepage (SAC).
- Plants in crevices on base rich rock (SAC).
- Tall herb community (SAC).
- Base rich scree (SAC).
- Upland assemblage (SSSI).

Loch Shiel SSSI

- Oligotrophic Loch.

Lon Leanachain SSSI

- Blanket Bog.

Onich to North Ballachulish Woods and Shore SAC and SSSI

- Alkaline Fen (SSSI).
- Base-rich fens (SAC).

South Laggan Fen SSSI

- Transition open fen.

Sunnart (SAC)

- Wet heathland with Cross-leaved Heath.
- Dry heath.

Moray & Aberdeenshire Forest District

Culbin Sands, Culbin Forest and Findhorn Bay SSSI

- Saltmarsh.
- Shingle.
- Sand dunes.

Lower River Spey SSSI

- River Shingle/sand.

Lower River Spey – Spey Bay SAC

- Coastal shingle vegetation outside the reach of waves.

Muir of Dinnet SSSI

- Upland assemblage.

Mortlach Moss SAC and SSSI

- Base rich fen (SAC).
- Basin fen (SSSI).

Spey Bay SSSI

- Hydromorphological mire range.
- Saltmarsh.
- Shingle.

North Highland Forest District

Ben Klibreck SSSI

- Blanket Bog.
- Alpine heath.
- Oligotrophic loch.

Caithness and Sutherland Peatlands SAC

- Blanket bog.
- Wet heathland with cross-leaved heath.
- Clear water lochs with aquatic vegetation and poor to moderate nutrient levels.
- Depressions on peat substrates.
- Very wet mires often identified by an unstable “quaking” surface.
- Acid peat stained lochs and ponds.

Caithness and Sutherland Peatlands RAMSAR site

- Blanket bog.



Dornoch Firth and Morrich More SAC

- Coastal dune heathland.
- Dunes with Juniper thickets.

Dornoch Firth and Loch Fleet RAMSAR site

- Sand dune.

Grudie peatlands SSSI

- Blanket Bog.

Kinrive – Strathrory SSSI

- Springs (including flushes).

Kyle of Sutherland Marshes SSSI

- Flood-plain Fen.

Morrich More SSSI

- Saltmarsh.
- Sand dunes.

West Borgie SSSI

- Blanket Bog.

West Strathnaver SSSI

- Blanket Bog.

Tay Forest District

Din Moss and Forest of Alyth Mires SAC

- Active raised bog.

Forest of Alyth Mires SSSI

- Raised bog.

Morton Lochs SSSI

- Loch trophic range.
- Sand dunes.

Lochmill Loch SSSI

- Lowland dry heath.

Kinnoul Hill SSSI

- Rocky slopes.
- Lowland dry heath.

Schiehallion SSSI

- Limestone pavement.
- Montane assemblage.
- Springs (including flushes).
- Subalpine calcareous grassland.

West Argyll Forest District

Knapdale Woods SSSI

- Loch trophic range.

Taynish and Knapdale Woods SAC

- Clear water lochs with aquatic vegetation and poor to moderate nutrient levels.

Scottish Lowlands Forest District

Coalburn Moss SAC and SSSI

- Active raised bog SAC.
- Degraded raised bog SAC.
- Raised Bog SSSI.

Hassockriggs and North Shotts Moss SSSI

- Raised Bog.

Haw Craig – Glenarbusk SSSI

- Inland Rock.

North Shotts Moss SAC

- Active raised bog.
- Degraded raised bog.

Dargavel Burn SSSI

- Valley Fen.

Lockshaw Mosses SSSI

- Raised Bog.