2. High Focus Habitats

2.1 Blanket and Raised Bog

2.1.1 Habitat Description

Blanket and raised bogs are recognised internationally as important habitats and for their role in mitigating climate change. Bogs are formed from the accumulation of peat, produced from the slow decay and compression of organic matter, making peat soils the largest single store of carbon in the UK. The estimated extent of bog habitat in the Biosphere is shown in Map 1.

For centuries peatlands have been managed for farming, forestry and sport, and more recently for windfarm developments. Some of the associated management practices have been detrimental, with draining, over-grazing, burning and planting for forestry significantly altering their hydrology and vegetation, which in some instances has led to erosion, peat loss and increases in greenhouse gas emissions. With advances in our understanding of appropriate management and restoration techniques, damage can now be mitigated and reversed.

Both raised and blanket bogs are characterised by being comprised of peat greater than 50cm in depth. Raised bogs are generally smaller, distinct, areas of very deep peat, with or without the characteristic “dome” appearance. Blanket bogs tend to be over more extensive areas, particularly in the uplands, with peat depths more variable.

Blanket bog is a priority UK BAP habitat and a habitat listed on the Annex 1 of the Habitats Directive. In addition to being in itself an important habitat, it is a preferential habitat of a number of priority species for nature conservation and Biosphere High Focus species (e.g. black grouse, golden plover, hen harrier). This habitat is well represented in the Core (Merrick Kells SAC and SSSI, Silver Flowe NNR and Ramsar site, Cairnsmore of Fleet NNR and SSSI) and also found at sites within the Buffer and Transition zones including Airds Moss, Afton Uplands, High Altercannoch to Loch Duisk, Drumlamford, Stinchar Valley, Knockdaw Hill SSSI/SAC.

Raised bog is a priority UK BAP habitat and a habitat listed on the Annex 1 of the Habitats Directive and is also a preferential habitat of a number of priority species for nature conservation (e.g. azure hawker).

The condition of blanket bogs in the Biosphere is only systematically recorded for blanket bogs found within the designated sites (eg. Merrick Kells SAC and SSSI, Silver Flowe Ramsar site, Cairnsmore of Fleet NNR and SSSI) and ranges from unfavourable declining to unfavourable recovering (more details found in habitat assessment section of GSAB 2014[2]). More recently Forest Enterprise

[2] Galloway and Southern Ayrshire Biosphere, Natural Heritage of the Biosphere Report. Available at: http://www.gsabiosphere.org.uk/what-we-do/conservation/

Scotland has commissioned condition surveys for a number of Forestry Commission Scotland sites and have prepared a Raised Bog Strategy and are currently preparing a Blanket Bog Strategy which will survey and prioritise sites for restoration. However, aerial images show that drainage on both blanket and raised bog is extensive, and that this in some instances has resulted in erosion. Domestic peat cutting and burning can also be locally significant and large expanses of deep peat have been planted with commercial forestry. Only a small area of (lowland) raised bog was recorded within the Core and Buffer zone so the greatest opportunity for this habitat is in the Transition Zone.

2.1.2 Conservation Objectives

The main conservation objectives for both blanket and raised bogs are to:

- Restore and maintain functional, peat forming condition.
- Increase the cover of the key peat forming species, Sphagnum moss.
- Raise and maintain the height of the water table.
- Help improve water quality in sensitive catchments by reducing levels of dissolved and particulate organic carbon.
- Support and maintain a mosaic of pools, Sphagnum dominated bog and appropriate dwarf shrub heath communities.
- Remove trees where possible and manage scrub.
- Stop erosion of the peat.

2.1.3 Management

There are a number of steps that can be taken to improve bog habitat extent and quality as well as return degraded bogs to better condition by reducing erosion and improving peat forming functionality. The suggested actions given in the following sections are intended to indicate the measures that can be adopted. Particular funding schemes may have their own guidance and prescriptions that should be adhered to (eg. agri-environment schemes).

2.1.3.1 Grazing management

Setting the right stocking densities for blanket and raised bog is vital as heavy grazing can reduce the diversity of the vegetation and cause erosion of the peat through trampling and poaching. Grazing, however, can be used as a way of managing scrub and dominant purple moor grass (*Molinia caerulea*). Burning (in isolation), used to improve grazing extent and quality, is usually not considered an appropriate management measure for blanket or raised bog vegetation as it can damage the growth of Sphagnum moss, and may result in less diverse swards and dominance of species such as purple moor grass or cotton-grass (*Eriophorum spp.*) In dry conditions it can lead to burns that consume the peat and cause significant ecological damage.

Suggested Actions:

- The suggested stocking rate on open bog is 0.02LU/ha/yr which equates to 1.3 sheep per 10ha or a maximum of 0.1cow per 50ha. Grazing densities may be higher than this during the summer period (up to 0.75 LU/ha which equates to 4 sheep or 0.75 cattle/ha/yr) if stock are off-wintered.
- It may be necessary to limit winter grazing as the quality of forage in the winter months is low, so supplementary feeding may be required, and the risk of poaching and trampling is greater during wetter months.
- Ensure grazing impacts of deer and wild goats are considered when formulating grazing plans.
- Off-winter stock (heather is most susceptible to grazing damage in autumn, winter and spring).
- Use cattle to graze areas where purple moor grass is dominant.
- Re-profile hagged areas to stop erosion by weather and livestock (rubbing/trampling) and improve access and grazing quality.
- In certain circumstances restoration of bare peat may also require temporary stock exclusion.

2.1.3.2 Management of water levels

Artificial drainage was carried out extensively in the past in an attempt to improve grazing and conditions for commercial forestry. In some circumstances draining has also led to peat erosion, resulting in networks of haggs and gullies. Draining of bog habitats can lead to profound changes in their ecology with a direct effect on their hydrology by reducing the height of the water table, and making conditions less suitable for peat formation. Dry bogs may also support undesirable vegetation communities and allow scrub encroachment.

Suggested Actions:

- No new drainage should be undertaken.
- Hill drains should be blocked using machine dug peat dams.
- Larger drains, often more associated with lowland raised bogs, should be blocked with peat where possible or with plastic piling where size dictates (these areas may also have to be temporarily fenced off from livestock).
- Re-profiling may also be necessary in hagged areas and areas previously afforested.

2.1.3.3 Restoration of bare peat

The greatest carbon savings are gained by preventing further erosion of peat in areas which are actively eroding. Bare peat can be continually eroded by wind and rain, frost heave, and livestock through trampling and rubbing. Without intervention, the peat in these areas will continue to erode so it is important that these bare peat areas are stabilised to allow the vegetation to recolonize.

There are various methods now widely used to restore areas of bare peat and peat haggs, which will not only stop erosion and have ecological and carbon benefits, but may improve grazing and access. Advice should always be sought when considering options for bare peat restoration but the following suggested actions describe the most common methods.

Suggested Actions:

- Actively eroding haggs (indicated by bare peat sides) can be re-profiled using a low ground pressure excavator. This smoothes the profile of the hagg and uses the remaining vegetation on the top of the hagg to cover the bare peat.
- In some instances, where machines cannot gain access to a site, biodegradable geo-textiles can be used to stabilise bare peat surfaces allowing vegetation to recolonize.
- Heather brash with Sphagnum moss cuttings can be applied to bare peat surfaces and can also be used to accelerate re-vegetation and stabilisation.
- In some areas it may also be necessary to reduce erosion by blocking gullies with dams or bunds to reduce water flow.

2.1.3.4 Tree Removal and Scrub management

Encroachment of woodland and scrub species onto blanket bog and raised bogs is likely where there is a seed source nearby and where water levels allow establishment of seedlings or on previously afforested sites.

Suggested Actions:

- Encroaching scrub and trees should be removed where these are considered to affect the conservation interest and peat forming functionality of the habitat.
- Dense scrub and continual regeneration suggests the areas are too dry and additional restoration measures, such as ditch blocking and re-profiling, may be necessary.
- In some instances, retention of some scrub can benefit species of interest (e.g. azure hawker).

Figure 2 Hill drain blocked with peat dams at Cairnsmore of Fleet

Figure 3 An actively eroding hagg and gully system

2.1.4 Example Projects

- Cairnsmore of Fleet SSSI - management changes on SNH-owned area:
  - Reduction of the flock size at SNH-owned part of Cairnsmore of Fleet SSSI by 150 ewes.
  - Off-wintering of ewes from the Mid Hill heft.
  - Cattle grazing on approximately 160ha between the Cardoon Burn and Mid Burn on an area dominated by purple moor grass. Grazing is seasonal (summer) using a herd of 40 Luing cattle.
  - The flock size on part of the site has been reduced to 300 ewes (an additional 90 hoggs stay on the hill for 4 months only).
  - Drain blocking using machine dug peat dams and re-profiling, funded by the Scottish Government Peatland Action project.

- Glenhead and Buchan cattle grazing hill trial by Forestry Commission Scotland (FCS):
  - The site was surveyed using Aerial photography at 5cm resolution to map bracken extent and this survey is to be repeated every 3 years. Baseline monitoring took place prior to the addition of two herds of cattle: One of Highland cattle and one commercial breed (total 120 head). Repeat monitoring is planned, to determine if cattle numbers are sufficient to reduce dominance of bracken. Two cattle have radio collars fitted to track grazing patterns.

- Silver Flowe:
  - Drain blocking with machine dug peat dams in order to raise the water table was carried out by FCS.
  - Assessment of the site was carried out by Crichton Carbon Centre to deduce carbon savings associated with improving peat condition.

- The Coalfield Environment Initiative (CEI) and Scottish Wildlife Trust (SWT) re-wetting of Dalmellington Moss Wildlife Reserve (SSSI), funded by Peatland Action and the Heritage Lottery Fund. Work entailed constructing a trench bund and repair to existing plastic piling dams to slow water loss and scrub removal. The aim was to stop carbon loss to address climate change and help to reduce local flash flooding. The site is monitored using fixed vegetation quadrats and automatic data loggers to record the height of the water table.

- Kilquhockadale Flow
  - A Partnership project between Forest Enterprise Scotland (FES), Galloway Fisheries Trust and Crichton Carbon Centre to survey 1200ha of commercial forestry and open bog to establish peatland condition, peat depth, water quality issues and restoration potential.
  - A report on the findings will help inform the new Land Management Plan and restoration plans being prepared by FES.

2.1.5 Considerations

- Potentially large, up-front, investment in capital works.
- Accessing funding for changes in grazing regime, restoration works and any associated ongoing management.
- Access requirements if machines are used.
- Timing of works (eg. considering ground conditions, ground nesting birds etc.).
- Conflict in management priorities eg. forestry versus open bog.
- Lack of knowledge of current location and condition of habitat, particularly in the Transition zone.
- Risk of wildfire (although re-wetting can help mitigate risk).
- Deforestation and scrub management can mean the removal of important habitat for other species eg. red squirrel.
- Hydrological impacts of restoration on adjacent land (eg. lowland raised bog bounded by improved grassland).

2.1.6 Opportunities

- Scotland's National Peatland Plan launched 2015; continued Government commitment to peatlands.
- The continued development of the Peatland Code as a mechanism to pay for restoration and management through carbon emissions savings.
- SRDP Agri-Environment and Climate Scheme 2014-2020 peatland restoration under Moorland Management and Lowland Bog management options (eg. ditch blocking, scrub removal, grazing).
- Good practice examples: private landowners who already manage their land sympathetically and have undertaken restoration could be used as demonstration sites.
- Rewetting of *Molinia*-dominated bogs helps to prevent wildfires.
- Rewetting of peatland to help prevent scrub/tree encroachment: potentially cost effective in the long term.
- Collaborations between adjacent ownerships to create connected habitat.
- Mapping of areas of plantations and scrub that block open peatland habitat networks.

2.1.7 Further Information

Peatland Action and National Peatland Plan: http://www.snh.gov.uk/climate-change/taking-action/carbon-management/peatland-action/

A Guide to Upland Habitats: Surveying Land Management Impacts - Volume 1 (SNH): http://www.snh.gov.uk/publications-data-and-research/publications/search-the-catalogue/publication-detail/?id=2094

A Guide to Upland Habitats: Surveying Land Management Impacts – Volume 2 (SNH): http://www.snh.gov.uk/publications-data-and-research/publications/search-the-catalogue/publication-detail/?id=116

Fen Management Handbook (SNH): http://www.snh.gov.uk/about-scotlands-nature/habitats-and-ecosystems/lochs-rivers-and-wetlands/fen/