Nature for Climate Peatland Grant Scheme: Restoration Grant

Guide for Applicants 2022

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This guidance is subject to confirmation when Natural England issue invitation to apply (ITA) packs.

www.gov.uk/natural-england

Contents

The Nature for Climate Peatland Grant Scheme

The Government committed more than £750 million to a Nature for Climate Fund, including for peat restoration and tree planting programmes. As part of this, Natural England (NE) is delivering the Nature for Climate Peatland Grant Scheme (NCPGS). The competitive scheme will run from 2021 to 2025.

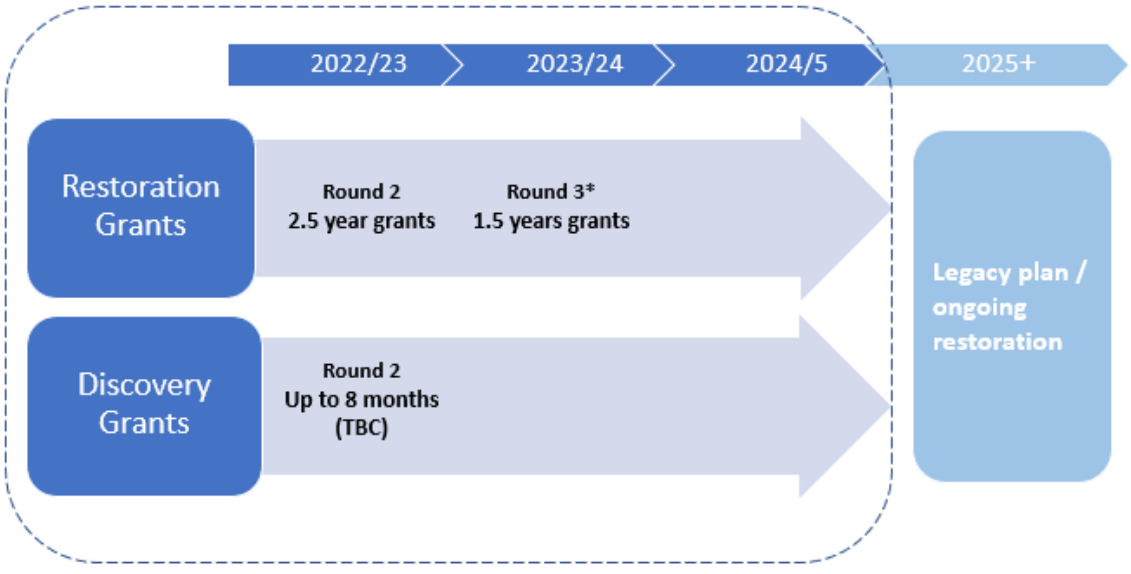
The NCPGS aims to:

- set 35,000 ha of degraded peatland in England on a path to restoration by March 2025
- reduce emissions from peat by 9 million tonnes carbon dioxide equivalent by 2050, with continued reductions after that

These targets are linked to the England Peat Action Plan.

Peatland restoration will also deliver wider environmental and social benefits. It will:

- contribute to the Nature Recovery Network (NRN)
- enhance ecosystems and biodiversity
- improve water quality
- provide natural flood management
- protect the historic environment
- give opportunities for people to connect with nature



The NCPGS includes the Restoration Grant and the Discovery Grant. This guidance is for the Restoration Grant.

The Discovery Grant has separate guidance. Discovery Grants are to unlock barriers to peat restoration. They help prepare projects to apply for Restoration Grants in future years. Discovery Grants fund up to 100% of costs.

About peatlands

Peatlands cover 3% of Earth's land surface but are the largest terrestrial carbon store (IUCN, 2018). They cover 10.9% of England but only an estimated 13% are in a near natural functioning state (Evans et al., 2017). England's degraded peatlands emit around 9.5 million tonnes of carbon dioxide equivalent annually (Department for Business, Energy & Industrial Strategy, 2021a).

Peat slowly accumulates where vegetation cannot completely decompose due to acidic, waterlogged conditions (Gregg et al., 2021). There are two main types of peatlands in England: bogs and fens.

Bogs support vegetation dependent on a high water table and lack of nutrients. The surface of a bog is often a raised mound, isolated from mineralised waters. Nutrients mainly come from rain and wind. Depending on location, climate, and topography:

- *Sphagnum* species are the dominant peat-forming species
- cotton-grasses and heathers dominate
- other species may grow in mosaics, such as sedges, bog rosemary, cranberry, and bog bilberry

Fens also have a high water table, but with slow internal drainage seeping along very low gradient slopes. Fens receive water from upslope, containing dissolved mineral nutrients. Peat-forming vegetation on fens varies, with ground water and surroundings. Vegetation on tall and short fens may include:

- sedges, such as *Carex* species. and *Cladium mariscus*
- reedbeds, such as with *Phragmites australis*
- bryophytes, such as *Sphagnum* species

Peatlands are drained for land uses such as:

- agriculture
- forestry
- peat extraction for horticulture or energy

Draining peat speeds up decomposition, and peat-forming species are lost. The peat releases carbon and it becomes a net source of greenhouse gases (GHG). The peatlands also lose their biodiversity and other benefits.

The Committee on Climate Change recommended restoring peatlands across England to meet Net Zero commitments by 2050 (Committee on Climate Change, 2020). Recent evidence shows water levels control GHG emissions from managed peatlands (Evans et al., 2021). Re-establishing natural peatland function takes time but is vital to secure the long term benefits they offer. Working through partnerships at a landscape scale is critical to deliver this ambition.

About Restoration Grants

Restoration Grants fund capital works. They are for projects where any preparatory work and management plans are complete, or mostly complete.

Restoration Grants will use most of the NCPGS funding. They will provide up to 75% of total project costs. In exceptional circumstances they may offer up to 85%. See Additional funding.

2022 Restoration Grant applications can get funding until March 2025. They are for projects where restoration can begin within the 2022 to 2023 restoration season. Subject to confirmation, we expect to open for 2022 Restoration Grant applications in April 2022, for 8 weeks.

We expect applications for £1 to £2 million across the life of the project, but we will consider other amounts. Funding allocations will be fixed once awarded. You will not be able to carry funding between years.

This is the second round of Restoration Grant applications. Find out about the first round of Restoration Grants awarded in 2021.

Restoration or creation

Re-instatement of peat-forming vegetation through Restoration Grants can include peatland restoration or creation. In this guidance the term restoration includes both restoration and creation activities.

Restoration takes place where peatland has degraded semi-natural vegetation. It may be drained or bare due to management, such as grazing.

Creation takes place where peatland has previously undergone land-use change which replaced the vegetation. This includes cultivation or re-seeding.

Both restoration and creation work should include raising water levels and reinstating peat-forming plant communities. You need to address all reasons for degradation or explain any barriers that you cannot address. You do not have to fully restore sites by the end of the project. Works are eligible where they secure a measurable amount of carbon. See E05: Environmental benefits - carbon.

Eligibility

Who can apply

Applications are encouraged from partnerships or holdings with high potential for carbon capture. Successful applications are likely to offer restoration at a landscape scale, involving multiple sites and land managers or substantial land area. Partnerships will need to decide who will lead their application.

Applications are open to:

- environmental groups
- local authorities
- businesses
- commercial enterprises
- charities
- public bodies
- landowners
- other organisations

You will need management control to meet the requirements of the grant, allow restoration works and retain them for the required term. This will include formal arrangements with site owners or managers. See E03: Legacy of investment.

You can submit more than one Restoration Grant application in 2022, but they must not include the same land.

If you applied unsuccessfully in a previous year, you can apply again this year.

If you applied successfully in a previous year, you can apply for different sites this year.

What land can you include

Restoration Grants will fund work on peatlands:

- in England's uplands and lowlands
- with peat soils at least 30cm deep, with at least 50% soil organic matter content
- with potential to restore hydrological function and peat-forming vegetation

If essential to restoration of the peat mass, you can include shallower peat and peaty soils with 20% to 50% organic matter. For example, where they are part of a wider hydrological unit.

Where there is wet grassland on peat, the NCPGS may fund restoration to bog or fen habitat. These are peat forming habitats, which sequester carbon. The NCPGS will not fund maintenance of wet grassland communities. The NCPGS will fund paludiculture if you can show that the management results in peat formation.

Former peat extraction sites are only eligible for Restoration Grant funding if there is no existing obligation to restore the site.

Land with Heritage Property Relief may be eligible. The NCPGS cannot fund work which is a statutory duty or fully funded by other sources. This includes management or access requirements in conditional exemption undertakings agreed under the Inheritance Tax Act 1984. You must check these undertakings before you apply for NCPGS funding.

Eligible and ineligible costs

Restoration Grants will fund work that helps restore degraded peatland at any stage in its restoration journey. This might include habitat and soil management, or preparation to restore sites in later years of the Restoration Grant project.

Eligible costs include:

- physical restoration works, such as blocking drainage and revegetating bare peat
- re-establishing peatland habitat on peat soils
- monitoring and surveys relevant to the project
- project administration
- partnership development and engagement
- contingency funds for unexpected or unforeseen costs – up to 10% of project costs, excluding staffing

Some other costs may be eligible if you can show they are beneficial to restoration. These include:

- access provision
- historic environment mitigation works
- community engagement
- training
- equipment purchase

Staff costs are eligible where they work directly on the NCPGS project. Relevant roles could include:

- Project Manager
- Project Officer
- Site Manager, or Site Supervisor
- Data and Monitoring Officer
- Historic Environment Officer
- Engagement and Education Officer
- Administrator
- Communications Officer
- Ecologist, or Surveyor

Your project might not need some of these roles, merge them, or need other roles. For each role in your application, you need to give information on:

- salary, including NI and pension
- overheads, such as directly-related office costs, travel and subsistence
- training and equipment

You should calculate any part-time staff costs pro-rata.

Ineligible costs include:

- land purchase
- buying out tenancy agreements
- landowner compensation for inconvenience or loss of income
- activities related to discharge of contractual or legal obligations
- research that does not directly support the restoration work under the NCPGS project
- costs incurred before the grant is awarded

Other schemes and grants

NCPGS Restoration Grant and Discovery Grant projects can run on the same site at the same time, but on different areas of land. Work on both grants must continue to their agreed work plans.

An NCPGS project can be active on the same land as Countryside Stewardship (CS) and Environmental Stewardship (ES) agreements, if the work is not:

- a commitment under the ES or CS agreement
- claimed under the ES or CS agreement
- needed due to a failure to deliver the ES or CS agreement
- at odds with the aims of the ES or CS agreement

If there is an existing CS or ES agreement, the agreement holder must:

- get approval from the RPA before you carry out any works under a Restoration Grant
- continue to meet the requirements of the agreement and keep the RPA informed

The new environmental land management schemes will fully open to applications in 2024. They will be the main mechanism to deliver peatland restoration. Using the NCPGS now will not disadvantage applicants to these schemes. The NCPGS means there is no reason to wait to respond to the climate emergency.

The Government will allow CS agreement holders to:

- use annual break clauses to end their agreements without penalty at agreed points, once they have secured a place in a new scheme
- remain on the same terms and conditions for the duration of their agreement if they want to

Additional funding

Government funded schemes are moving towards blended funding, including private investment alongside Government funds. This is important to achieve large scale change and meet long term restoration targets.

Restoration Grants normally cover up to 75% of total eligible costs, with the remainder coming from non-Treasury sources.

The total Treasury contribution for the proposal cannot exceed 75% of the total eligible costs. This can include other sources of Treasury funds, such as funding from the Environment Agency. The funded activities must be eligible under NCPGS to count as part of the NCPGS application. The other funding commitment needs to be recent enough that it is not considered a prior commitment.

Additional NCPGS funding

In exceptional circumstances Restoration Grants may cover up to 85%.

A project is an exceptional case if it is both:

- offering unique and significant environmental benefits that commonly used restoration techniques could not achieve - for example, innovative techniques to reintroduce rare species
- from organisations or partnerships with constraints over their ability to secure other funding

These projects still need to score highly against all assessment criteria.

If you want to apply at this rate, you must confirm your eligibility before you apply. Contact the NCPGS team at peatlandscheme@naturalengland.org.uk.

Match funding

You can get the additional funding you need to secure a Restoration Grant through match funding.

Match funding can be any non-exchequer sourced funding. It can cover staff or volunteer time dedicated to the NCPGS funded work. It needs to directly match NCPGS funding sought and be secured for the life of the NCPGS project.

Match funding can include private finance.

You can find out more about match funding in the Commercial Questionnaire.

Private finance

Private finance is any funding for your project that does not originate from the UK Treasury. For example:

- cash or in-kind contributions from private companies or individuals
- grants or contributions from charities
- volunteer time

Carbon Finance is the term for funds coming from purchase of greenhouse gas reductions to offset carbon emissions. Peatland restoration secures significant amounts of carbon, so projects have an opportunity to secure carbon finance. Applications that include carbon finance in their match funding will attract higher scores.

Opportunities to develop private finance and carbon finance include:

- the Natural Environment Investment Readiness Fund (NEIRF), which can fund activities to prepare projects to attract private investment
- the Peatland Code which gives assurances on the private purchases of carbon
- investment from private sources, such as water companies

You can claim for NCPGS funding alongside these. You can claim for other schemes on the same land as these if they are funding different activities.

Using the Peatland Code alongside the NCPGS

Carbon credits can provide funding where areas of drained or actively eroding peat over 50cm deep are to be restored, and the Peatland Code provides assurances that the climate benefits being sold are real, quantifiable, additional and permanent.

Peatland Code projects have a series of distinct steps.

1. Register the site with the Code.
2. Completing site surveys and developing a management plan.
3. Validation of the surveys and management plan.
4. Implementing the initial capital restoration works, usually over a maximum of 3 years.
5. Verification that works have been completed.
6. Maintaining the improvements for at least 30 years.

The first 4 steps align with developing an NCPGS project.

Peatland Code sites can link to the NCPGS in two ways.

1. Entering a site into the Peatland Code is an excellent example of a legacy plan to maintain the investments under NCPGS.
2. In certain circumstances the Peatland Code can provide funding during the initial capital restoration phase.

To restore Peatland Code sites under the NCPGS, you will need to:

- register sites with the peatland code before applying to the NCPGS to make sure the Code is recognised in NCPGS scoring
- preferably get surveys and management plans validated by the Peatland Code before you start works

Beginning works before validation risks the site not being entered into the Peatland Code, losing that funding stream.

Not all costs eligible for funding under NCPGS are relevant for a Peatland Code restoration plan. Any works after March 2025 are ineligible for NCPGS funding.

How to apply for a Restoration Grant

To apply for a Restoration Grant, you need to use Defra's eSourcing portal (Bravo). Find out how to register and apply.

You will need to complete three questionnaires:

- qualification (eligibility)

- technical
- commercial

This guidance will help you complete the technical and commercial questionnaires.

You will also get an invitation to apply (ITA) pack through Bravo, which will tell you:

- how to complete the questionnaires
- the evaluation criteria NE will use to assess and score applications

You can submit any queries on the application process through Bravo.

Your application must include information for the full period you apply for. You must provide full details for the first year's funding and where possible for later years.

You may not be able to give accurate or confirmed details for later years. This is likely if you include any preparatory work as part of the project. Where this is the case you should give enough information to show that the work will be achievable, or you have considered contingencies. You might give estimates and known details of:

- areas needing restoration
- type of restoration works
- contact with landowners
- costs

Explain any assumptions you have made.

Technical questionnaire

You can find guidance below on the technical questions in the 2022 Restoration Grant application.

E01: What will you achieve?

You must give an outline of your project, showing:

- how it meets the aims of the NCPGS
- the partners involved
- why restoration is necessary on the site, or sites
- the restoration journey and the role of the project in it
- the role of any previous NCPGS projects
- that you have considered the conservation objectives of protected sites

You should give a non-technical description, which non-specialists could understand.

You must include:

- project title
- project aims – the long-term vision for the project
- restoration objectives – the short and medium-term results of project activities, which will help realise the project aim

For example:

- project aim – to restore a number of hectares of drained lowland raised bog using rewetting and revegetation best practice
- restoration objectives – to create peat cell bunding to raise water levels, and use a moss-rich nurse crop enhanced with *Sphagnum* species to re-establish peatland vegetation

You need to include the total area and carbon dioxide equivalent that the project aims to secure. You can get this from the environmental benefits carbon calculator. See E05: Environmental benefits - carbon.

E02: How will you achieve this?

You must give a plan, timetable and method for the restoration and associated monitoring. You must:

- describe your overall approach in the E02 answer template
- complete the Site-Specific Template for all sites where work will start in year 1, between April 2022 and March 2023
- complete the Site-Specific Template for sites where work will start later, where possible

You should show the reasons behind site degradation and what you still need to do to fully understand what restoration work the site needs.

To restore peatland, you will need to restore hydrological function and establish suitable conditions for peat-forming vegetation. On bogs you may need to repair erosion features. Degraded bogs may have negative features, such as:

- active drains or ditches
- erosion gullies
- peat haggs
- bare peat

You must choose appropriate methods for each site. You can find guidance on restoration methods in Annex 1– Peatland Restoration. You must show how the method will:

- benefit the site's hydrology, habitat, and species

- restore the whole hydrological unit
- follow best practice, referencing published guidance or your previous work
- be appropriate for site conditions, and why you chose it over other methods
- minimise impacts to the habitat, species, historic environment, and any designated features

You need to give as much detail as possible, including:

- materials you will use
- dam frequency
- borrow pit frequency
- vehicle access
- information about donor material

You should show evaluators that the activities would be permissible if required. Assume that evaluators know nothing of any existing research projects or models you propose to use.

You must assess biosecurity to import any materials to the site. If you plan to use donor material, you must complete the Biosecurity Donor Site Information Form in Annex 2 and include it with your application. See Annex 2 – Biosecurity.

You must complete the Project Milestones table in the answer template using realistic and appropriate milestones. These Milestones will be the deliverables that your project achieves. You will need to report progress against these Milestones quarterly. More detailed and frequent Milestones will allow more accurate and reliable reporting.

Spatial data

You must provide site and restoration maps to support your E02 response. You should use a georeferenced application to plot your project areas. We prefer that you use ArcView but will accept other formats. We understand that not all projects have access to mapping systems, but there are open-source applications available.

The maps must show any:

- site boundaries
- features to restore
- access routes for machinery and equipment, including helicopter lift sites
- storage or permanent refuelling locations
- historic environment features
- monitoring locations

You may not need to individually map features to restore but you must show their location and scale. They might include:

- ditches and erosion gullies to block or re-profile
- areas of bare ground to re-vegetate
- areas of scrub removal
- area of surface bunding

Export maps at a scale with enough detail to accurately interpret where you plan to work. You should include:

- maps of individual sites at no more than 1:25000 scale
- an overview map showing all your sites and their locations, with references to the individual site maps

You should use one of the following combinations of file types:

- PDF and shapefile (.shp) of each site with an overview map
- PDF, JPG or other and GPX or other of each site at a suitable scale with an overview map
- PDF, JPG or other and GPX or other of each site at a suitable scale
- PDF, JPG or other of each site at a suitable scale

Environmental monitoring

Monitoring will show how projects deliver against their objectives. It will also show the impact of restoration activities on peatland condition.

Monitoring should focus on hydrology and biodiversity. These factors are key to help peatlands accumulate peat, act as carbon sinks, and regulate the climate.

As peatland restoration is long-term, NCPGS monitoring will look at restoration trajectories. The approach will consider changes expected during projects, and later long-term changes.

Monitoring will show you if you need to adapt your approach during the project. For example, where responses to restoration are not as expected or take longer.
Using standardised monitoring across NCPGS projects will help build a picture of England's peatlands. For example, their location, extent, condition changes and restoration actions. The data will help NE evaluate the impact of restoration on peatland condition. This will contribute to targets such as Net Zero and give insight on what works and what needs improvement. Data submitted to NE will be made available according to the grant terms and conditions. This may include sharing scheme data externally.

You must provide a Monitoring Plan as part of your response. You can find more information in Annex 3 - Environmental Monitoring.

Permissions and Regulations

Restoration works on peatlands are likely to need permissions and to follow environmental regulations. You must apply and comply with any permissions and regulations applicable to the land use change or management in your project.

You need to consider any permissions and regulations as early as possible. In the application you must give evidence of them, or when you will get them.

Permissions and regulations that may apply include:

- tree felling licences from the Forestry Commission
- Environmental Impact Assessments (EIA), such as for deforestation or rural land use change
- environmental permits and flood risk activity permits from the Environment Agency
- Ordinary Watercourse Consent
- planning permission or permitted development rights
- water storage related to the Reservoirs Act 1975
- public rights of way legislations (PROW), including the Countryside and Rights of Way Act 2000 & Highways Act 1980
- consent to construct works on common land from the Planning Inspectorate
- Scheduled Monument Consent
- minor and temporary amendments to any other agreements, such as CS and ES

If you are unsure of the permissions and regulations which you need to consider for the work, you could consult:

- Forestry Commission
- the local planning authority
- the Environment Agency
- the Lead Local Flood Authority (LLFA)
- NE: Environmental Impact Assessment (EIA) (Agriculture) Unit
- Historic England
- local authority or National Park archaeologists
- Rural Payments Agency (RPA)

Protected sites and species

If you have a protected site or landscape in the application area you must inform NE. You need to use the site background table in the E02 question template, and the correct field-forms in the applicable Site-Specific Template.

Where you propose restoration that may affect a statutorily protected site, you must show that the works are necessary for conservation of the site and are appropriate to the site conditions.

In your application, you must give details of the measures necessary to avoid or minimise any impacts to designated features. You must do this for your first-year sites as a minimum. You should give full details in the Site-Specific Template, and a summary in the E02 answer template.

You should also consider any opportunities to improve biodiversity to maximise the score for non-carbon benefits. See E06 non-carbon Environmental Benefits.

You must give enough detail for NE to make a protected sites authorisation determination for your year 1 sites as a minimum. If you do not, NE will not be able to award your grant due to the possible impacts on protected sites. This is also the case where you give site specific proposals to the NCPGS team after application. For example, further details for sites for year 2 onwards.

We recommend that you get NE Area Team and NCPGS input on restoration proposals before you apply.

For applications affecting sites of special scientific interest (SSSI), you must not start works until you and NE complete the following steps.

1. You receive a grant offer and gain access to the NCPGS Notice Template. Natural England can give advice on completing this.
2. You accept the grant offer through Bravo.
3. You complete your Notice of Proposal form and email it to peatlandscheme@naturalengland.org.uk.
4. NE receive the completed Notice of Proposal.
5. Natural England determine the Notice and issue SSSI Consent, Assent or Advice, if appropriate.

The Bravo Application will not constitute a Notice of Proposal, and the grant offer will not act as SSSI Consent, Assent, or Advice.

If the site and work already have a protected sites authorisation, or one has already been provided to NE, please state this in your E02 answer.

If statutorily protected species are known to be present in the application area and may be affected by the restoration works, you will need to show how you will avoid or mitigate impacts on them to comply with national legislation.

You can find more guidance in Annex 4 - Protected Sites and Protected Species.

Historic environment

Peatlands can contain valuable historic environment features. Not all important historic features are designated.

You will need to:

- consult with historic environment experts
- show how your restoration plans fully consider the historic environment
- integrate these concerns into your application

If you have known historic features in the application area you must inform NE. You will complete your Historic Environment Assessment (HEA) to get this information. In your application, you must give details of the measures necessary to avoid, minimise or mitigate any impacts to historic features. You must do this for your first-year sites as a minimum. You should give full details in the Site-Specific Template, and a summary in the general E02 answer.

You should also consider any opportunities to improve historic features to maximise the score for non-carbon benefits. See E06: Environmental benefits – non carbon.

You must give enough detail to show that you will be able to apply for any historic environment permissions and consents.

If Scheduled Monument or Listed Building Consent is already in place for the site and work, or you have had pre-application discussions with historic environment consenting bodies, please state this in your E02 answer. You can include copies of any correspondence as part of your Historic Environment Assessment (HEA), or in Further Supporting Information.

You can find more guidance about Historic Environment Assessments (HEAs) in Annex 5 – Guidance on Historic Environment Assessments (HEAs) for peatland restoration.

Access

Peatlands are important for public access and recreation. If your area of works includes Public Rights of Way (PRoW), you must contact your local access authority. They can advise you of any temporary closures needed while works take place.

Many areas of peatland are also designated Open Access land. If you may need to restrict access to this land while works are underway, then you must contact the Open Access Contact Centre at openaccess@naturalengland.org.uk.

If your project includes fencing or other works which might impede access to common land, this will need a section 38 approval. You can find more information in the Carrying out works on common land guidance on GOV.UK.

Restoration planning must consider and avoid risks to PRoW or open access land. You should include this in your E02 response. You need to use the correct field-forms and the section on ‘Consents, Permissions, Historic Environment & Protected Species’ in the applicable Site-Specific Template.

If permission is already in place for the site and work, or you have had pre-application discussions with local councils about access, please state this in your E02 answer. You can include copies of any correspondence as part of Further Supporting Information.

You should also consider any opportunities for improving access to maximise scoring for non-carbon benefits. See E06: Environmental benefits – non carbon.

E03: Legacy of investment

You must outline plans for management of the sites in the project, beyond the period that it will cover. This will show your understanding of the entire restoration journey.

You will need to:

- maintain the positive environmental outcomes obtained through the NCPGS
- negotiate a retention period for the physical infrastructure introduced to sites

The retention period must be at least the duration of the grant agreement. You must make this clear to landowners if they are not the applicant.

You need to include evidence that you will maintain the works carried out through the NCPGS and continue appropriate site management. This will help meet the long-term aims you describe in E01.

You should indicate the status of actions proposed and provide appropriate supporting evidence. You should describe what is needed to maintain ongoing management and achieve long-term aims, including:

- tenure of sites, such as conservation covenants, site ownership, or long-term tenancy
- funding and mechanisms, such as registration and sale of carbon credits, private finance and environmental land management schemes
- works needed beyond the NCPGS
- co-ordination, such as a long-term management plan or organisation or partnership strategy
- monitoring to demonstrate progress and achievement of aims

You should include production of a legacy plan as a project milestone.

On SSSIs, land managers will receive consent to carry out rewetting works, but not to install drainage to undo those benefits.

It is your responsibility to get any permissions required from other bodies.

E04: Experience and ability to deliver

You must show that your project has the expertise, resource, and policies necessary to deliver the project as proposed.

You need to give details of the project team including:

- team structure
- all associated partners and sub-contractors
- the roles and responsibilities of main personnel

You should look for value for money, but make sure personnel have appropriate expertise. You should give evidence of expertise and how it is relevant. For key personnel, you may give CVs, each up to 2 pages long.

You should give evidence of previous experience of successfully delivering similar peatland restoration projects. Include details of all aspects of project delivery, including monitoring, reporting, project management and restoration works.

Many aspects of peatland restoration need specialist vehicles and machinery. For example, low ground pressure vehicles, and bog mats to protect vegetation. You need to show that you have access to and experience of using equipment appropriate to the project and site conditions. See Annex 1.

You must show how you will make sure contractors follow best practice. If you know who will do the work, you need to give evidence of their qualifications or skills, experience and any relevant professional memberships. If you do not know, you need to show how you will assess contractor's skills, experience, and machinery at the tender stage.

You should provide contingency plans for potential disruptions to the project. For example, delays due to poor weather, or contractor or equipment availability. You should make sure you can still claim funding as agreed and deliver the agreed total area of restoration works by the end of the project. You may identify alternative works or areas to restore. Before work can begin on these areas, you may need additional approvals such as SSSI consent.

You can use any standard tendering and contractor arrangements. You must show that they deliver the outcomes, meet the terms and conditions and provide value for money. Single tenders are possible where there is only one supplier with the expertise or equipment to complete the task. Successful applicants will need to give evidence to confirm this before using sole suppliers.

Job creation

You should show how the project will create and retain jobs. Include any jobs that the project funds directly, including people employed by all partner organisations. Give the

total number of jobs and the full time equivalent (FTE) that the project funds directly. Include any:

- direct jobs retained - existing staff whose salaries are paid wholly or partly by the project budget, including through Full Cost Recovery
- direct jobs created - new staff employed by this grant
- new paid apprenticeships and job placements

We will not assess this information as part of your application but will use it for scheme reporting.

E05: Environmental benefits - carbon

Improving peatland condition reduces greenhouse gas (GHG) emissions. You can use changes in areas of peatland condition categories to estimate how much GHG a project saves. You can find out more about condition categories in Annex 3 - Environmental Monitoring.

You will find a calculator as an annex of the online ITA. You must complete this to show the potential GHG abatement your project will deliver over 50 years.

You need to complete a separate Site tab for each site in the project. There are 20 tabs in the spreadsheet, and you cannot add extra tabs. If your project has more than 20 sites please contact the NE NCPGS Team at peatlandscheme@naturalengland.org.uk. There is an example tab in the spreadsheet.

On each Site tab you should provide the:

- site name
- timing of restoration works
- peat depth
- total site area that the project will restore, in hectares

This information should match any site details in earlier parts of the application form. The site area is the area where peat condition is expected to change due to the restoration activities undertaken.

In the second part of each Site tab, you must complete a table with the condition and extent of peat. Enter the area of peat in each condition category, for each of the 5 year intervals in the table. As changes on the ground are uncertain, you will need to estimate when areas will move from one condition category to another. This may or may not be in the lifetime of the NCPGS funding.

The peat area for each time interval in the table should match the total area to be restored at the site. You can check this in the final row of the table, which will turn red if the values do not match.

The spreadsheet will calculate the total carbon savings from the project by 2050 and over the next 50 years. You can find this on the Introduction tab. You should use the 2050 carbon value when you report the total carbon savings of the project in E01.

These calculations of GHG abatement will be based on the latest GHG emission factors used by the Department for Business, Energy & Industrial Strategy to report on annual estimates of UK GHG emissions.

E06: Environmental benefits – non carbon

The main aim of the NCPGS is climate regulation, but projects may have other benefits, including:

- flood mitigation
- drought resilience
- water quality and supply
- biodiversity
- connecting people with nature
- historic environment protection

You should optimise how you restore peatland, to deliver wider benefits at the same time. You should not try to deliver wider benefits separately. You may include benefits linked to your project which are not listed.

You should give project or site-specific information on how you will deliver benefits. Do not give generic descriptions of the wider benefits of peat restoration.

You should give evidence that you can realistically achieve the wider benefits through the restoration activities. Include any timescales you have planned.

Restoration can also increase risks, such as localised flooding. You need to minimise these risks with appropriate management.

Flood mitigation

How is your restoration designed to optimise natural flood management benefits whilst minimising flood risks?

The higher downstream peak flows of some degraded peatlands may increase the flood risk of communities with peatland headwaters. Peatland restoration may be designed to

reduce this flood risk through overland flow attenuation ('slow the flow') and surface storage.

Eroded bare peat surfaces may accelerate the surface flow of water down hillslopes. Restoration techniques which increase surface roughness can help to dissipate and slow the surface flow of water. This may include revegetation, particularly with vegetation shows to reduce flow velocity, such as Sphagnum species. Blocking ditches also has potential to slow runoff through flow channels. The design of dams, such as altering their permeability, can impact the flow of water.

Rewetting peatlands raises the water table to near the surface, which may limit additional soil water storage during rainfall events. Naturally occurring hollows and pools in semi-natural peatland systems provide small-scale surface water storage. Incorporating these features in your restoration designs may help to reduce peak discharge, though the impacts are likely to be minimal in storm events.

Raising water levels and creating saturated soil conditions may result in a localised increased flood risk to people and property. Restoration plans need to consider the potential risks where overland flow from high rainfall events may occur across a saturated surface. You need to consider these risks alongside potential flood mitigation benefits.

If your project may deliver flood mitigation, you need to describe:

- the current surface conditions, such as impoverished microtopography or depleted acrotelm
- how the design of your restoration will impact on existing, new and potentially re-instated flow pathways
- the potential risks, such as increasing runoff, synchronising flow from multiple sub-catchments or different flow pathways affecting local infrastructure
- how potential risks are mitigated
- area of peatland restoration which will occur within a catchment upstream of a community at risk of flooding - in hectares and as percentages of the total peatland area upstream and total catchment area upstream

You may find the following information helpful:

- Protect NFM project publications
- Peatland Catchments and Natural Flood Management: Report to the IUCN UK Peatland Programme
- Mires on the Moors project
- Impacts of upland open drains upon runoff generation: a numerical assessment of catchment-scale impacts (Lane and Milledge, 2012)

Drought resilience

How is your restoration project designed to deliver drought resilience?

Optimising drought resilience outcomes within programmes of peatland restoration can benefit the ecology and water supply of catchments. Increased droughts through climate change risk vegetation suited to drier conditions dominating over peat-forming vegetation due to higher evaporation.

Restoring the hydrological function of peatlands needs to go beyond raising water levels and re-establish peat-forming vegetation. This will help hold water in the surface layers of the peat (the acrotelm) during drought conditions and reduce water table fluctuations. Flushes of organic matter, which often occur during rainfall events that follow drought conditions, may also reduce.

Your response should consider:

- the current surface conditions and vegetation present
- how the design of your restoration will help to hold water
- the potential risks and how you will mitigate these

Water quality

How is your restoration project designed to deliver improvements in water quality?

Peatland restoration can improve water quality for drinking water and the ecohydrology of aquatic systems.

Degraded peatlands can significantly impact the quality of drinking water supplies through the fluvial losses of carbon from drained oxidised peat. Carbon losses can result in the brown colour of peaty water, which needs additional processing in water treatment.

Degraded peatlands can also impact water quality and ecology in waterbodies they drain into. For example, through sedimentation or increased acid flushes and associated changes to acidity.

Your response should describe:

- local impacts on water quality from peat degradation - for example, water bodies failing due to poor water quality leaving your site
- how your restoration techniques are designed to improve the quality of water leaving sites and the catchment
- how your restoration techniques fit into a catchment or wider scale approach to improve water quality - for example, as part of a Catchment Partnership Action Plan

- the impact of improving water quality for partners or key stakeholders, such as water companies
- the area of restoration activities occurring on peat in a catchment which drains to a public water supply, and whether the area is in a drinking water protected area for colour - data available from the Catchment Based Approach Data Hub

Biodiversity

How will your restoration plans deliver biodiversity benefits at the landscape scale?

Peatlands are home to species adapted to waterlogged, acidic, nutrient-poor conditions. Many peatland species are rare, threatened, or declining. Peatland degradation threatens their survival.

Restoration brings back the conditions peatland species need, but they may not recolonise naturally. You may need to do additional activities to reintroduce them.

You should describe how far your project will contribute to biodiversity and the aims of the 25 Year Environment Plan and Nature Recovery Network. You should include evidence on how your project will benefit biodiversity and help achieve the following three objectives.

1. Creating or restoring 500,000 ha of wildlife rich habitat outside the protected site network, focusing on priority habitats.
2. Restore 75% of protected sites on land and freshwaters, to favourable condition so nature can thrive.
3. Recover threatened and iconic animal and plant species by providing more diverse and better-connected habitats.

You should show how:

- you will deliver biodiversity benefits on a landscape scale which you could not achieve on individual sites - for example within Local Nature Recovery Strategies
- restoration will tackle condition threats, remedies, and benefits to designated features
- biodiversity benefits are relevant to the peatland type and site context

You can find protected sites information on NE's Designated Sites System. You can find Conservation Objectives for European Sites on NE's access to evidence website.

You must include the area of peatland you will restore or create:

- outside of a Site of Special Scientific Interest (SSSI)
- in the priority habitat inventory
- in each of the national habitat network zones

You can use NE's open data to find these, including:

- SSSI (England)
- Priority Habitat Inventory (North) (England)
- Priority Habitat Inventory (South) (England)
- Priority Habitat Inventory (Central) (England)
- Habitat Networks (Individual Habitats) (England)
- Habitat Networks (Combined Habitats) (England)

You can find these on NE's MAGIC map, following these pathways:

- Land-based designations – Statutory - Sites of Special Scientific Interest (England)
- Habitats and Species – Habitats – Wetlands, for priority habitat inventory
- Habitats and Species – Habitats – Other - National Habitat Network All Habitats Combined (England)

Connecting people with nature

Peatlands can help people feel connected with their natural environment. Connecting with nature benefits wellbeing and peatland degradation can reduce this benefit. Restoration projects should help reconnect people with peatlands.

Access and recreation

Answer the question: **How will your project enable people to enjoy the benefits of your peatland restoration project?**

You should also show how you will minimise any risks related to access and recreation. For example, you could:

- install boardwalks to reduce impacts of disturbance on peatland vegetation, while increasing access to a site
- manage bird watching opportunities to minimise disturbance to protected species
- consider footpath accessibility, public rights of way or open access land

You may find the following useful for your response:

- Green Infrastructure Map
- Enabling a Natural Capital Approach – Services and Assets Databook

Volunteers and local community

Answer the question: **How will your project engage with people, including volunteers and the local community?**

Examples of engagement include:

- volunteers carrying out restoration works
- citizen science, such as Eyes on the Bog monitoring
- community engagement to help mitigate fire risks or explain a site's history
- education, through school or university visits
- provision of physical or digital interpretation
- evidence and research, such as long-term monitoring or university collaborations

You may find the Heritage Fund volunteering guidance useful for your response.

Historic Environment

How will your project have a positive impact on historic environment features?

Peatlands often include above and below-ground archaeological features, historic built structures, and artefact scatters. These may be on, under, or within the peat. Peat itself also contains records of past environments, in pollen, plant remains and other paleoenvironmental evidence.

Your restoration plans should avoid negative impact (damage) to historic features and minimise damage where this is not possible. Mitigation is a last resort. You must give evidence about this in your Historic Environment Assessment (HEA) and your response to E02. You can find further guidance in Annex 5 – Guidance on Historic Environment Assessments.

If your project goes beyond the requirements of the HEA and has a positive impact on historic environment features, this is considered a wider benefit. You can adapt your restoration techniques to benefit historic environment features and address their vulnerabilities. Some examples of positive impacts and adaptations follow.

You could **stop or repair erosion to preserve known historic features**. This helps address heritage at risk with a principal vulnerability of visitor erosion, livestock erosion or natural erosion. To repair erosion on historic features, avoid ground disturbance from reprofiling. You should use geotextile barriers between the feature and any repair and move soil by hand or small machinery.

You could **restore water tables on below-ground waterlogged historic features**. This helps address heritage at risk with a principal vulnerability of dewatering. Choose an appropriate water table on waterlogged archaeology. Sometimes this is higher than the peatland habitat needs. For previously waterlogged archaeology that is now dry seek specialist advice from an Historic England science adviser. Historic features may need more intensive monitoring during rewetting. You can find more information here.

You could **remove woody or deep-rooted vegetation from known historic features to avoid root damage**. This helps address heritage at risk with a principal vulnerability of tree or plant growth. Fell plantation trees or remove scrub without removing stumps. You may need to use smaller machinery or hand cutting.

You could **record exposed finds to safeguard information about the past**. Record the location of archaeological artefacts eroding from the peat and report to the local Historic Environment Record (HER). Removing archaeology is a specialist job and you should seek further advice in the event of any finds.

The historic environment can contribute to other wider benefits, such as engagement with volunteers and the local community. You can use it to explain long-term environmental change and the effects of changes in management practices. You can use peat cores to analyse palaeoecology, showing the previous habitats and species at a site, which might be suitable to reintroduce.

You must seek bespoke advice from Historic England or the relevant authority if proposing work on designated features.

You can find out more about designated historic features at the National Heritage List for England. The Historic England Heritage At Risk Register can tell you if a designated historic feature is known to be at risk and why.

Commercial questionnaire

NE will assess the commercial questionnaire separately to the technical questionnaire. You must give all commercial information about your project in the commercial envelope.

You can find guidance below on the commercial questions in the 2022 Restoration Grant application.

F01 Cost-effectiveness (value for money)

NE will assess the value for money for your project based on:

$$\frac{\text{total grant requested from the NCPGS}}{\text{total value of carbon dioxide equivalent secured by 2050, from E05}}$$

The ITA will give further details and include a spreadsheet template. You should complete the tabs, including:

- site specific costs
- wider project costs

- additional funding

You can include supporting documents as attachments. For example, procurement policies, and call-off frameworks.

You need to base costs for year 1 on detailed plans and work programmes. You can use estimated costs for later years if you do not yet have detailed information.

You need to give costs across financial quarters 1 to 4 for the first year, and at least the yearly total for following years. If you know the quarterly details for later years, you should include this. If your application is successful, these figures will inform your claim profile. Your costs must enable you to achieve your project milestones set out in E02.

Site costs tabs

You need to use the Site tabs to show the costs for each activity on the site. Include detail for each cost in the description field.

The spreadsheet will automatically calculate total costs entered, and add a total figure against each activity on the Summary tab.

Do not include any costs in these tabs that are not site specific.

Wider project costs tab

Please enter any costs that are not site specific into this tab. For example, staff costs for overall project management.

At the bottom of the wider project costs tab, you need to add the total carbon secured figure by 2050 from the carbon calculator in E05. This will produce a figure for the grant you request per tonne of carbon secured.

You need to include the following staff costs:

- salaries, including annual salary, National Insurance and Pension contribution
- FTE amount, and the number of days per year on the project
- overheads including office costs, Travel and Subsistence
- training
- equipment

You need to include the costs of materials and equipment for site works in site-specific costs.

Additional funding tab

You need to itemise all match funding on this tab. You can add lines to show contributions from each source. You should split amounts into cash and in-kind contributions for each funder, with a line for each.

A contribution will count as match funding if it relates to an eligible project cost. If an activity is not eligible it will be excluded from project costs. If that activity was a source of match funding it will also be removed from the match funding contribution.

You are expected to have secured or have firm plans to secure additional funding over the whole NCPGS project, and to grow the capacity of private finance markets.

Match funding does not include staff time funded by Defra, as they are exchequer funded. It may include Authority staff time funded by a non-exchequer income stream. You will need to show evidence of this in your application.

Match funding cannot form part of an existing obligation. It does not include LIFE funding. It does include the National Lottery Heritage Fund and the Landfill Communities Fund.

You should use the following rates to calculate the value of volunteer time:

- professional volunteer, such as accountancy or teaching: £50 per hour
- skilled volunteer, such as leading a guided walk: £20 per hour
- volunteer, such as administrative work: £10 per hour

You should not include people who take part in engagement activities, such as a guided tour.

If you do not have match funding in place yet, you should include enough detail on anticipated timescales for NE to assess the credibility of plans. Some private finance schemes need to verify the baseline condition of a site before restoration works can start.

Summary tab

You do not need to populate the summary tab. It will populate automatically using the data you provide in the other tabs.

The summary tab includes:

- total project costs
- total grant requested and intervention rate
- cost per tonne of carbon dioxide equivalent

F02 Carbon finance

Peatland restoration projects are an opportunity to secure carbon finance through schemes such as the Peatland Code.

The commercial score will receive a 5% uplift for applications that include land:

- eligible for the Peatland Code or equivalent scheme
- you registered with the code before you submitted the NCPGS application

If any land in the application is not already registered, the uplift will be withheld.

To receive the uplift for land where you are not the landowner or tenant, you need to negotiate management agreements before you apply to NCPGS.

Application decisions

Once the application window has closed, NE will assess all applications. This is likely to take approximately two months.

If the NCPGS team need any clarifications about your application, they will contact you through Bravo.

Successful applications

If your application is successful, NE will notify you in writing and send you a grant offer letter.

The grant offer letter will include:

- any special conditions
- timescales to get consents or permissions
- terms and conditions

You will need to sign and return the offer letter by the date given. You must not start the project until you have signed and completed all documents in the grant offer letter and fulfilled any special conditions.

Unsuccessful applications

If your application is unsuccessful, NE will notify you in writing through Bravo. You will have the opportunity to seek further feedback. You can apply again in future years.

Successful grant projects

Successful applicants will receive further information about:

- payments and the claims process
- monitoring, including monitoring templates
- reporting, including reporting templates

Payments

NE will make grant payments in arrears for eligible expenditure against agreed milestones. You can submit claims monthly and must at least quarterly. You will need to submit total costs and give evidence for grant claims. Some examples follow.

Evidence of restoration work or re-establishment of peat habitat might include:

- specification of works, including location and type of works
- Invitation to Tender for letting works contract, including specification
- quotes with breakdown of costs and timings
- consultant or expert advice on methods to use
- wildfire management plan
- photographic evidence of works underway or complete, with geo-tag and accompanying map
- specialist reports covering mitigation works
- NE site inspection
- receipted invoices

Evidence of permissions might include:

- copy of consent or permission from relevant authority
- protected species survey reports and agreed mitigation
- agri-environment agreement, including written RPA approval for amendments
- biosecurity form
- Historic Environment Assessment, signed off by relevant authority or NCPGS Historic Environment Senior Adviser

Evidence of monitoring might include:

- specification or Invitation to Tender for contracting out monitoring or planning monitoring surveys
- quotes for equipment or surveyor costs
- baseline data submission, signed off by NCPGS Monitoring & Evaluation Senior Adviser

- annual data submissions, signed off by NCPGS Monitoring & Evaluation Senior Adviser
- receipted invoices

Evidence of a legacy plan might include:

- legacy plan document signed off by NCPGS team
- physical infrastructure retention - written landowner agreement
- withdrawal of incompatible consents or permissions
- management plan including how you will maintain positive environmental outcomes - agreed with partners such as water companies, NE or Environment Agency
- conservation covenant
- designations monitoring process
- new CS agreement, or environmental land management scheme tests and trials or pilots
- robust additional finance plans
- long term community engagement, such as volunteer groups

Evidence of additional finance might include:

- Peatland Code – copy of registration or documents for verification, such as plans or stakeholder meeting minutes
- bid preparation for other grant schemes or funds
- donor letters or written confirmation of other grants or funds, including dates and work specification
- specification or Invitation to Tender documents for development of private finance

Evidence of project administration might include:

- quarterly reporting using NCPGS template
- annual reporting using NCPGS template
- final reporting using NCPGS template
- land searches, such as to find out and map ownership
- certified staff and volunteer timesheets, broken down by task or milestone
- travel and subsistence claims and receipts
- job adverts or recruitment plan for new posts

Evidence of community engagement might include:

- engagement plan, including dates, types of activities, audience
- summary of activities or meeting minutes, containing number or list of attendees, photos, evaluation, or feedback from attendees
- receipted invoices, such as for venue hire
- access assessment, such as for temporarily restricting access

- citizen science, including resources developed, evidence of data submission

Evidence of training might include:

- skills gaps identified or analysis showing training needs
- courses identified and booking confirmation
- attendance confirmation or training record
- receipted invoices
- training provided, such as a course advert, or attendee feedback

Evidence of partnership development might include:

- specification or Invitation to Tender for contracted roles, such as a facilitator role
- project management, such as identification of stakeholders
- meeting minutes or list of attendees or participation rates
- terms of reference
- legal agreement between partners
- governance structure, such as a Memorandum of Understanding, or list of steering group members
- responsibility matrix to map responsibilities of partners

Reporting

Your Grant Funding Agreement will show the dates that reports are required. You will receive templates for each report you need to submit.

You will need to give quarterly updates on progress, including:

- the area under restoration
- progress made towards project milestones
- any issues, such as weather delays
- any changes to the project

At the end of each financial year, you will need to submit an annual report, including:

- summary of project progress
- the number of jobs supported by your grant
- environmental monitoring data, as described in Annex 3
- receipted invoices and other evidence to confirm spend to date

By the end of the project, you will need to submit all monitoring data and a final report. The final report should:

- cover all restoration work done across the project

- evaluate how far the project achieved its original aim

Regular reporting will let NE make sure projects are on track to achieve their aims. In particular, the total area of peatland restored and carbon savings. NE may also:

- use information from project reports to evaluate the role of partnership working in restoration success
- survey grant project partners through interviews or online surveys

Acknowledging funding

You must acknowledge Natural England's support in any publicity or materials that refer to the project. This includes any written or spoken public presentations you give about the project.

You should use:

- our name
- our logo, where you have asked permission or where we request it

When using the Natural England name and logo you need to follow any branding guidelines we send you. We will provide updated templates from time to time.

Further information

You can find more information about the NCPGS on GOV.UK.

If you need further support, you can contact the NE NCPGS Team at peatlandscheme@naturalengland.org.uk.

References

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Annex 1. Peatland Restoration

Nature for Climate Peatland Grant Scheme

Guide for Applicants

Date: 17 January 2022

Version: Draft

www.gov.uk/natural-england

Contents

Introduction

Peatland restoration is often predominantly concerned with the restoration of hydrology as well as vegetation communities. Peatlands can be split into two groups according to the water source. Bogs derive their water from precipitation while fens are dependent upon groundwater. This gives rise to very different conditions and very different approaches to restoration.

Aim of this document

The purpose of this document is to provide an overview of current known best practice for the restoration of peatlands. It is by no means an exhaustive list of all techniques and other methodologies may be appropriate. You should research the current best practice and demonstrate you have a clear understanding of the work required and justify the use of your proposed methodology. Use of methodologies not covered in this document should be supported by sufficient evidence of efficacy to achieve the desired outcome.

The formation of peatland can be very variable in terms of hydrological regime, chemistry, and plant communities, but this can be split into two broad hydrological classes of peatland:

Ombrogenous mires (bogs)

Bogs are typically water shedding systems that received their water from rainfall. Most activities that damage bogs cause direct or indirect changes to the hydrology, therefore the restoration of the hydrological function within the peatland is necessary for the conservation of the peatland and its associated habitat and species. Techniques have been developed over the years to include a range of different approaches according to the conditions and limitations of the site in question. The principal considerations for bog restoration are:

- Restore hydrological continuity
- Repair and prevent further erosion features
- Re-vegetate bare peat
- Re-instate active peat formation

When designing a restoration plan, you should select the most appropriate method for the conditions on the site. Degraded bogs may have negative features including one or more of the following:

- Active drainage features (ditches/grips)
- Erosion gullies
- Peat haggs
- Bare peat

- Degraded peat surface impacting hydrological conductivity and surface water flow
- Degraded vegetation communities

The type and extent of these and the specific conditions of the individual site will determine which of restoration options will be the most appropriate, but methodologies will largely concentrate on preventing the loss of water from the damaged bog system.

Minerogenous mires (fens)

Fens and transition mires are typically water receiving systems. They support a variety of habitats, ranging from tall herb fen to discrete vegetated seepages. They receive water from several locations including rainfall, ground water, surface water and overland flow. They are also intrinsically linked to the surrounding geology and can be heavily influenced by the surrounding land type and its use.

Degraded fens may include one or more of the following negative influences that will compromise their condition:

- Eutrophication
- Over/under grazing
- Diffuse pollution
- Point source pollution

Devising a restoration plan for a fen will be site specific. You will need to understand the nature and extent of negative influences as well as the functional hydrological mechanisms of the site. You will not be able to restore your fen effectively without a clear understanding of all these factors.

To gain greater understanding of fens you may want to use the Wetlands Framework (Wheeler et al. 2009) approach. This ecohydrological framework defines habitats according to pH, fertility, and water supply mechanisms (WETMECs). The analysis of these relationships reveal how habitats and vegetation types are intrinsically linked to their surroundings and therefore can guide restoration opportunities.

Given the wide range of types of habitats and issues that can affect fens, it is beyond the scope of this guidance to discuss specific methodologies. However, restoration may consider connecting the fens to their wider landscape as well as limiting certain damaging inputs and perhaps also retaining water within the system. Applicants undertaking fen restoration should demonstrate a detailed knowledge of proposed restoration sites as well as their hydrological regime.

The restoration methodologies presented in this document are examples of those used on bogs. However, many synergies exist and therefore the methods described may be adapted to suit fen conditions.

Project preparation

It is essential that you establish baseline data from which to build an appropriate restoration proposal. You need to understand the depth, extent, and nature of the peat within the proposed restoration area to select most appropriate restoration methodology. You should seek to address all the impacts that are causing the peatland to be degraded.

Peatland restoration can be a complex undertaking; therefore, you must demonstrate that you have the relevant skills and expertise to design and undertake a restoration project. You must also explain clearly how you will choose contractors that have the relevant proven expertise to undertake the proposed works in the project.

You must demonstrate an understanding of the hydrology of the proposed area as well as how it interconnects with neighbouring land. Wherever possible, your project should aim to restore whole peat bodies, but this may not always be practicably possible. In these cases, you should detail fully what the constraints are and how these may impact upon the proposed methodology and projected outcome.

Where possible, your project should take account of the underlying drift geology, especially in lowland settings where bogs or fens may be adjacent to agricultural land. The extent of the impact of rewetting a peatland will be determined by the underlying drift geology. Where over clay, the impact will be negligible owing to its low conductivity. However, where over sand or other permeable drift, the raising of water levels within the peat can cause water to rise through the sand, even when there are perimeter drains.

Proposals on SSSI will need consent of Natural England (see Annex 4). Where proposals apply to SAC or SPA sites Natural England will carry out a Habitats Regulations Assessment (see Annex 4). You must demonstrate that you have consulted with the local Natural England Team prior to your application. Furthermore, your proposal must include sufficient information to allow Natural England to carry out the necessary regulatory processes. You must justify why the methods proposed are necessary and how all possible damaging effects of the proposals have been minimised.

Creation of Bog or Fen

The discussion of specific methodologies for bog or fen creation is a broad and varied subject and beyond the scope of this document. You must demonstrate that you have undertaken the necessary hydrological and peat depth surveys and can demonstrate that the soil conditions are suitable for establishing an appropriate bog or fen habitat.

Creation projects will only be eligible where:

- a land use change has occurred in the past resulting in the complete loss of bog or fen vegetation and/or
- active drainage has been undertaken to facilitate its use for agriculture.

Your creation project should aim to re-create the former peat forming habitat/s that would have occupied the land prior to land use change.

Your application must present the creation methodology with sufficient evidence and baseline data to support that

- the creation of a peat forming habitat is appropriate and possible on the land and
- it is possible to secure the management of the water table to support the desired habitat.

It is also essential that you demonstrate management in place to ensure the continued success of the habitat/s.

Restoration

Restoration of hydrology

Water moves through intact peat very slowly. Artificial drainage and erosion features lower the water table, drying the peat, and speeding up of the transmission of water through the bog. This leads to a change in the vegetation away from sphagnum dominance to woody or shrubby plants, which in turn exacerbate further erosion of the peat.

A fundamental part of peatland restoration is the repair of the hydrological function. On bogs, this aims to slow the loss of water from the peat and can be achieved through the construction of dams and bunds.

The construction of a dam in a damaged bog will not only slow the movement of water but will also raise the water levels back to the surface, thus preventing further degradation of the peat and facilitating the recovery of the vegetation.

There are many methods for dam construction including solid materials such as timber or plastic piling to using the peat within the bog to construct effective dams. Solid material dams are very effective, but they have a different hydrological conductivity to the surrounding peat and therefore can lead to scouring and erosion around the dam and may even fail or create too much water pressure behind the dam which could lead to a bog burst.

Peat dams

Peat dams (Figure 1) are often the preferred technique used for blocking drainage features. They share the same properties as the surrounding bog and therefore are less likely to fail and the material is plentiful and already on site.

However, they require a skilled excavator driver for their construction. There are also situations where they are not suitable, such as highly degraded/gullied peat, large erosion gullies or steep slopes, where permeable dams may be more suitable.

Peat dams have the same hydrological conductivity as the rest of the peatland and therefore create a natural restoration of the previous hydrological regime.

Figure 1 Restoration at Blackpitts, Exmoor. Photo Credit: IUCN Peatland Programme

Peat dam location & frequency

Peat dams are only effective where there is sufficient depth of saturated un-oxidised peat within the erosion feature into which a dam can be keyed.

The frequency of dams you select will be dependent upon the slope of the restoration site. Generally, they will be much more spaced out on flat terrain and increasing in frequency with the increase in slope. The spacing should follow the top to toe principle, so that the base of an upstream dam is at least level with the top of the downstream dam (Figure 2).

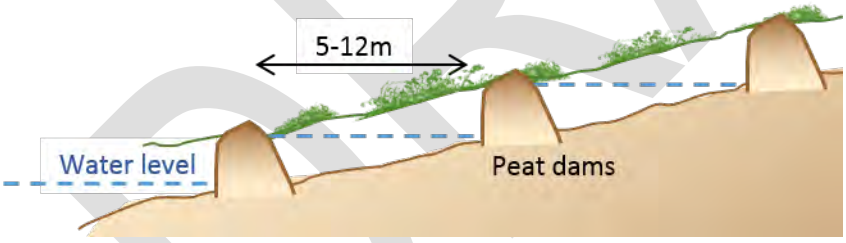

Figure 2 Dams showing top to toe spacing

Drainage features (ditches, drains, grips and gullies) depress the water table and lead to the oxidation of the peat around the drainage feature. This oxidised peat does not have the same properties as the saturated peat and becomes hydrophobic. It is therefore not suitable to use this material to make dams as it will not form an effective seal with surrounded saturated peat. It is therefore essential that peat dams must be made of saturated un-oxidised peat, **not** sloppy or oxidised peat.

Where there is sufficient depth of peat, you can take donor peat from the base or sides of the drainage feature upstream of the dam location. However, peat in these locations may be shallow, disturbed or degraded and therefore may not be suitable for making dams. If using peat from the undisturbed peat mass adjacent to the drainage feature you must justify this in your Method Statement. In such cases, you must obtain peat from the bog adjacent to the erosion/drainage feature. This can be done by digging a borrow pit.

Borrow pits

You must locate borrow-pits on a sufficient depth of peat to prevent exposure of the underlying mineral ground when extracting the peat for dam construction.

Your design should minimise the impact by siting borrow pits away from high quality habitats so that the integrity of undisturbed parts of the peat mass is not compromised. You must keep tracking across the peat surface to a minimum. To further reduce the impact from tracking, borrow pits should be located within the reach of the excavator arm.

You must site of borrow-pits using suitable spacing and avoid forming a string of excavation hollows that could act as a secondary parallel drain (Thom et.al, 2019). Where dams are closer together, you may need to alternate the sides of the drain that the pits are sited to reduce any possible connectivity.

You should start construction removing the vegetation as a turf and placing to one side along with any oxidised peat. You can then excavate the exposed saturated peat and use it to form a new dam. You can then reuse turves to re-vegetate areas of bare peat. You should record the locations of borrow pits using GPS so that their recovery can be monitored.

Once completed, the oxidised peat that you removed when constructing the borrow pit, should be pushed back into the pit. You should re-profile the sides to a shallow angle and tease surrounding vegetation in to cover any bare peat.

Figure 3 Grips before, during and summer after restoration activity at Innishewen Ford. Photo Credit: Peatland ACTION

Areas of open water will naturally colonise provided there is a *Sphagnum* source nearby but if not, you can introduce it using an approved method (refer to the section on

Revegetation below). Borrow pits will eventually form bog pools supporting species such as *Sphagnum cuspidatum* and complement the overall habitat.

Peat dam construction

You must key the dam into the surrounding peat by removing the degraded peat from the sides and base of the drainage feature so that the peat dam can connect with the saturated peat of the bog. This step is crucial to reduce the chance of dam failure. You can dispose of arisings within the drainage feature.

The thickness of your dams will be site specific, increasing in thickness with the width and expected water pressure of the drainage feature.

The finished height of your dams should be slightly above the top of the drainage feature and keyed into adjacent saturated peat beyond its side to facilitate a diffused flow of water. This will reduce the risk of the dams being damaged or undermined by high flows.

You must revegetate any areas of bare peat on the dam and sides of the drainage feature with suitable bog vegetation to prevent erosion. You can achieve this through stretching turves from the borrow pit or other suitable method as described in this document.

Wave dams & zipping

This method of using peat to block drainage features does not rely on the use of borrow peats to form bunds. Instead, a low ground pressure excavator straddles the drain and uses the bucket to pull peat towards the machine to form an elevated vegetated ridge. The process is repeated across the drain extending either side and then compressed to create a good seal and ensure the height is just above the desired water level (Figure 4, Short & Robson, 2016).

The peat along the drainage feature is then pulled in to block the void and therefore speed up the restoration process. The process is quick and creates less overall disturbance to the peatland beyond the drain.

Figure 4 Creation of a wave dam (Short & Robson, 2016)

Where not to use peat dams

You should not use peat dams on areas where there are multiple erosion gullies on thin and unstable peat. There is a risk that if you disturb the peat further you could create more instability and exacerbate existing erosion. A recent study by Regensburg *et.al*. (2021) showed that simply blocking peat pipes at their exit could lead to greater pipe

formation and therefore it was important to carry out works to improve the water retention further into the bog expanse.

Figure 5 shows an extensively gullied and eroded blanket bog at Bleaklow. In this case, taking peat from the existing thin strips of intact peat may destabilise it. Restoration of such highly degraded peatlands may require a long-term approach where the water may need to be brought up in stages through the construction of low bunds within the gullies to catch sediment which can then vegetate and stabilise. Once stable, further bunding can bring the water table higher and repeat the process.

Figure 5 Aerial footage of Bleaklow, Derbyshire

On designated historic features you may be asked to use a different methodology as part of any permissions or consents. Consult Historic England in advance for further information.

Dams made from other materials

Where peat is not suitable other materials can be used to block drainage features.

Plastic

One of the benefits of plastic is that it is lightweight and offers a low-tech solution that may not require machinery for installation. Therefore, plastic piling would be desirable to block small drainage features on remote sites with very soft ground conditions.

There are limitations with using plastic that you must consider including

- there must be sufficient depth of peat for you to drive the piling into.

- You must drive the piling into the peat to a depth of at least half of the height of the dam to give sufficient structural rigidity (Moors for the Future, 2020).
- There must be sufficient depth of peat at the side of the dams for you to effectively key piling into the bog.

The piling will not be effective on shallow peat as the piling cannot be driven into the mineral soil.

Figure 6 Top: Plastic piling in a raised bog (Thom, 2019); Bottom: Timber dams in a blanket bog gully. Photo credit: Moors for the Future

A notch or lower section in the centre of the dam will also help guide the flow to the centre of the dam to prevent scouring.

Timber

Timber is generally used for the construction of permeable dams (Figure 6) but can be used for blocking ditches. They have similar advantages to plastic in that they present a low-tech solution that can be implemented without the need for specialist machinery.

However, timber dams share the same disadvantages as plastic in that you must have a sufficient depth of peat for you to drive stakes into. They are therefore not suitable for shallow peats. Due to similar risks from scouring you must key timber dams into the surrounding peat and incorporate a notch to channel the flow to the centre of the dam.

General considerations

You should space plastic or timber dams sufficiently frequently to reduce water pressure on the dams and prevent scouring and risk of failure.

You should use any oxidised peat removed during excavations to infill the ditch line upstream of the dam. You should use saturated peat to shore-up the dams and key into the surrounding bog.

Where you have removed turves during construction, you must replace these or use them to cover any areas of bare peat.

Permeable dams

Some drainage and erosion features can be very large or may be sited on thin and highly degraded peat. In these cases, you may decide to use permeable dams to slow the movement of the water and therefore facilitate siltation and prevent further erosion. Your choice of material will be dependent upon site specific conditions and objectives but generally the design will use 'top-to-toe' principle unless the degradation is so severe that a staged approach to restoration is required.

Stone

Stone dams are permeable gully blocks constructed from piles of stone. They are best suited to areas of high velocity channel flow or where the peat surrounding the grip/gully is highly fragile (Parry et al. 2014). The design of a stone dam is porous so that they can slow the flow of the water and trap sediment. Eventually, once the pores of the dam are filled, they trap water more effectively leading to a build-up of sediment, thereby raising the base of the gully. This allows vegetation to colonise and stabilise the area (Figure 7).

Figure 7 Stone dam installed in the Peak District. Photo Credit: Moors for the Future

Finally, the sides of large gullies will also need to be re-profiled to prevent erosion.

You should make these from inert stone material e.g., gritstone, so as to not alter the water chemistry of the peatland.

Owing to the volume and weight required, you will require transportation to site when constructing stone dams. Owing to the amount of material required, you must use low ground pressure vehicles to transport materials to the site. On some sites you may only

need to lay a bog mat road. In remote locations you may need to airlift material to site using underslung hoppers or dumpy bags.

Timber

As discussed, timber dams can also form semi-permeable dams in drainage features including large erosion gullies (Thom, 2019). The dams are deliberately leaky so that they can trap and slowly release water from high rainfall events. They slowly accumulate sediment, raising the bed of the gully and allowing vegetation to establish. You can aid vegetation establishment by teasing out surrounding turf or by introducing vegetation (see below).

You must drive timber dams sufficiently deep into the peat and extended into the sides to prevent erosion. You must include a central notch to channel the flow away from the sides of the gully.

Organic dams

Organic dams are constructed from natural materials such as heather, coir and wool. These have been shown to be effective to form leaky dams on eroded gullies (Thom, 2019). These types of dam are generally only suited to low-energy gully systems. You should consider alternative materials (*e.g.* stone) for high energy systems.

Figure 8 Top: Established heather bale dam (Photo credit: Moors for the Future). Bottom: Coir rolls on Pendle Hill, Lancashire. Photo credit: Conservfor Ltd

Each of the different materials has its benefits and your choice of material should be site specific and dependent upon site objectives. As for all dams, you must key organic dams into the side of the gully for them to be effective. You should ensure that bare peat is re-vegetated.

Heather bales offer an effective solution for creating an organic leaky dam. They are highly effective at reducing the flow and trapping sediment. They also blend with the surrounding habitat and vegetate readily. You can make the bale from material on-site (Figure 8) or you can make it from heather cut elsewhere. If you are using material from another site this must follow strict biosecurity measures to ensure that pest species and/or diseases are not imported into the site (Annex 2). If you are using

materials from other ‘donor’ sites this may also affect your historic environment assessment (HEA) requirements (see Annex 5).

You can also use rolls of coir to ameliorate erosion and trap sediment. These offer another low-tech solution for low energy systems. You usually require minimal machinery to install these.

Willow faggots have recently been trialled in the Peak District to form a leaky dam that grows into the mineral ground within a gully. This creates a living leaky dam trapping sediment which can then vegetate. This together with the use of willow stakes or ‘Green Nails’ are very much at the trial stage. If you wish to use these methods, you must present good evidence of their efficacy as well as evidence to show that they will not pose a threat to the restoration of the hydrology of the peatland.

Techniques which add additional material as opposed to using excavated peat are often suitable for use on historic features, however the technique you select must also be suitable for the hydrology and terrain present on the site.

Bunding

Peatlands that have been damaged from lowered water levels will often have damage to the upper layers of peat between the ditches. This means that simply blocking the ditches will not remedy the loss of water since it will continue to leave the site through sub-surface flow. This is evident where vegetation is dominated by heather despite ditch blocking.

Most degraded peatlands will have damage to the top layers of peat that will lead to sub-surface flow. Therefore, during restoration, you must also consider the use of peat bunds to:

- hold water in place
- prevent subsurface flow between the drainage features and
- slow the water leaving the bog.

Bunding can comprise linear features along a contour or a series of cell bunds. Your choice of bund design will depend on site conditions and the objectives of your restoration plan.

Cell bunding or shallow bunds are techniques used to restore the water holding capability of wet modified peatlands. These can be in the form of contour bunds to prevent sub-surface flow.

Where the damage is extensive, deep trench bunding is more suitable. These bunds typically extend to a depth of 0.5m to 1m deep (Rook, 2016). Deep trench bunds are specially designed to re-wet degraded peatlands, sealing underground cracks or peat pipes. The aim is to restrict the subsurface flow through the creation of a subsurface wall of intact saturated peat within the damaged layer, thereby slowing the flow of the water to

that of the intact layers below. This is coupled with a small surface bund to slow any surface water movement (Rook, 2016).

The design can vary from rectangular cells, fish scales to horseshoe arcs, principally seen in lowland sites, to linear bunds along contours between drainage features to prevent sub-surface flow in upland sites. The chosen design will be determined by the specific site conditions.

Figure 9 Top: Cell bunding at Roundsea woods & Mosses NNR. Photo Credit: Conservfor. Bottom: Horseshoe bunds at Bolton Fell Moss. Photo Credit: Deborah Land

You should only create peat bunds on deep peat where sufficient material is available. You must construct the bunds from saturated peat if they are to be effective. Where practically possible, you should obtain the peat within the proposed bund line to reduce the use of borrow pits. You will create the bund by removing the turves, including root mass, and setting aside and then turning and compacting the peat within the line to form a seal. Depending on the depth of oxidised peat, you may need to top up the bund with some material from a borrow-pit before the original turf is replaced.

When creating cell bunds, size is an important consideration since large bodies of open deep water are not conducive to *Sphagnum* re-colonisation (Wheeler & Shaw, 1995). It is also dependant on slope with smaller cells required on sloping ground. Generally, you should not create cell bunds greater than 30 x 30 m. Cell bunds may only be 10 x 20 m on sloping ground. You should aim to avoid creating large bodies of water which attract wild fowl and gulls and can cause localised eutrophication preventing establishment of bog vegetation. You may need to incorporate water control mechanisms within bunds to ensure that water levels cannot get too high.

This technique has mostly been applied in the lowlands, but it is increasingly being used in the uplands along contours to slow the movement of water between blocked drainage features.

Vegetation management

Re-profiling

Degraded bogs often have multiple erosion features such as gully sides and haggs. These are likely to continue to erode if not revegetated.

Where these features are steep sided or too steep for most re-vegetation methods, you will need to re-profiling to create a more stable surface for revegetation. Re-profiling such features requires skilled excavation operators to carefully pull back the turf so that the underlying steep peat faces can be reduced to slopes of 30 to 45°. The turf should then be pulled back and stretched to cover the bare peat. This may be supplemented by using a biodegradable geotextile fabric to further stabilise the peat.

Figure 10 Top: Peat hagg**.** Bottom: Re-profiling of a hagg. Photo credit: Cumbria Wildlife Trust

When reprofiling on or near designated historic features you may be requested to use different methods as part of your permissions and consents. One method is to revet the edges of steep peat faces using peat filled jute bags to change their angle, rather than to excavate. You can then cover with turves or plug plant into the bags.

Trees & Scrub

In the UK, the presence of trees and scrub on peat is an indication of damage, usually through drainage. Once scrub or regen from nearby plantations has become established, their presence becomes a positive feedback loop since they intercept rainfall as well as lose additional water through evaporation and transpiration. As the peat dries, nutrients locked up in the peat are released which further stimulates the growth of tree species.

If working on bogs supporting trees and scrub your restoration project must include a programme of removal. This is essential so that the hydrology of the peatland can be restored, and characteristic bog vegetation re-established.

The method of removal you select will be site specific and dependent upon site conditions and access. Where the timber has value and the site conditions are dry enough, you may use commercial removal methods such as a mini harvester. However, the scrub is often of low economic value and may only be of use as firewood if it is possible to extract it.

Where the ground conditions prevent conventional machinery, you must use low ground pressure machinery and bog roadways to gain access (see section on vehicles). You may either remove scrub using chainsaws or chip it *in-situ*. You can either do this using a mobile chipper or where access is possible, you may want to use a track mounted flail/mulcher on the end of the excavator arm.

You can push the arisings into drains between peat dams or leave them on the surface where they will be inundated once re-wetting is completed. Burning them is unnecessary and should be avoided.

Where ground conditions are very wet and/or the vegetation is of high quality, you should remove seedlings by hand pulling. You can remove larger trees with a chainsaw and left to degrade naturally.

Heather management

Whilst a component of bog vegetation, a dominance of heather is a strong indicator of damage. Extensive research suggests that some burning regimes lead to the degradation of bog habitat, reducing the presence of bog plants, loss of structural diversity and a dominance in species indicative of heath (Stewart et al. 2004; Tucker 2004; MacDonald 2008; Lindsay 2010). When combined with active drainage, blanket bogs can comprise a monoculture of heather with little or no characteristic bog vegetation and none of the natural structural diversity. The four main issues related to heather dominance are (Moors for the Future, 2020):

- Lowered water tables
- Peat pipes
- Interception of rainwater
- Shade & leaf litter – creating inhospitable conditions for other blanket bog species

When restoring heather dominated blanket bog you must aim to reduce the dominance of heather through

- re-wetting and
- re-introduction of key bog species such as Sphagnum.

It is unlikely that re-wetting alone will reducing the dominance of heather, so you may also need to cut. The methodology of this must consider the ground conditions and potential impact of access, plus any Sensitive Areas as detailed below:

- Flushes and mires, including areas around springs, pools, wet hollow and those rich in bog mosses with abundant and/or almost continuous cover of Sphagnum species, other mosses, liverworts, and lichens.
- Hags, erosion gullies and areas of Bare Peat, or where previous restoration works (brash, lime, seed and fertiliser) have been carried out.
- Areas where soils are less than 5cm deep or made up of scree, or where there is a high incidence of exposed rock.

- Areas with a noticeably uneven structure (at the spatial scale of 1m square or less). In dry heath, this is most commonly found in very old heather stands, often comprising large and spreading dwarf shrub bushes. In blanket bog, this is characterised by Sphagnum hummocks, lawns and hollows, or mixtures of well-developed cotton-grass tussocks and spreading bushes of dwarf shrubs.
- Steep slopes and gullies greater than 1 in 3 on blanket bog and 1 in 2 on dry heath.
- Areas of grassland and rush-dominated areas.
- Above-ground historic features listed on your Historic Environment Assessment (see Annex 5 for more details about HEAs).

Once you have blocked the active drainage and reduced the heather canopy, it may be necessary to re-introduce key bog species (see Re-vegetation section below).

Commercial Forestry

The impact of forest ploughing disrupts the water table creating deep furrows which, combined with oxidation and cracking, result in highly degraded conditions (Sloan et.al. 2018). In addition, the intense shading and needle litter also may impact the *Sphagnum* species exacerbating the degradation of the bog (Lindsay et al., 2014).

Forest-to-bog restoration is rapidly evolving, with techniques building on previous methodologies to tackle the impacts caused by forestry. As with all bog restoration, the restoration of the hydrology is key.

Your restoration project should begin with removal of the trees and scrub above ground biomass. In some cases, the peatland may be dry enough for you to use a commercial forest harvester to cut and remove the trees. In wetter conditions, you need to employ other methods of extraction. Alternatives include standard or lightweight skyline which, using chainsaw operators on the ground, can drag or lift the trees off the bog where they can be processed and removed of site.

Removal of commercial forestry must be undertaken in accordance with the UK Forestry Standards.

Smoothing & Stump flipping

Standard methods of tree removal leave stumps and roots in the peat which can act like drains, facilitating continued water loss. New methods include forest smoothing. In this approach, you extract trees where they have a commercial value, but others are mulched *in-situ* using a low ground pressure excavator with a mulching arm. You then flip the remaining stump using the excavator and push it into the forest furrows. Smaller trees are simply pulled-up and pushed into the furrows. The ground is then tracked consolidating the ridges and material in the furrows to leave a smooth surface.

Figure 11 **L**eft: Trial plot after ground smoothing. Right: One year after treatment supporting hare's tail cotton grass *Eriophorum vaginatum* and *Sphagnum cuspidatum* (Short & Robson, 2016)

Any removal of trees must be accompanied by a programme of ditch blocking and bunding using peat and other materials as appropriate, to block drains and furrows as well as cracks in the peat.

Conifer regeneration

A further issue may be conifer or birch regeneration. This is an issue where trees are adjacent to the restoration area and can be a problem on any decomposing brash mats. This should reduce once the bog hydrology is restored and the vegetation recovered, but this may take a considerable time. During this recovery period, regenerating trees should be removed. In some instances, clearing trees that are acting as a seed source near the bog should help but, in some cases, these will belong to other landowners (Anderson 2010).

Molinia management

Purple moor-grass, *Molinia caerulea,* is a natural component of many bog communities. However, research has shown that since the start of the Industrial Revolution, an increase in dominance has occurred. This has led, in some places, to a complete monoculture of purple moor-grass at the expense of *Sphagnum* and other bog building plants. According to Chambers & McCarroll (2015) there is evidence that increased burning activity leading to an increased atmospheric input, in combination with a change in grazing pressure, may have been responsible for an increase in purple moor-grass dominance.

Research by Anderson (2015) shows that the growth of purple moor-grass is much poorer where water levels are high. However, owing to its vigorous growth and location of growth nodes located above the ground surface on tussocks, simply drowning out the plants to reduce dominance cannot be achieved without creating a water level that will be too high for other important bog species. Furthermore, where nitrogen and phosphorous is high, purple moor-grass can remain dominant even with high water table (Anderson, 2015).

Several control measures have been trialled throughout the country including

- grazing
- cutting
- flailing
- herbicide application
- compressing by tracking
- the introduction of key species to diversify the sward.

Trial results vary and it is likely that you will need to use a combination of methods alongside raising water tables to control purple moor-grass.

If your projects include restoration of *Molinia* dominated peatland you must detail your preferred methodology. You should demonstrate a clear understanding of the issues regarding this difficult area of bog restoration. Your project should consider

- causes of the dominance of purple moor-grass on the site
- what specific work, or combination of work, you can undertake to that will reduce its dominance and increase the cover of characteristic bog vegetation.

Invasive non-native plants

Intact bogs are largely protected from invasive plants owing to their high moisture, low nutrient, and acidic nature. However, peatlands which have been degraded through drainage and other human activities, can present suitable conditions for certain invasive non-native plant species, and these species may be widespread across some sites.

The most commonly found plants listed on the EU Regulation on Invasive Alien Species (EU Regulation 1143/2014) and Schedule 9 of the Wildlife and Countryside Act invasive non-native plants include:

- Japanese knotweed *Fallopia japonica*
- Giant hogweed *Heracleum mantegazzianum*
- Himalayan balsam *Impatiens glandulifera*
- Rhododendron *Rhododendron ponticum*
- Pitcher plant *Sarracenia purpurea subsp. purpurea*

Once established, invasive non-natives species can cause serious degradation through outcompeting and excluding native bog flora, and by altering the hydrology of habitats.

The remedial action you choose will vary between plants and sites. You will need to review Defra standing guidance on invasive species before you select and take actions. This will be a particular issue if Japanese knotweed is present on site, for which separate standing guidance is available (see Factsheets and Further Information).

Rhododendron

Rhododendron can present a serious problem once established on a degraded bog. Small plants quickly form dense bushes, shading out bog vegetation leading to the loss of *Sphagnum* cover.

You should use the same management approach for dense rhododendron as for dense scrub, with the addition of applications of herbicide to prevent regrowth. In severe cases, you may not be able to remove rhododendron by chainsaw and may find it more appropriate chip and mulch *in-situ* using a track mounted flail/mulcher on the end of the excavator arm.

Figure 12 *Sarracenia purpurea* established on a lowland raised bog, Wedholme Flow, Cumbria (Walker, 2014)

Any programme of scrub or rhododendron removal must be followed up with a programme of re-wetting to prevent recolonisation of seedlings and drown out re-growth. This can negate the use of herbicides. However, rhododendron can be pernicious and will likely require follow-up treatment with herbicide to prevent it from re-establishing.

Your projects must clearly describe any programme of tree & scrub removal detailing

- the chosen methodology and
- any safeguards to protected features
- any follow-up works to ensure continued eradication.

Pitcher plant *Sarracenia purpurea subsp. purpurea*

Sarracenia is a carnivorous plant from North American that has been deliberately planted on lowland bogs and mires throughout Britain and Ireland since the late nineteenth century (Walker, 2014).

Management has largely been by hand-pulling the mature and juvenile plants. However, experience in Cumbria has not been successful since there is rapid recolonisation from seed. This has led to experimental trials using glyphosate to remove dense areas of the plants.

You must give due consideration to the potential biosecurity risks of spreading this plant when removing it from site. You must include details on the Biosecurity form in Annex 2.

Re-vegetation

There are significant areas of bare peat throughout our uplands occurring in large areas and small patches in mosaic with degraded vegetation. In the lowlands, bare peat tends to be a feature where sites have been subject to commercial extraction of peat.

Factors that lead to bare peat forming are complex but usually include one or more of the following (Moors for the Future, 2021):

- Historic air pollution
- Wildfire
- Historic drainage
- Access
- Colonisation by non-native plants
- Commercial extraction
- Agriculture

Figure 13 Top: Bare eroding peat. Photo credit: Yorkshire Peat Partnership. Bottom: Bolton Fell Moss extraction site. Photo credit: Natural England

Bare peat is extremely unstable and vulnerable to the effect of wind, rain, and livestock, all of which further exacerbate its instability creating further erosion. It is an extremely hostile environment for plants and there are few, if any, species that can colonise it without some assistance.

The key to successful re-vegetation is to stabilise the substrate and create conditions that favour bog vegetation. Techniques are constantly evolving with new ways to cope with what is the most challenging part of bog restoration. Whilst there are numerous methods, most focus on the re-establishment of *Sphagnum*.

However, species of sphagnum that contribute to bog communities require moisture, shelter and microtopography to thrive, so you will need other materials to create suitable conditions.

Early methods of restoring bare peat used heather brash. Heather thrives on dry peat, so the application was hugely successful in covering the bare ground. However, the dominance of heather on degraded peat further exacerbates the degradation through continued interception of rainfall, transpiration of moisture, and the root systems can lead to cracks and pipe formation in the peat. Once established, the dominance of the heather canopy prevents the colonisation of the appropriate bog community necessary for peat formation. Heather brash harvested during a period of low seed burden may be acceptable for use in the preparation of moss-rich brash but the use of seed laden brash or heather seed is **not** considered a suitable method of restoration.

The most important step is the stabilisation of the bare peat to reduce the impact of erosion. There are many innovative approaches including using geo-jute, wool and even old nets, to provide a matrix in which applied vegetation or seed can grow into. You should select the appropriate method for your site.

Moss-rich nurse crop

A nurse crop is essentially the establishment of a crop of vegetation where the sole function is to facilitate the establishment of the desired bog vegetation, which will, over time, outcompete and replace it.

It is possible to establish a nurse crop of pleurocarpus ('feather') mosses. Donor material comprises feather moss fragments typical of drier habitats (*e.g. Hypnum* spp*., Rhytidiadelphus* spp*., Pleurozium schreberi*) together with any other cut vegetation that may be present on the donor site. In order to ensure the colonisation of *Sphagnum* to the proposed recipient area, you should either enrich the mix with *Sphagnum* prior to application or add this afterwards by plug planting or other suitable method. You must choose *Sphagnum* species suitable for the site conditions.

Where deep ombrotrophic peat is present, choose species such as

- *Sphagnum papillosum,*
- *Sphagnum capillifolium*
- *Sphagnum medium*

On shallow fen peat choose more nutrient tolerant species such as

- *Sphagnum palustre,*
- *Sphagnum fallax*
- *Sphagnum subnitens*

Where possible, your donor material should be of local provenance. You should locate the donor site as close as possible to the receptor site. The donor site must support the target vegetation as described above. You must collect all donor material in accordance with the Biosecurity Guidance (Annex 2).

On application to the bare peat, the mix of vegetation adheres to the bare peat creating a thin organic mat. The feather mosses are quick to establish and in doing so, maintain a thin layer of moisture and offer a suitable microclimate in which the *Sphagnum* can establish and grow.

You must not leave donor material in dumpy bags or in piles on site for any more than a 2-3 days as this can impact the viability of the material. Ideally, your project should time revegetation work to ensure that the delivery of donor material is close to when it will be applied at the recipient site.

Figure 14 Left: Organic mat of grasses and moss donor material. Right: Donor material 1 year after application. Site: Bolton Fell Moss. Photo credit: Natural England

Turfing

This method lends itself to sites where small areas of bare peat or localised gully erosion lie within a larger intact vegetated bog. Using a suitable low ground pressure excavator, a turf is removed from an intact area and then stretched over the bare peat. The turf is tamped down to ensure a good contact with the peat.

The vegetation either side of the donor area is then stretched out to cover the excavation area to ensure rapid colonisation and minimise any erosion.

Whilst quick and effective, this method may not be suitable for areas of high nature conservation value. You must demonstrate in your application that you have discussed the options with the local Natural England Team.

Seeding

A mixture of grass seeds and bog species can be spread onto degraded peat surfaces to stabilise the surface whilst also increasing the diversity of the vegetation. You can harvest seeds using a brush harvester or by hand. You can apply these using a number of methods depending on the site conditions (Thom et al., 2019):

- Traditional spinner drill
- Land based air drill
- Helicopter air drill
- Suspension hydro-seeding

Grass nurse crops

Grass nurse crops comprise fast growing agricultural and amenity grasses. However, they are unlikely to establish in on peatlands without some help owing to the low pH and acidic conditions. Owing to the potentially damaging effects of using lime on existing bog vegetation, you should only use this method where the conditions are so severe that it warrants this approach. You must justify the need for this approach in your application and fully detail the proposed seed mix.

Lime & Fertiliser

Whilst not generally advised in peatland management, there are exceptional circumstances where you may need to apply lime and fertiliser to aid establishment. These include severely degraded peatlands, such those in the Peak District, which have an extremely low pH making them extremely hostile areas for plant colonisation. In these areas you may apply lime to raise the pH quickly and allow nurse crop grasses to establish. Once the grasses have germinated, you can apply agricultural fertiliser to encourage root growth (Thom et al., 2019). You may need repeated applications of lime and fertiliser to fully stabilise the peat and encourage a comprehensive sward.

Figure 15 Bare peat restoration in the Peak District. Photo credit: Moors for the Future

As the sward develops and the pH and soil macro-nutrient levels begin to reduce to typical background levels with the cessation of fertiliser and lime applications, the sward will be stable enough to allow typical native bog flora to re-establish and the introduced nurse crop grasses will die off. If proposing this method, you need to include

- Justification of why this method is required
- Details of lime and fertiliser application rates

Increasing plant diversity

For degraded bogs with fragmented vegetation cover and patches of bare ground, you may need to supplement the existing vegetation with seed, plugs, donor vegetation or turves. For extensive bare ground, you may need to use further measures such as using coir logs, timber barriers or geo-textiles to stabilise the peat.

Plug planting

You can achieve re-vegetation by plug planting bog plants such as cloudberry (*Rubus chamaemorus*), hare's-tail cotton-grass, (*Eriophorum vaginatum*), common cotton-grass (*E. angustifolium*), bilberry (*Vaccinium myrtillus*) and crowberry (*Empetrum nigrum*), as well as various *Sphagnum* spp. Plug planting can also be beneficial to re-introduce bog species into impoverished vegetated peatland following re-wetting.

Figure 16 Planted *Sphagnum* clump. Photo credit: Yorkshire Peat Partnership

Where available and given the appropriate permissions, you can obtain donor plants from within the restoration site. This has the advantage of being a low cost and simple solution.

You can also harvest *Sphagnum* from suitable nearby donor sites, although this requires specialist cutting and harvesting machinery to collect the mosses without causing damage to either the moss fragments or donor site. You must complete the Biosecurity Form when importing any plant material from other sites (Annex 2).

You can also source *Sphagnum* from specialist growers who can propagate *Sphagnum* in various states such as a gel, encapsulated bead or a hummock.

You must ensure that all nursery grown plants have been grown in peat free media.

The following guidance will therefore principally relate to the restoration of blanket and raised bogs.

Grazing

The subject of grazing is complex and beyond the scope of this document. However, it is important to consider the role that grazing has on peatland habitats in the restoration context. Whilst grazing by native wild animals is a natural part of the peatland ecosystem, overgrazing by livestock can be detrimental, leading to the loss of key species and trampling. Where there are high levels of grazing and livestock trampling, restoration of hydrology is likely to be compromised.

The impacts of high stocking rates and associated trampling can lead to changes to the peatland vegetation resulting in physical damage and the creation of areas of bare ground and erosion hot spots (Lindsay et al., 2014a).

Achieving sustainable grazing is not within the scope of this scheme. However, prior to restoration, it is crucial that you reduce livestock numbers to sustainable levels, or even remove them to allow the vegetation to recover. In areas where red deer numbers are high, grazing impacts can continue to present a problem and you may need to implement measures to control deer numbers.

Access

Access on peatlands, where not managed correctly, can cause considerable damage to the integrity of the vegetation and the hydrology. These may be in the form of existing tracks or paths, or desire lines across the peatlands.

Some existing tracks can create a hydrological barrier within the peatland or lead to erosion and should be considered in drawing up restoration plans.

Recreational access on peatlands can cause damage through damage to vegetation and the peat mass which affects water movement. Further impacts occur as a result of braiding paths. You may need to address erosion issues caused by access so that the hydrology can be restored. This may include suitable path remediation, such as creation of 'floating' paths, or the provision of boardwalks to reduce erosion.

Access and engagement can also add value to a project. Where you think that this will be the case include more information about this in question E06 of your application (Non-carbon benefits).

Vehicle access for restoration

Access routes for heavy machinery on deep saturated peat, without the use of bog mats, can lead to severe damage of the peatland and its vegetation. This may also cause the machinery to become stuck. They may also damage sensitive areas, such as historic features, or disturb species.

You should ensure all vehicles and cutting apparatus are tracked and low ground pressure (<3psi), to prevent damage to vegetation or soils. You should plan routes to ensure that vehicle movements will avoid sensitive areas. You must ensure that any disturbance is limited to that which can be expected to have recovered within 12 months.

You must re-fuel machines away from sensitive areas, using areas of hardstanding where possible. You can achieve this by placing a non-porous membrane underneath fuelling points to prevent fuel contact with the vegetation.

Fuel must be stored in a designated area and in bunded tanks. You must carry spill kits with sufficient capacity for fuel and oil with vehicles so that they can be deployed immediately if required.

Your airlifting operations should follow Civil Aviation Authority regulations. You should establish the location of drop points in advance and site them away from sensitive locations where possible. You should refuel helicopters in accordance with the measures discussed above.

Cutting and collecting brash for heather bales/dams

You must not cut in Sensitive Areas (as defined on page 15). You must set cutting machinery at a height that will avoid contact with the moss layer and/or hollows and hummocks. Cutting should ideally be focused upon drier areas where there is a dominant canopy of mature heather with occasional or infrequent mosses.

You must not cut within 5m of any watercourse to minimise erosion and damage to watercourse edges. Cutting must avoid the bird nesting season.

Delivery of materials to site

For sites where access is close to a paved road you may need to use bog mats and drive the materials to the restoration site. However, for more remote locations, you may find it more suitable to use helicopter transportation.

Where possible, you should locate any storage areas on existing hard standing or aggregate areas. Any materials that you store on vegetation should not remain on that location for too long to avoid shading out and damaging vegetation through compaction. You must remove all waste materials promptly from site.

Paludiculture

Approximately two thirds of the 325,000 ha of lowland peatlands in England are now classed as ‘wasted’. In the Somerset Levels, there has been subsidence and shrinkage estimated to be 1 to 1.5 cm per year (DEFRA, 2018) and only an estimated 16% of the peat stock recorded in 1850 in the East Anglian Fens now remains (Morris et al, 2010). The continued use of peat in traditional drainage-based agriculture will eventually result in the complete loss of the peat

Paludiculture is not nature conservation but is productive use of peatlands that aims to reduce greenhouse gas emissions during their use. Paludiculture on peat soils will maintain the peat store and result in lower carbon emissions than traditional agriculture. Some paludiculture crops can result in the active accumulation of peat.

Paludiculture crops that result in the accumulation of peat will be eligible for this scheme. You must:

- Clearly define the proposed paludiculture option and
- Explain how it will be managed to result in the formation of peat

Paludiculture methods that have little soil disturbance, longer rotations and shallower root penetration will be more suitable on historic features than other methods. Short-rotation coppice should usually be avoided on historic features.

Summary

You should research your proposed techniques widely and reference supporting evidence within the methodologies in your application. You should fully describe any examples of new and innovative techniques with supplementary evidence and justification.

Links to factsheets and further information

DEFRA: Stop invasive non-native plants from spreading. https://www.gov.uk/guidance/prevent-the-spread-of-harmful-invasive-and-non-native-plants

DEFRA: Prevent Japanese knotweed from spreading. https://www.gov.uk/guidance/prevent-japanese-knotweed-from-spreading

EcoCo Life Resources: Peat Damming Techniques – methods by OpenSpace https://www.ecocolife.scot/node/239#peat

OpenSpace. Deep Trench Bunds – Method of Installation Restoration technique 5. Viewed: 11 March 2021 <https://www.ecocolife.scot/sites/default/files/Technique%205%20-%20Method%20of%20Installation%20-%20Deep%20Trench%20Bunds.pdf>

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Moors for the Future (2020) Timber Dam Fact Sheet. Viewed: 05 March 2021 <https://www.moorsforthefuture.org.uk/__data/assets/pdf_file/0031/87529/Timber_Dams_Factsheet.pdf>

Moors for the Future (2020) Blanket bog land Mangers Guidance: FAQs. Moors for the Future on behalf of the Uplands Management Group. Viewed 24March. <Blanket-bog-land-manager-guidance-FAQs-Report.pdf (moorsforthefuture.org.uk)>

Moors for the Future (2021) Reasons for and problems with bare peat. Viewed: 18 March 21 < Reasons for and problems with bare peat | Moors https://www.moorsforthefuture.org.uk/our-purpose/habitats-for-wildlife/reasons-for-and-problems-with-bare-peat for the Future>

Peatland Action Resources https://www.nature.scot/climate-change/nature-based-solutions/peatland-action/peatland-action-project-resources

The Bog Conservation Handbook https://www.iucn-uk-peatlandprogramme.org/sites/default/files/header-images/Conserving Bogs the management handbook.pdf (iucn-uk-peatlandprogramme.org)

Yorkshire Peat partnership https://www.yppartnership.org.uk/resources

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Lindsay R, Birnie R & Clough J (2014a) IUCN UK Committee Peatland Programme Briefing Note 7: Grazing and Trampling. Viewed 19 March 2021 <7 Grazing and trampling final - 5th November 2014.pdf (iucn-uk-peatlandprogramme.or https://www.iucn-uk-peatlandprogramme.org/sites/default/files/2019-05/7%20Grazing%20and%20trampling%20final%20-%205th%20November%202014.pdf g)>

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Annex 2. Biosecurity

Nature for Climate Peatland Grant Scheme

Guide for Applicants

Date: 17 January 2022

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www.gov.uk/natural-england

Contents

Introduction

This guidance provides information on biosecurity for restoration grant projects funded under the Nature for Climate Peatland Grant Scheme (NCPGS). This guidance should be read in conjunction with the Invitation to Apply and NCPGS Guide for Applicants.

Some restoration methods may require the importation of offsite organic materials such as heather, *Sphagnum*, nurse crop grasses and plug plants, to facilitate restoration actions. This may be associated with the creation of permeable dams, or the revegetation of bare peat.

Heather or straw may also be harvested and spread as a brash and used to aid stabilisation of bare degraded peat areas. Where there is insufficient vegetation available a nurse crop may be required. This will require plug plants, donor site *Sphagnum*, nurse crops grass species or micro-propagated plants, to be brought into the site.

For further information on these techniques, please see the Peatland Restoration Annex or see the further links suggestions at the end of the document.

Where this material can't be sourced from the restoration site itself and must be sourced from an offsite location or grown specifically for the restoration project, careful consideration needs to be given to avoiding contamination since it could bring in invasive plants/species to the restoration site.

The use of vehicles and equipment may also introduce potentially hazardous organic material onto sites, therefore best practice must be carried out to ensure that vehicles enter the site clean and free of contamination.

Brash and heather harvesting

Donor material should ideally come from the locality, although this may not always be possible. In which case donor sites should be as close as possible and a site inspection can ensure that material is not being taken from unsuitable sites which may be damaged by the action.

If material must be harvested from an offsite location, this must have undergone biosecurity checks focused on heather beetle and *Phytophthora*. This security check will need to be captured by applicants within the Donor Site Information Document.

Harvesting and spreading *Sphagnum*

A possible method of *Sphagnum* inoculation is to sustainably harvest *Sphagnum* fragments or clumps from a suitable donor site and to spread these either by hand or using specialised machinery (Thom *et.al*, 2019).

As per brash collection, if material must be harvested from an offsite location, this must have undergone suitable biosecurity checks. This security check will need to be captured by applicants within the Donor Site Information Document as seen at the end of this Annex.

Donor Sites

Donor Site Information Documents must be included as supporting documents when completing the application, detailing the names, addresses and grid references from which it intends to source the donor material. Natural England will use all reasonable endeavours to ensure that all donor sites will be kept confidential and viewed only by Natural England. Any variation to the proposed donor sites must be discussed with the NCPGS team as this may require further consent.

Projects should be aware of the intended use of the donor material and should demonstrate they have made appropriate enquiries to establish there is no known history of pest or disease at the donor site which may affect the recipient land. Any such disease or pest at the donor site must be declared to the NCPGS team.

It is agreed that a breach of this clause constitutes a material breach for the purposes of the Standard Conditions (Termination) and that in addition to the contractor being liable for Natural England's costs associated with a breach, the contractor will also be directly liable to the landowner or user of the recipient land for any costs, damages and demands incurred (including indirect loss and loss of profits).

The applicant must provide a letter, or other written confirmation, from the owner of the donor site confirming all permissions or planned permissions and that there is no known history of pest or disease at the donor site which may affect and agricultural, conservation or sporting interests on the recipient land.

Potential NCPGS applicants must inform the owner/occupiers of donor sites (where they are SSSIs and the SSSI is not within the NCPGS application boundary), that it is their responsibility to secure prior consent from Natural England for the activity. As there is a potential that these particular consents may lie outside a NCPGS application and will therefore need separate notice and consents. Early consideration will be required by applicants and donor site owner/occupiers to avoid later delays, and an indication of when the notice will be submitted should be included within the Donor Site Information Document.

Natural England reserves the right to reject any proposed donor sites.

Commercially Grown Plug, Nurse or Micro-propagated plants

Plug plants and micro-propagated *Sphagnum* should be propagated in peat free compost in green houses free from pests, diseases and unwanted species. Species proposed to be planted will include only species appropriate to the relevant bog vegetation community.

Contamination

All equipment, tools and personal protective equipment (PPE) required to complete the works must be clean and free from material which could contaminate the restoration site. This will include but is not limited to restoration and access vehicles, hand tools used for restoration activities, PPE garments, storage containers and transportation apparatus.

All new equipment being brought onto site during the restoration should also be inspected where it has been used on sites previously.

Links to factsheets and further information

Moors for the Future https://www.moorsforthefuture.org.uk/our-resources

Peatland Action Resources https://www.nature.scot/climate-change/nature-based-solutions/peatland-action/peatland-action-project-resources

Yorkshire Peat partnership https://www.yppartnership.org.uk/resources

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Thom, T., Hanlon, A., Lindsay, R., Richards, J., Stoneman, R. and Brooks, S., 2019. Conserving Bogs: The Management Handbook. Available from: <https://www.iucn-uk-peatlandprogramme.org/sites/default/files/header-images/Conserving Bogs the management handbook.pdf (iucn-uk-peatlandprogramme.org)

Moors for the Future (2020) Heather Cutting Fact Sheet. Viewed: 11 March 2021<https://www.moorsforthefuture.org.uk/__data/assets/pdf_file/0023/87431/Heather-cutting-Factsheet.pdf>

Donor Site Information

Application reference:

Name of Donor Site:	
Address:	
Grid Reference:	
Quality of Material available:	
Earliest available date for collection at this site?	
Is it a designated SSSI?	
Is Natural England permission required and if so when will Notice be given?	
Has an archaeological search been undertaken?	
Is there any known history of disease at the Donor Site which may affect any agricultural, conservation or sporting interests on the Recipient Land?	
Has a letter of confirmation that the Donor Site has no known history of pest or disease been provided by the landowner?	
Name:	Company:
Signed:	Date:

Annex 3. Environmental Monitoring

Nature for Climate Peatland Grant Scheme

Guide for Applicants

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Contents

Introduction

This guidance provides information on peatland monitoring design, implementation and reporting for restoration grant projects funded under the Nature for Climate Peatland Grant Scheme (NCPGS). This guidance should be read in conjunction with the Invitation to Apply and NCPGS Guide for Applicants. The term restoration in this guidance is used to cover activities which may be considered either restoration or creation as described in the NCPGS Guide for Applicants.

In the NCPGS, monitoring is required to:

- demonstrate projects have delivered against their restoration objectives
- assess the impact of restoration activities on peatland condition, i.e. hydrology and biodiversity
- enable adaptive management where responses to restoration are not as expected

Hydrology and biodiversity are prioritised for monitoring and evaluation as they reflect the key benefits of healthy functioning peatlands; a water table near the surface providing the waterlogged conditions needed for peat formation and is resilient to fluctuations, and vegetation which is both peat-forming and supports wider ecosystem diversity. Together these enable peatlands to function as carbon stores and potentially carbon sinks, enabling peat accumulation and providing a crucial role in climate change mitigation.

The grant scheme will only fund monitoring which is:

- **directly linked to assessing the success of restoration activities which are funded through the NCPGS**
- **relevant and proportionate to the scale of restoration works undertaken**

The use of standardised monitoring techniques by grant scheme funded projects will help to build a bigger picture of England's peat condition and restoration activities. The data will allow Natural England and Defra to undertake wider evaluation of the impact of restoration on peatland condition, contributing to targets such as Net Zero.

In your restoration grant application, you are required to provide a Monitoring Plan which must include:

- Survey methods and design for peat depth, hydrology and vegetation surveys
- Number and location of sampling points
- Timing and frequency of measurements
- Description of baseline surveys already completed or planned
- Details of any additional monitoring or research projects
- How monitoring will fit into the project as a whole

Monitoring for the grant scheme may be carried out through partnerships with academic or research institutions, or consultancies, enabling access to additional expertise or equipment. Opportunities for studies that will provide further detail about restoration methods or responses will be welcome but cannot be funded through the scheme or be used as match funding. If you are unsure whether specific monitoring works can be funded, please contact the NCPGS team at peatlandscheme@naturalengland.org.uk.

Monitoring restoration

Monitoring the impact of restoration on peat condition during the grant scheme should focus on hydrology and vegetation. The monitoring techniques you should use are described in this guidance. You will need to decide where to carry out monitoring, as this depends on your restoration objectives and resources and skills available.

Monitoring should be integrated so that measurements of peat depth, hydrology, vegetation, and other environmental factors occur in the same locations. This will help to understand the effects of restoration works on the eco-hydrology of the site and explain unexpected changes.

To assess whether restoration is leading to changes in peatland condition, the starting condition (i.e. a baseline) needs to be known, as well as how conditions change during restoration and the influence of wider environmental conditions, for example weather. Having access to meteorological data from a local weather station will be helpful to explain environmental responses to restoration and should be considered by projects.

Baseline survey

A robust baseline survey enables change to be assessed in the future and must be undertaken before restoration activities commence, allowing before-after comparisons to be made. A minimum of a one-year baseline is preferable as it allows the seasonal variability in water levels and vegetation to be captured, however any monitoring before works commence is valuable.

The baseline survey should be collected using the methods described in the Survey Methods section below, unless monitoring programmes are already established at sites to be restored. Where baseline surveys are underway or have been completed as part of an existing monitoring programme (such as a Discovery Grant), a description of monitoring methods should be provided with justification of how the monitoring is able to demonstrate a change in peat condition from restoration.

Comparison site

Projects which are implementing new or innovative restoration techniques should include monitoring at a comparison site or area not under the innovative technique. Comparison

site monitoring should also include a baseline survey to enable the impact and success of the selected technique to be assessed. In selecting a comparison site, care should be taken that the site has the same local conditions and management history as the area under restoration (with the exception of intact sites).

Comparison sites may include:

- control areas which are not under restoration and in a similar degraded state to the site to be restored
- areas or sites where established techniques have been applied
- intact or near-natural site which demonstrate locally appropriate target condition.

At the application stage, your monitoring plan should include a summary of baseline surveys which have been completed, are underway or planned, including:

- survey methods, including timings and frequency of sampling
- survey locations
- number of sampling points
- at both restoration and comparison sites if relevant

During the project, data collected during the baseline surveys should be provided to Natural England within year one of the project (i.e. by March 2023) for sites being restored in year one of the grant scheme. For sites being restored later in the grant scheme, baseline survey data should be provided during the annual data submissions.

Monitoring objectives and restoration trajectory

Monitoring objectives are targets which help to assess whether a restoration objective has been met. For example, where the restoration objective is to rewet an area through ditch blocking, the monitoring objective may be that the water table depth is raised to within 10cm of the peat surface within 5 years of the works being completed.

The long-term nature of peatland restoration means that restoration and therefore monitoring objectives have a longer-term goal than what is achievable during the lifetime of the grant scheme. A restoration trajectory is a useful way to capture the changes expected during the project lifetime and projected into the future, enabling success to be evaluated at a range of timescales.

The expected restoration trajectory will differ depending on individual restoration objectives, peatland type and condition at the start of the project (Alderson et al., 2019).

Short term changes within the lifetime of the grant scheme might include:

- raising of the water table in the immediate vicinity of bunds or dams
- stabilisation of bare peat from a nurse crop
- increase in peat-forming vegetation due to planting
- removal of non-peat forming vegetation (e.g. cropland on peat)

- planting or recolonisation by fen or bog vegetation

Medium term changes are likely to reflect the gradual return of the natural functioning of the peat, for example:

- natural shifts in vegetation and increases in positive indicator species
- water levels continuing to rise
- reduction in annual water level fluctuations due to water retaining capabilities of the peat re-establishing

Over the long term, wider recovery of biodiversity is expected with rare species expanding in range and increased hydrological function.

All projects funded through the grant scheme should provide anticipated trajectories for the following attributes:

- Hydrology - mean or range of annual water table depth
- Vegetation
    - Positive indicator vegetation - % cover or frequency
    - Negative indicator vegetation - % cover or frequency
    - Bare peat - % cover
- Peat condition category - see peat condition section

Expected restoration trajectories should also be provided for other attributes which are relevant to your specific restoration objectives. For example:

- Dissolved organic carbon (DOC)
- Particulate organic carbon (POC)
- Species presence or abundance

The restoration trajectory should cover expected change over the next 50 years, reflecting the long-term vision of restoring peatlands to near-natural condition. The restoration trajectory may cover an entire site, or may be focused on where restoration activities are taking place e.g. in the vicinity of ditches which are blocked.

At the application stage, you must provide a restoration trajectory to show the expected changes in environmental attributes. You should describe the expected changes:

- over the next 50 years
- annually during the lifetime of the grant scheme
- at key checkpoints after the end of the grant scheme – every 5-10 years

Separate restoration trajectories may be required for different sites where different restoration activities are taking place, although sites or areas may be grouped where appropriate.

You may use the table set out in the example below, or use a different format such as a graph, to present the trajectory. Any figures or values you provide are intended to be indicators and do not need to be exact.

During the project, progress against the restoration trajectory should be reported in your annual report.

In the Final Report, the progress of the site condition against the restoration trajectory should be presented based on the monitoring data collected and implications for future restoration should be described.

An example is included here.

The example project involves revegetating bare peat and blocking ditches with dams which are expected to raise the water table and rewet the surrounding peat. Assuming the dams are installed properly and work effectively, the annual water table is expected to rise compared to the baseline. The restoration objectives are to:

- raise water levels and reduce sediment losses through blocking grips using coir dams
- re-establish vegetation cover on bare peat areas using a moss-rich nurse crop enhanced with *Sphagnum* species

In this example the success of restoration is assessed by:

- water levels moving towards the surface
- reduction in cover of bare peat
- increase in *Sphagnum* cover from the nurse crop

Some fluctuation in these changes is anticipated, for example seasonal drawdown of the water table, but the measures should show some overall change if restoration is working. Later checkpoints in time could also include the presence of other *Sphagnum* species which are characteristic of natural bogs.

Year	Mean annual water table depth (cm)	Vegetation (positive/negative)		Bare peat (% cover)	Peat condition
Baseline	-100		Bare peat	70%	Drained eroding modified bog, drained semi-natural modified bog
1	-100	Nurse crop application	Bare peat covered by nurse crop	70%	Drained eroding modified bog, drained semi-natural modified bog
2	-50	Sphagnum established		60%	Drained eroding modified bog, drained semi-natural modified bog
3	-30	30-50% *Sphagnum* on previously bare peat		40%	Drained eroding modified bog, drained semi-natural modified bog

4	-15	50-70% *Sphagnum* cover		20%	Drained eroding modified bog, drained semi-natural modified bog
5	-5	70-90% *Sphagnum* cover		10%	Rewetted modified semi-natural bog
10	-3	90-100% *Sphagnum*		5%	Rewetted modified semi-natural bog
15	-3	90-100% *Sphagnum*		0%	Rewetted modified semi-natural bog
20	-3	90-100% *Sphagnum*		0%	Rewetted modified semi-natural bog
25	-3	90-100% *Sphagnum*		0%	Rewetted modified semi-natural bog
30	-3	90-100% *Sphagnum*		0%	Near-natural bog
35	-3	90-100% *Sphagnum*		0%	Near-natural bog
40	-3	90-100% *Sphagnum*		0%	Near-natural bog
45	-3	90-100% *Sphagnum*		0%	Near-natural bog
50	-3	90-100% *Sphagnum*		0%	Near-natural bog

Site description

A site is an area where peatland restoration activities are planned. Accurate site descriptions enable us to get a better idea of the state of peatlands and whether management is sustainable and helping to improve peatland condition. Spatial data is an important component of describing sites and the use of digital resources, such as ArcGIS, enables a lot of information to be accurately recorded, updated and analysed consistently.

Project boundary

The boundary of a project encompasses all restoration activities undertaken by a project funded through the grant scheme. This may be over multiple sites, as well as comparison sites where required for new or innovative restoration techniques.

Site boundary

The boundary of a site should include the area where restoration activities are being carried out and where they are likely to impact. Site boundaries should make sense from both a management perspective and hydrological or ecological perspective.

The area under restoration within a site specifically refers to the area where restoration activities have taken place, for example, the area of cell bunding.

The footprint of works is the area of ground that will be physically disturbed by restoration activities. This may include areas not being restored, such as land used to access a site.

Natural England will use the area where peat condition changes as a consequence of funded restoration activities to report against the Nature for Climate Fund commitments.

At the application stage, details of each site should be provided in your E02 response, with appropriate maps and spatial data as described in the Guide for Applicants.

During the project, spatial data layers of the site boundaries and areas under restoration should be provided to Natural England for known restoration areas within year one of the project (i.e. March 2023). For sites where restoration is being planned during the grant scheme, data should be submitted with annual data submissions as appropriate. The format to be used will be provided to successful applicants.

In the Final Report, a final version of the site boundaries should be submitted as a spatial data layer if amendments are made.

Restoration activities and mapping

Mapping of site features is important to keep a record of what restoration has taken place and features that need to be considered when working on site.

Mapping of restoration and management activities and site features in a standardised format will help Natural England to collate a national picture of the restoration activities funded through the scheme.

It is also recommended that projects are added to the restoration projects map on the IUCN Peatland website, to help build a wider inventory of restoration within the UK.

At the application stage, your proposed restoration activities should be described and mapped in your E02 response as described in the Guide for Applicants.

During the project, completed restoration works, management implemented, and monitoring locations should be mapped as a spatial data layer. Successful applicants will be provided with further information on the details to be included.

You should keep a record of restoration methods where these deviate from your agreed ‘Detailed Site Restoration Proposal’.

You will be required to report quarterly on the progress of restoration activities and area where activities have been started for each site.

In the Final Report, a spatial data layer with all restoration activities, capital works and management across the project should be provided.

Peat condition

The grant scheme will calculate greenhouse gas (GHG) emission savings of projects using the latest peat condition categories and emission factors from the UK Peatland GHG Emission Inventory. The emission factors in the table below were published as part of the UK Greenhouse Gas Inventory, 1990 to 2019 (Brown et al., 2021) and provide an update to those in Evans et al. (2017). If emission factors are updated prior to the launch of the restoration grant in 2022, this will be highlighted in the ITA.

The changes in area of peat condition will be used to identify the contribution of peatlands to the Nature for Climate Fund and Net Zero Strategy commitments.

Descriptions for each of the peat condition categories can be found in Evans et al. (2017), however the way eroded modified bogs are considered has changed. Previously, the areas of eroded modified bog assumed 15% bare peat and 85% heather or grass dominated modified bog. These emissions have now been separated into their component categories. The eroding modified bog category represents bare peat only and should be applied to the eroding areas of the landscape. The heather or grass dominated modified bog should be applied to modified bog areas dominated by heather or grass vegetation. This amendment does not affect the total emissions estimates, but more clearly demonstrates the emission savings associated with restoring eroding peat.

Peatland condition	GHG emission factor (tCO2e/ha/year)	
Forest (drained)	5.46 to 1.15	
Cropland (drained)	37.61	
Eroding modified bog (drained)	13.28	bare peat only
Eroding modified bog (undrained)	12.17	bare peat only
Heather dominated modified bog (drained)	3.54	
Heather dominated modified bog (undrained)	2.31	
Grass dominated modified bog (drained)	3.54	
Grass dominated modified bog (undrained)	2.31	
Extensive grassland (drained)	13.03	
Intensive grassland (drained)	27.54	
Rewetted bog (rewetted)	3.91	from forest, cropland, grassland, extracted or eroding
Rewetted fen (rewetted)	8.05	
Rewetted modified (semi-natural) bog (rewetted)	-0.02	from semi-natural, heather/grass dominated
Near natural bog (undrained)	-0.02	
Near natural fen (undrained)	-0.93	
Extracted domestic (drained)	13.37	
Extracted industrial (drained)	13.28	
Settlement (drained)	1.61	

Table A 3.4.28 from UK Greenhouse Gas Inventory, 1990 to 2019: Annexes (Brown et al., 2021)

At the application stage, you must select the dominant peat condition of each site in the site background table of your E02 response.

You must state the area of peat in each condition category in your E05 response using the spreadsheet provided (see ITA Annex). For restoration at sites which will be planned during the first year of your grant, a best estimate of condition and area should be provided.

During the project, you should map the baseline peat condition for each site and submit this in a digital spatial data format within year one of the project (i.e. March 2023). Further guidance will be provided to successful applicants.

In the Final Report, you should submit a map of the peat condition from the final survey season in a digital spatial data format. The written report should include the area within each peat condition category and evaluate the progress against the expected restoration trajectory for each site, linking to any issues with completing restoration activities.

Survey methods

Sampling

Surveying should be integrated so that monitoring of peat depth, hydrology, vegetation and other environmental factors occurs in the same locations. This will help to understand the effects of restoration works on the eco-hydrology of the site and explain unexpected changes.

The level of sampling required will be site specific and depend on the restoration being undertaken. Whilst you plan your monitoring, you should keep in mind the purpose of monitoring for the grant scheme is to evaluate the success of restoration works, focusing on changes in water level and vegetation.

You will need to decide:

- the number of sampling points
- the location of sampling points

You need to ensure that monitoring can be realistically and robustly carried out during your project. The timing of monitoring activities should minimise the number of visits required as this will help to reduce the potential impacts of trampling. Surveyors should avoid using the same paths repeatedly, especially in wet or sensitive areas, to minimise damage.

Where innovative restoration techniques are being trialled, a higher degree of monitoring may be appropriate with monitoring at nearby control areas. Alternatively, where well-

established techniques that have already worked successfully in other areas of the peatland are being used, monitoring may use a lighter touch.

You should consider who will carry out the monitoring. Some of the monitoring methods in this guidance require specific expertise, such as vegetation surveys, however some methods are more general and suitable to be carried out by non-specialists, for example, volunteer groups.

The questions below will help you to think about what level of sampling is appropriate:

- What are the restoration objectives of the site?
- What are the different restoration activities occurring across the site?
- How are the restoration activities expected to impact the water levels of the site?
- How are the restoration activities expected to impact the vegetation at the site?
- How big is the site and are the same restoration activities happening everywhere?
- How variable are conditions across the site, considering both environmental and past management history?
- What resources are available for monitoring during the project? Will volunteers be used?
- How accessible is the site? Will it take a long time to get to certain locations to monitor them?
- What nearby environmental monitoring is there, such as a weather station?

Suggested sampling approach

The sampling approach provided in this guidance is based on using 10m quadrats, within which peat depth measurements and broad level vegetation surveys are carried out (figure 1). More detailed vegetation surveying is carried out within a 2m quadrat, which sits at the centre of the 10m quadrat. During field surveys, it will be useful to mark out the four corners of the quadrat being surveyed using ranging poles to help define the area.

Hydrological monitoring should be located near to quadrats so that water level changes can be associated with vegetation changes.

The monitoring you do should follow the survey methods included in this guidance as far as possible. However, if you are restoring sites with previously established monitoring programmes, you should describe the methods used and how they can demonstrate changes in water level, vegetation and peat condition from restoration.

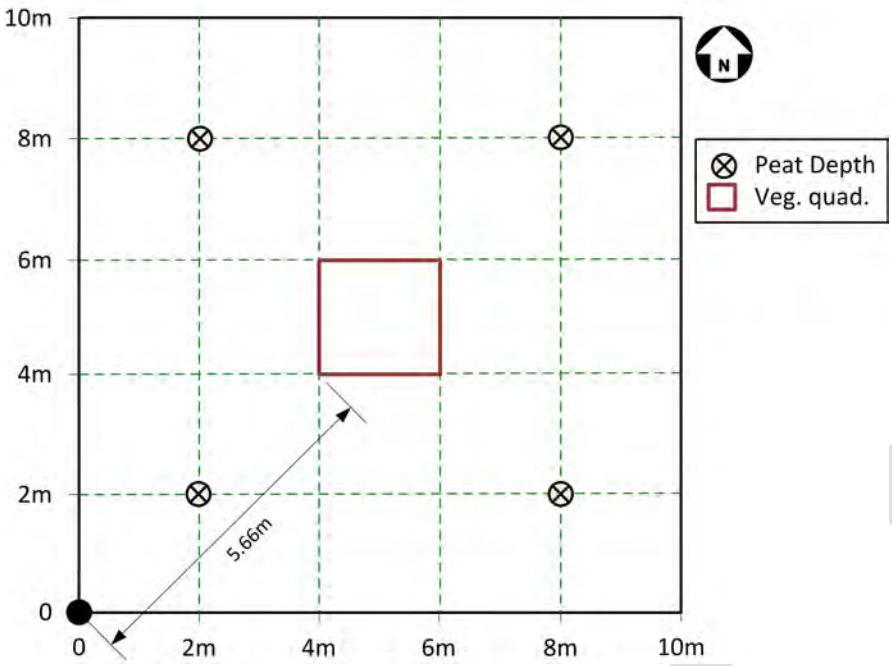

Figure 1: 10m quadrat layout with 2m quadrat in the centre for detailed vegetation surveys.

Peat depth

Measurements of peat depth help to characterise a site and determine the extent of the peat resource which may be protected through restoration. This will help to inform what restoration techniques may work and the vegetation types which are realistic to achieve. Tracking the long-term change in peat depth also allows us to determine whether peat is accumulating or being lost from the system, this can be done through surface-level rods.

Peat depth surveys should be carried out within the first year of a restoration grant being awarded. If peat depth surveys have previously been carried out on the site to be restored, additional surveys may not be needed if comparable methods were used and measurements are recorded to an exact depth (rather than a minimum peat depth e.g. measurements which record a depth of greater than 1m but not the exact depth). An outline of existing data should be provided in the application form and peat depth data provided as per the reporting requirements.

Method: Peat depth measurements should be taken using peat rods to measure the depth of the organic horizon. Four peat depth measurements should be taken in each 10m quadrat as shown in figure 1.

1. Locate where peat depth measurements should be taken, according to the layout in figure 1.
2. Drive the unthreaded end of a peat depth rod into the soil, attaching further extension rods as required, until you feel the soil becoming more resistant, or the texture changing (sand grains rubbing the rod can be felt and heard). Note that completely

resistant, hollow-sounding material may be woody material which can sometimes be penetrated with further pressure.

3. Once you have reached the bottom of the organic layer, mark the peat rod at the peat surface (e.g. with tape) and gently pull out the rod until you can see the end of the join of the next rod section below.
4. Use a tape measure to measure from the end of the rod or the joint to your marked point and use the known lengths of the joints to determine the total depth of the organic layer.
5. Record the location of the measurement using a GPS, taking at least a 10 figure British National Grid (BNG) reference.
6. Make a note of the characteristics of the peat surface where the measurement was taken, for example lawn, hummock, hollow or pool, open water, ditch or grip, eroded surface.

Location & number of sampling points: Peat depths vary on a local scale so multiple measurements will be required per site. The location of peat depth measurements must relate to where restoration works are proposed. Examples of peat depth measurement locations include:

- within 10m quadrats as shown in figure 1
- where there is a lack of existing data – for example creating new peat-forming habitats on arable peat
- to identify the edge of a peat mass
- to identify the extent of restoration works needed

Timings & frequency: A peat depth survey only needs to be carried out once during the grant scheme. It is recommended that you undertake peat depth measurements:

- during the baseline surveys prior to restoration work starting
- at the same time as quadrat vegetation surveys to minimise potential disturbance

Data to be reported: You should provide peat depth survey data to the NCPGS team within year one of the project (i.e. March 2023). You will be provided with details of the format to use to submit your data. Where restoration locations are still to be determined during the project, you should provide peat depth survey data with annual data submissions.

Surface-level rods

Surface-level rods are a simple and effective way to monitor surface level change over a long time period by inserting inert rods into the peat until the mineral soil or bedrock is reached. The positioning of washers on the rod enables the surface level change to be measured on returning to the rod. The full methodology is available in the Eyes on the Bog Monitoring manual from the IUCN UK Peatland Programme (Lindsay et al., 2019). The low cost to construct, install and monitor the rods means they are an effective way to monitor surface level changes across large areas over a long time.

Location & number of sampling points: Peat depths vary on a local scale so a site may need multiple rods installing. It is recommended that surface-level rods are installed where a measurement of peat depth has been taken using a peat depth rod (section above), though it is not intended that surface-level rods are installed in every 10m quadrat. Surface-level rods provide an opportunity for long-term monitoring of the restoration carried out through this grant scheme and therefore locations should be decided with the long-term vision of the site in mind.

Rods should be marked with at least a 10-figure grid reference so that you can find them again in future. The use of a high accuracy GPS will improve the accuracy of recording locations. A metal detector may also be useful to re-locate rods where they have become buried by vegetation.

Timings & frequency: Surface-level rods can be installed any time of year. It is recommended rods are checked twice a year, once in June and once in November. Checking rods at the same time each year ensures that data across the site is comparable and reduces the impact of seasonal variation. Measurements should aim to coincide with other monitoring visits.

The surface-level rods will last a long time once installed and therefore it is recommended you consider continuing measurements twice a year beyond the lifetime of your grant. This may be through volunteers or citizen science surveying. The frequency of measurements may be reduced where resources are limited, however it will be important to note the date of any measurements, to take into account seasonal changes when comparing data.

Data to be reported: Surface-level rod data should be reported using the template provided to successful applicants and submitted during annual data submissions. All data should be submitted by the end of the project.

Hydrological monitoring

Raising water levels in peatlands is a key step to restoring a functioning system and reducing carbon losses. Dipwells are a simple and commonly used method to determine the water table depth, i.e. how far below the peat surface the water table is. Dipwell measurements throughout the year enable the seasonal changes in water levels to be tracked, as well as the response to rainfall or drought events.

Water level monitoring using dipwells needs to be considered in the context of recent weather data, particularly rainfall to determine whether measurements are reflecting water levels sustained by re-wetting or from recent rainfall events. Projects should identify whether local meteorological data is available from nearby stations, and how representative this data is of site conditions. Where data from a local met station is not suitable, rainfall data can be simply collected using a rain-gauge.

Method: Dipwells can be purchased or can be constructed from a plastic pipe using the following specification:

- approximately 4 - 5cm in diameter
- length of 1.5 – 2m, so the water table will not drop below it when inserted into the ground
- slots or holes along the entire length so water, but not peat, can easily flow into and out of the pipe – this can be done by drilling four holes approx. 5mm diameter at 7cm intervals along the length of the pipe
- the base of the pipe should be sealed, for example with a bung, to prevent peat ingress when it is installed
- the top of the pipe should have a cap which can be removed to take measurements

To install the dipwell:

1. Use an auger with a slightly narrower diameter than the dipwell to create a hole to the required depth
2. Insert the dipwell so approximately 15cm remains above the surface
3. Record the location of dipwell using a GPS
4. Place a cane or stick next to the dipwell to help locate it in future

To take dipwell measurements:

1. Measure the depth of the water inside the dipwell from the top of the dipwell - shown by (a) on Figure 2.
   This can be done using a dipmeter which makes a noise or flashes a light when the end comes into contact with the water. Alternatively, insert a small straight tube into the dipwell whilst blowing until you can hear bubbles as the pipe reaches the water surface and measure the length of pipe inserted into the dipwell.
2. Measure the height of the dipwell compared to the ground surface using a tape measure - shown by (b) on Figure 2.
3. Subtract the measurement in step 1 from the measurement in step 2, to calculate the water table depth. A negative value indicates a water level below the surface.

Automatic data loggers can also be installed in dipwells which take measurements at a high frequency and are useful to assess the response to rainfall events. Manual measurements of these dipwells will still be required for calibration. Automatic loggers will need downloading as per the equipment instructions.

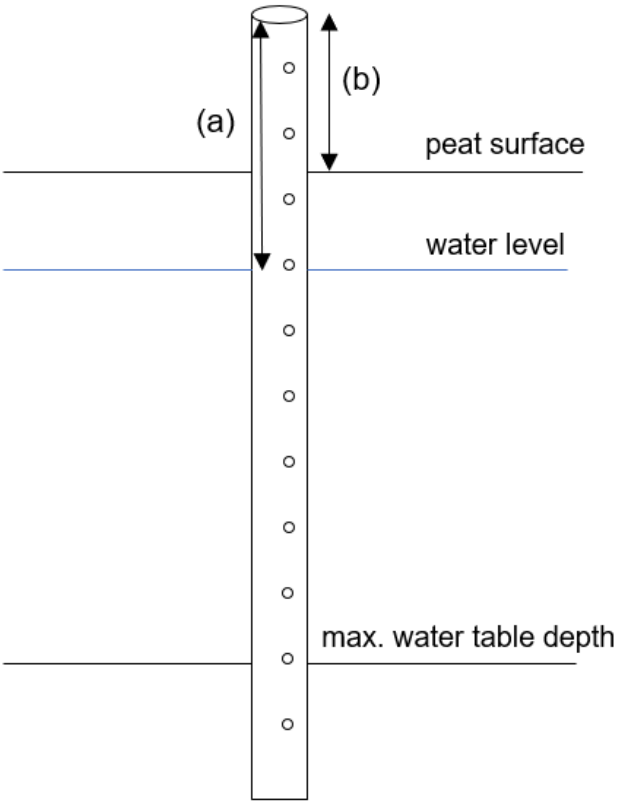

Figure 2. Dipwell installation and measurements to be taken.

Location: Dipwells should be installed:

- where changes to the water level from restoration activities are likely, such as where ditches are blocked or cell bunding is being installed.
- at a comparison site (if required) to see if water levels respond in the same way to rainfall events.
- avoiding surface features such as hummocks or hollows
- in transects or grids, depending on the sites and works undertaken
- beyond the immediate area of restoration works to help determine the extent of rewetting

For example, a transect of dipwells might be installed from the centre of a raised bog to the periphery where cell bunding is being used to help re-wet central area of the bog. The transect may extend into the surrounding lagg fen to see if water levels are impacted downslope. Alternatively, a grid of dipwells across a ditch or grip network might be used to determine the extent of rewetting from the ditch and influence of position on a slope, once grips have been blocked.

Number of sampling points: A grid of dipwells might have approximately 15 within a 30m by 30m area but this is not intended to be scaled up across the whole project. For example, a project blocking ditches within a site may choose to install three grids of dipwells; two grids across ditches being blocked but on different slopes and one grid

where restoration is due to start in the third year of the project. This third grid of dipwells will enable a comparison to an 'unrestored' area for the first two years of the project as well as a baseline for a before-after comparison once ditch blocking has occurred.

Automated data loggers are not required for every dipwell but should be used at key locations to monitor high frequency changes in water levels. Automated loggers will be most informative where water levels are still likely to fluctuate after restoration works and should be avoided where inundation is likely. For example, in a transect of dipwells across a lowland raised bog, three automated dipwells could be installed; one near the centre of the bog, one in the middle of the slope, and one on the margin of the bog.

Timings & frequency: Dipwells should be installed as early as possible during the planning of restoration projects to enable a baseline to be collected prior to restoration works starting.

Manual dipwell measurements should be taken monthly to capture the seasonal changes in the water table depth and automated data loggers downloaded at the same time. Visits should be undertaken at the same time as other monitoring to minimise any possible trampling effects.

Data: During each visit, the water table depth should be recorded, along with the date, time and weather conditions. This will help to match manually collected data with that from the automated data loggers and determine whether water levels have been impacted by recent rainfall or drought conditions. A template will be provided for hydrological data to be submitted to Natural England.

Vegetation monitoring

Vegetation surveys are a crucial part of assessing peatland and habitat condition, with repeated surveys showing what change has occurred over time compared to a baseline survey. Depending on the restoration works planned, changes in vegetation during the grant scheme may only be subtle, therefore collecting a robust baseline from which future changes can be assessed is critical. Alternatively, where the creation of peat-forming habitat is occurring, such as from improved grassland, vegetation changes may occur more rapidly.

Baseline vegetation map: Before restoration works start, a baseline survey should map vegetation communities across sites to be restored by the project. Aerial photography, remote sensing or existing data may be used to help produce these maps, but you should ground truth these. The site vegetation map should be produced as a digital spatial layer.

Location: The baseline vegetation map will help to identify where more detailed monitoring should take place. It is recommended that vegetation quadrats are used to monitor vegetation change. Vegetation quadrat surveys may be carried out to assess change in areas:

- under different restoration techniques

- under different types of vegetation
- where change from restoration works is likely
- which are representative of site in general

The location of quadrats should be chosen using a stratified random sampling approach, using the main vegetation types present and/or restoration techniques to stratify the samples. For example, if ditch blocking is being carried out across an area with three distinct vegetation types present, the quadrats should be placed randomly within each of the three vegetation types.

Quadrat locations should be permanent, meaning that the same locations are revisited for re-surveying. To ensure the same location can be found a high accuracy GPS is recommended, as well as the use of permanent markers.

Number of sampling points: The number of sampling locations will depend on the diversity and size of a site; a larger and/or more variable site will need more sampling points compared to a smaller homogenous site. It is recommended that:

- a minimum of 10 quadrats are surveyed per site
- more quadrats are surveyed in larger or more diverse sites - suggested 25 – 50
- at least five quadrats are surveyed for each vegetation type and/or restoration technique
- equal numbers of quadrats are assigned to each stratification
- a pragmatic approach is followed to decide the number of quadrats to survey

You may choose to undertake a power analysis to help determine an appropriate number of quadrats to use.

A pragmatic approach should be taken if you have a number of small sites, for example in a highly fragmented peatland context. In this case, you may wish to choose a catchment-scale monitoring approach. You should prioritise sites for quadrat surveys based on your restoration and peat partnership objectives.

Quadrat survey method:

1. Identify the four corners of the 10m quadrat and mark using ranging poles (figure 1).
2. Take a wide landscape photograph of the quadrat to provide a reference of general condition. Record the orientation so future photographs are taken in the same direction.
3. Record the total percent of the 10m quadrat covered by the following taxa and ground cover types. This only needs to be done where the vegetation group covers more than 5% of the quadrat.
    - Heather
    - Other dwarf shrubs
    - *Molinia caerulea*
    - Other grasses
    - All cotton-grasses

- Other sedges
- All rushes
- *Sphagnum* species
- Other bryophytes
- All forbs
- *Phragmites australis*
- Other reeds
- Trees and shrubs (not dwarf shrubs)
- Bare peat
- Nurse crop/vegetation applied (bare peat re-vegetation)
- Other ground cover type (e.g. bare rock, bracken, crops, open water)

4. Record the presence or absence of the following ground features within the 10m quadrat:
    - Presence of microtopography (hummocks/hollow structure)
    - Presence of drainage
    - Presence of active erosion (e.g. eroding haggs or gullies)
    - Signs of grazing or browsing
    - Evidence of recent burning
    - Any other form of disturbance e.g. vehicle tracks, trampling etc.
5. Mark the four corners of the 2m quadrat, in the centre of the 10m quadrat (figure 1).
6. List all the species present with a minimum of 5% cover in the 2m quadrat.
7. Record the total percent cover within the 2m quadrat for each species listed in step 6.
8. Record the frequency within the 2m quadrat for each species listed in step 6. This may be done by subdividing the quadrats into 25 equal compartments and recording the presence or absence of a species within each subdivision.
9. Take a photograph of the 2m quadrat from above (plan view). Geo-tag or label the photograph so it can easily be linked to the vegetation survey data. It may also be useful to include a scale marker in the photograph for future reference.
10. Record the altitude, aspect and slope of the quadrat. This may be done using desk-based maps, rather than in the field.

Timing & frequency: Vegetation surveys should be carried out during spring or summer; however, identification can generally be made throughout the year if necessary. Vegetation surveys are recommended twice during your project:

- The baseline vegetation map and quadrat surveys should be carried out before restoration works take place.
- In the final year the project receives grant funding, the quadrat surveys should be repeated. The vegetation map should be updated where changes have occurred.

When planning your vegetation surveying, you should consider:

- Carrying out any re-surveys at the same time of year as the baseline to account for seasonal variability

- Surveying later in the year if you need to assess the cumulative effect of grazing as part of your restoration proposals
- the bird nesting season and risk of disturbance to sensitive areas
- timing surveys with other monitoring visits
- continuing monitoring key indicators every 2-3 years after the grant scheme if possible

Data: You should submit baseline vegetation survey data within year one of the project (i.e. March 2023) for sites being restored in the first year of your project. For sites being restored later in your project, you should submit baseline data with the annual data submissions. Data from the final year surveys should be submitted with the Final Report. You should use the templates provided to successful applicants to submit your data. As with all monitoring, field notes should include general observations that may help to interpret the data.

Fixed point photography

Fixed point photography is an effective way to visually record change over time. Photographs should:

- be taken before, during and after restoration works to demonstrate the efficacy of works
- include 'close-ups' of examples of specific works
- include landscape scale views from vantage points or using unmanned aerial vehicles
- consider taking photographs in the eight cardinal directions from vantage points
- be taken from the same location to show change over time – foreground and background features will help to lined up photographs
- be taken at the same time of year to account for seasonal changes

Location: Photographs should be in relevant locations for identifying change but are not required everywhere. Vantage points which provide a view over representative areas of the site should be chosen, for example where vegetation shifts can be observed. 'Close-ups' of restoration works are likely to be most useful where other monitoring is taking place e.g. where surface-level rods are installed.

Number of sampling points: Representative locations should be chosen for vantage point and 'close-up' photographs, whilst keeping in mind the potential data storage of lots of photos.

Timings & frequency: Vantage point photographs should be taken quarterly at a minimum and in general photographs should coincide with other monitoring visits. More frequent photographs may be taken where changes are expected to occur quickly, for example during the installation and immediately after rewetting works at a chosen location.

Data: Photographs should be named in a consistent and informative way to enable comparisons over time. All photographs do not need to be submitted to the NCPGS team

but may be used as evidence to demonstrate changes happening on the ground in response to restoration, for example in written reports.

Additional monitoring

The monitoring methods described in the survey methods section of this guidance are a requirement for projects funded through the Nature for Climate Peatland Grant Scheme. Additional monitoring may be relevant for projects, depending on individual restoration objectives or where long-term monitoring is already established.

This section provides a brief overview of some common monitoring methods which may help to evaluate the success of restoration but are typically beyond the funding provided by the grant scheme. Further information on monitoring techniques is widely available in the literature, for example Bonnett et al. (2009) and Thom et al. (2019).

Peat properties

Characterising the properties of peat can provide useful information to determine the extent of degradation, for example bulk density, humification or carbon content. An indication of humification can be carried out simply in the field using the von Post squeeze test. This method ranks peat relative to their degree of humification on a scale from H1 (undecomposed peat) to H10 (completely decomposed peat). Whilst more sophisticated laboratory techniques are available to determine humification, the von Post scale provides a rapid field assessment which can be used to provide indications of long-term change, especially if located with surface-level rods.

To take a sample:

1. Dig approximately wrist deep into the peat using a trowel or auger
2. Take a sample somewhat larger than a golf ball from a depth of approximately 7-8 cm
3. Squeeze the peat to determine whether any water is extruded and its colour, and the proportion of peat extruded (if any)
4. Rub a small amount of the sample between your forefinger and thumb to identify the texture
5. Use the results to assign a H-value using the descriptions in the table below

Various descriptive tables have been developed to describe each H-value, for example the table below from the Conserving Bogs Management Handbook (Thom et al., 2019).

	Nature of liquid expressed on squeezing	Proportion extruded between fingers	Nature of plant remains	Texture	Description
H1	Clear, colourless	None	Unaltered	Very rough and very spongy	Undecomposed
H2	Almost clear, yellow-brown	None	Plant structure distinct	Very rough and very spongy	Almost decomposed
H3	Slightly turbid brown	None	Plant structure distinct, most identifiable	Moderately rough, slightly spongy, moulded residue when squeezed	Very weakly decomposed
H4	Turbid brown	None	Component fragments distinct, leaves identifiable	Very slightly soapy feel, moulded residue	Weakly decomposed
H5	Strongly turbid, contain a little peat in suspension	Very little	Plant structure clear but becoming indistinct	Slightly soapy feel. Moulded residue	Moderately decomposed
H6	Dark brown, much peat in suspension	One-third	Plant structure indistinct	Moderately pasty, residue	Well decomposed
H7	Strongly muddy	One-half	Indistinct with few remains identifiable	Very pasty, moulded residue	Strongly decomposed
H8	Thick mud, little free water	Two-thirds	Very indistinct, only plant fibres and wood identifiable		Very strongly decomposed
H9	No free water	Nearly all	Plant structure almost unrecognisable	Feels greasy	Almost completely decomposed
H10	No free water	All (unless too dry)	Completely amorphous	Feels very greasy	Completely decomposed

Water quality

The loss of carbon from peatlands in the fluvial system is typically dominated by dissolved organic carbon (DOC). Measurements of DOC may therefore be important if your project aims to reduce fluvial carbon losses. Fluvial carbon losses from peatlands also include particulate organic carbon (POC), dissolved inorganic carbon and dissolved CO_2 and CH_4. Some types of DOC result in the brown colour of peaty water, which reduces water quality and must be removed during the treatment process for drinking water. Consequently, monitoring fluvial losses of carbon may be additionally relevant for projects with restoration

objectives linked to improvements in water quality, particularly in relation to drinking water provision in the uplands.

Monitoring fluvial carbon losses will need to consider the flow patterns within a catchment or sub-catchment so monitoring can be located accordingly to identify the impacts of restoration. Projects may only need to monitor water quality within a sub-catchment where restoration works are being carried out.

Water samples are typically taken from streams which are representative of water leaving the sub-catchment. DOC concentrations naturally change seasonally, so monitoring should be carried out to capture this variation. Higher intensity monitoring campaigns might be used to capture flushes of DOC leaving peatlands during storm events.

Water samples should first be filtered at 2mm to remove large particles. POC represents the carbon that will be retained on a 0.45µm-membrane filter, whilst DOC is smaller than 0.45µm (including particulates smaller than 0.45µm). The DOC concentration of the filtered water can then be measured using carbon analysers in the laboratory. Whilst the methods for quantifying DOC and POC are well-established, the need for laboratory equipment and careful storage of water samples, mean this monitoring may be most effective in partnership with a water company or academic or research institute.

Long-term monitoring is crucial to identify changes in DOC, with historic long-term data sets required pre-restoration, as well as the commitment to continued monitoring post-restoration. Historic datasets may be obtainable where organisations, such as water companies, universities or the Environment Agency, have established monitoring programmes.

The monitoring of pH (i.e. how acidic a sample is) may be useful for monitoring the impact of peatland restoration on other water quality issues, such as acid flushes, which may be impacting on the ecology downstream. Measurements of pH can be made simply in the field using either water samples or moist peat samples and a pH meter. Similar monitoring may be carried out for electrical conductivity to give an indication of the presence of inorganic components, such as from adjacent agricultural land.

Greenhouse gas emissions

The exchange of CO_2 and CH_4 between peatlands and the atmosphere can be measured using GHG flux chambers or eddy covariance systems, also known as flux towers. Both methods are high cost and require considerable expertise for installation and maintenance. Direct measurement of GHG fluxes requires long-term datasets to overcome annual variability and for modelling annual GHG balances (Baird et al., 2019) which is beyond the funding available for this grant scheme.

The grant scheme will use proxies to calculate changes in GHG emissions from restoration activities as peatlands move between condition categories, as listed in the peat condition section of this guidance.

Hydrology

Whilst dipwells provide an effective method to measure water level changes within peatlands, other aspects of hydrological monitoring might be useful to further understand the whole hydrological system and water balance of a site. As well as additional equipment, expertise may be required to help interpret the monitoring data collected and implications for restoration.

Piezometers are used to measure water pressure (hydraulic head) and hydraulic conductivity, which can provide information on the water flow dynamics within the peat. The construction of piezometers is similar to dipwells; however, they are sealed along their whole length, with an opening at the bottom of the pipe, and installed to different depths in groups (commonly known as nests). Installation in this way provides data on the water pressure at different levels within the peat and therefore enables vertical and horizontal water flows within the peatland to be calculated.

Discharge or channel flow measurements may be useful where water is flowing through a ditch or stream, for example using a V-notch weir and water level recorder. The weir acts as a dam, with the notch acting as a spill-way and a standard formula can be used to calculate the discharge based on the level of water above the base of the notch. Weirs must be constructed from materials which are capable of coping with the waterlogged conditions of the peatland and installed correctly to prevent erosion from water flowing around the edges under high flow conditions. Monitoring of discharge will be most useful when coupled with monitoring of other aspects of the hydrological cycle, for example to identify whether changes are linked to precipitation, storage, evapotranspiration or restoration activities.

Evaluating success

Adaptive management

Regular reviews of monitoring data are important to assess the impact of restoration works and can inform whether any adjustments to site management are required, for example amending or adding capital works or trialling different restoration techniques. It may be that more detailed investigations or data collection are needed to understand why the responses on the ground to restoration are not as expected. Learning from responses observed and using this to refine the design of restoration works, and therefore the restoration trajectory and objectives for a site, helps to increase certainty around the outcomes of future restoration.

Data and quality assurance

Collecting data in comparable ways and making data openly available means that monitoring data can be collated nationally and be used to inform methods, policy and guidance on future restoration. This means that data needs to be managed properly, with preparation before fieldwork, consistent handling and secured for long-term storage.

Templates will be provided to successful applicants for submitting data to the NCPGS team and these can be used to record data in the field, either on a printed-out sheet or on a tablet. These templates include reminders on what is important to record for each measurement, such as the units and scale. Taking a note of observations whilst out in the field will also help with interpreting data, such as the weather or signs of human impact, especially if data analysis is carried out at a later date.

Once data has been recorded in the field, it should be transferred to the template provided if it has been recorded elsewhere. The spreadsheet should be checked to ensure that all columns have been completed using the correct units or scale, and no typos have been made. The data should be kept safe, and digital copies of the data should be backed-up in different locations to avoid any loss of the data. Data should be submitted at least annually to the NCPGS team using the templates provided.

Checking monitoring data regularly is important to ensure that equipment is performing as expected and to check whether management needs to be adapted if the changes observed are unexpected. Simple plotting of data on a graph can help to visualise the changes that are happening, for example changes in water level over the year.

Data submitted to the NCPGS team will be made available under Open Government Licence (OGL) according to the grant terms and conditions. Natural England intends to use the data submitted by projects in the development of the England Peat Map, which aims to produce an updated map of peat location, extent, depth and condition across England, which will be available under OGL. Data may also be used in other relevant work areas by Natural England, for example to inform condition assessments of protected sites.

Reporting

The reporting requirements of projects awarded a restoration grant are outlined in the Guide for Applicants and templates will be provided to successful applicants for quarterly, annual and final reporting.

The checklist below lists the monitoring requirements which are required for submission at each stage in a project.

	Application	Baseline	Spatial data by end year 1 (March 2023)	Annual report	Final report
Restoration trajectory					
Hydrology	✓			✓	✓
Vegetation	✓			✓	✓
Peat condition	✓			✓	✓
DOC/POC	*			*	*
Other	*			*	*
Site information					
Project boundary			✓		✓
Site boundary	✓		✓		✓
Area under restoration	✓			✓	✓
Site features	✓		✓		✓
Restoration activities	✓			✓	✓
Peat condition	✓		✓		✓
Monitoring plan					
Monitoring methods	✓				✓
Monitoring locations	✓		✓		✓
Number of survey points	✓				✓
Survey timings	✓				✓
Sampling frequency	✓				✓
Completed baseline surveys	✓		✓		
Monitoring data					
Peat depth		✓		✓	✓
Surface-level rods		✓		✓	✓
Hydrology		✓		✓	✓
Vegetation map		✓		✓	✓
Vegetation quadrat surveys		✓		✓	✓
DOC/POC		*		*	*
Photography		✓		✓	✓
Other		*		*	*
✓ = essential requirement. * = optional, where relevant to the project.					

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Annex 4. Protected Sites & Protected Species

Nature for Climate Peatland Grant Scheme

Guide for Applicants

Date: 17 January 2022

Version: Draft

www.gov.uk/natural-england

Contents

Introduction

This guidance provides information on protected sites and protected species for restoration grant projects funded under the Nature for Climate Peatland Grant Scheme (NCPGS). This guidance should be read in conjunction with the Invitation to Apply and NCPGS Guide for Applicants.

If you have a protected site in the application area you must inform Natural England using the site background table in the E02 question template and the correct field-forms in the associated Site-Specific Template (required for Year 1 sites as a minimum). You must also demonstrate the works proposed are necessary for the conservation of the site and are appropriate to the site conditions.

You must include specific details in your application on the measures necessary to avoid or minimise any impacts to designated features i.e. routes for avoidance of sensitive habitat areas, the use of bog mats, use of borrow pits, re-fuelling & storage of materials etc. This information is best included in detail in the E02 Site-Specific Template with an overview or summary in the general E02 answer.

Failing to include these details will result in Natural England being unable to award your grant application due to the possible impacts on the protected site(s). There must be sufficient detail within the detailed site proposals provided at application, to allow a protected sites authorisation to be made for at least the 1st year sites.

This is also the case where site specific proposals are provided to the NCPGS team after the initial application i.e. year 2 onwards proposals that were not included within the initial application.

It is therefore strongly recommended that restoration proposals have incorporated Natural England Area Team and NCPGS contribution and feedback prior to the grant application.

If a protected sites authorization is already in place for the site and work, or a Notice of Proposal has already been provided to Natural England, please state as such within your E02 answer.

Protected Sites

If you have a protected site within the application area you must inform Natural England. These include:

- Sites of Special Scientific Interest (SSSI)
- Special Areas of Conservation (SAC)
- Special Protection Areas (SPA)
- Ramsar
- Potential Special Protection Areas (pSPA)
- Possible Special Areas of Conservation (pSAC)

If you are unsure how to find out about site designations, information is available on the Magic website, using the interactive mapping tool.

SSSI Notice of Proposals

The standard Notice of Proposal and Consent, Assent or Advice procedure will apply for all proposals on Sites of Special Scientific Interest (SSSI). The Bravo Application does not constitute a Notice of Proposal, and the grant offer will not act as SSSI Consent, Assent, or Advice.

Consent

This will be applicable for most applications, including those where a partnership is acting as an agent on behalf of a single, or several Owner/Occupiers (O/O).

Assent

This will be applicable if you (the applicant) are a Section 28G Public Body, are largely carrying out the works yourself and the proposed restoration work is part of the authorities' functions. Importantly this applies equally to proposals being undertaken outside an SSSI but likely to affect it.

Advice

For some projects it may be possible that a Section 28G Authority is granting a permission for a 3rd party, for instance a partnership, to carry out the works. In this instance the section 28G body will provide Natural England written notice under section 28I. Importantly this applies equally to operations being undertaken outside a SSSI that are likely to affect it.

You will only need to submit a Notice of Proposal for Consent or Assent, or consult Natural England for Advice, after a grant offer is made. However, restoration / creation works cannot be commenced until you have secured SSSI authorisation. When the grant offer is

made, the NCPGS Notice Template will be made available to grantees. Advice can be provided on the completion of this document should it be required.

Should you wish to accept the grant offer, you should do this via Bravo. Your Notice of Proposal form should be completed and returned via email to peatlandscheme@naturalengland.org.uk and not to your local Area Team.

Separate Notice of Proposals and authorisations will be required for all SSSIs within the application boundary.

If you are not the O/O (i.e. a partnership), you should include a Letter of Appointment stating you are acting as an agent acting on behalf of the O/O (you may already have included this as part of your application). This should include all necessary information to verify this, for instance signature(s) or email confirmation.

Following receipt of the completed Notice of Proposal, Natural England will determine the Notice and, if appropriate, issue Consent or Assent or give Advice that the proposal can go ahead.

Depending upon the proposed timetable of restoration works and the detail known at outset, it may be necessary to submit several Notice of Proposals/Site Restoration Proposals throughout the planned restoration works, as the initial Notice may not cover all future restoration works. This will be discussed with applicants when a grant offer is made.

It is your or the owner/occupier's responsibility to make sure that all necessary permissions and consents are in place to cover activities prior to commencing works, and that contractors are fully aware of the site requirements.

European Sites and Habitat Regulation Assessment

European Sites are defined as Special Areas of Conservation (SAC), and Special Protection Areas (SPA).

If your plan or project is within a European Site, or outside a European Site but restoration activities could impact upon it, a Habitat Regulation Assessment (HRA) may be required.

In most cases Natural England will act as the 'competent authority' and undertake this assessment, (the HRA) before deciding whether to permit restoration plans or projects. This assessment will take place prior to any formal grant offer. Where the plans or projects are being developed by s28G authorities or where a s28G authority is permitting the proposal, the s28G authority should act as the competent authority and carry out an HRA where necessary.

If you are a s28G authority and the proposed restoration work is part of the authorities' function or where the s28G authority is permitting this action in the exercise of its functions, then it is your responsibility to complete an HRA prior to Bravo submission of the plan or project, unless you do not have the means to do so.

Your Bravo application should include confirmation of the decision-making process that you have undertaken under regulation 63 of the Habitats Regulations. This should include proof that the screening stage and if necessary, an Appropriate Assessment, has been undertaken. If you do not have the means to undertake this assessment, please make this clear within the application.

The HRA process consists of two main elements; Screening and Appropriate Assessment. An Appropriate Assessment is not always required if the plan or project is directly connected with – or necessary to – the nature conservation management of the site, or if the proposals are not likely to have a significant effect on the European site(s), either alone or in-combination with other plans and projects. This initial stage of the assessment must however take into consideration all features on the site (not just those at which the restoration is aimed), so the Appropriate Assessment stage of the HRA process may still be required even if conservation management is the aim of your restoration proposals.

Protected sites outside project boundaries

Some projects may require access to protected sites outwith the project boundary, to carry out their restoration activities. This may include access via an adjacent site, storage on an adjacent site or the more comprehensive use of donor material, for which more detail is provide below.

The importation of offsite organic materials such as heather, *Sphagnum*, nurse crop grasses and plug plants, to facilitate restoration actions may be associated with the creation of permeable dams, or the revegetation of bare peat.

Donor material should ideally come from the locality, although this may not always be possible. Where it is proposed that material is imported from an offsite location, applicants should closely follow the advice within Annex 2 and complete the Donor Site Information Document.

You must inform the owner/occupiers of donor sites or adjacent sites used for access and storage (where they are SSSIs and the SSSI is not within the NCPGS application boundary), that it is their responsibility to secure prior Consent (if appropriate) from Natural England for the activity.

As there is a potential that these particular consents may cover SSSIs outside a NCPGS application, and will therefore need separate SSSI authorisations, early consideration will be required by applicants and donor site O/O to avoid later delays and an indication of when the Notice will be submitted should be included within the Donor Site Information Document.

Protected Species / Ecological Impact Assessment

If protected species are known to be present within the application area (e.g. otters, water voles, great crested newts or freshwater pearl mussels etc.) and these species may be affected by the restoration works, you will need to demonstrate how impacts on those statutorily protected species will be avoided and/or mitigated to comply with legislation.

If you are unsure of the presence of protected species on your site, information is available on the Magic website, using the interactive mapping tool. Your local records centre will also hold details of protected species previously recorded in that area. The most suitable local records centre for your site can be found using the Association of Local Environmental Records Centres 'find records centre tool'.

It may be necessary to collect baseline data to determine the presence / absence and population abundance of protected species or to produce a full Ecological Impact Assessment (EcIA). This possibility should be considered as early as possible by the applicant and should be completed prior to any grant application.

Annex 5. Guidance on Historic Environment Assessments (HEAs) for Peatland Restoration

Nature for Climate Peatland Grant Scheme

Guide for Applicants

Date: 17 January 2022

Version: Draft

Contents

About Historic Environment Assessments (HEAs)

You must complete an HEA to meet the historic environment standards for NCPGS Restoration Grant applications. You must complete it for the area proposed for Year 1 works **before** you apply and submit it with the Restoration Grant application.

You can complete HEAs for later years during Year 1 of your Restoration Grant, if accepted. This may affect the order in which you decide to undertake works, for example you may decide to work on areas where the archaeology is well understood first. Note that any work undertaken prior to a Restoration grant may **not** be claimed retrospectively.

You can complete an HEA on its own in advance of a Restoration Grant application, or as part of an NCPGS Discovery Grant. HEAs are eligible for Discovery Grant funding, as they help remove barriers to restoration work.

About this guidance

Use this guidance, including any links, to help you complete an HEA.

Further information about peatland archaeology can be found in Historic England's documents

Peatlands and the Historic Environment: An Introduction to their Cultural and HeritageValue.

And

Peatlands and the Historic Environment: Guidance for Carrying out Investigations and Works (forthcoming)

What an HEA involves

You need to find a qualified archaeologist and get their advice to:

- complete an HER consultation and desk-based assessment (DBA)
- identify and undertake any scoping surveys necessary, such as remote sensing or fieldwork
- describe the impact of proposed works on the historic environment, including adjacent monuments, donor sites, access routes etc.
- create integrated proposals for restoration planning
- plan how to deal with any contingencies, such as discovery of human remains

You must have **all** of these elements for your HEA to be signed off as complete for Year 1 works.

For Year 2 works onwards you should show what each of these elements would cost in your application. Provide quotations or estimates. If you have an archaeologist on staff, make clear that thiswork is included in your staffing costs instead.

You may want to complete a DBA for the whole potential restoration area, even if you must only scope Year 1 of works before applying for a multi-annual Restoration Grant. This may be the best value for money.

Find a qualified archaeologist

The HEA must be done by a qualified archaeologist, who may be a staff member or contractor. They must have knowledge of:

- historic environment legislation in England
- industry best practice as described in the Chartered Institute for Archaeologists (CIfA) Standards and Guidance

They must have experience of:

- consulting records and databases for archaeological evidence, sometimes called desk-based assessment or DBA
- field-based or remote sensing survey in upland or lowland peat environments
- giving heritage management advice
- archiving data gathered during fieldwork

You can use an archaeological professional accredited by the CIfA. They offer guidance on finding contractors.

You can use an archaeologist who is not accredited, but they must give evidence of:

- references for similar work
- archaeological qualifications – a minimum of tertiary education in Archaeology, or Heritage Management, or an allied subject
- appropriate insurance

You should share this guidance document when you request tenders, to help your archaeologistunderstand the work and the standards they need to achieve on your behalf.

Desk-based assessment

Desk-based assessment (DBA) considers known historic environment features that a peatland restoration project might affect. This is through analysis of written, graphic, photographic, and electronic information.

Within a specified area, it will usually identify the:

- known heritage assets and their interest and significance
- character of the study area, including considering the settings of heritage assets
- nature, extent, and quality of potential archaeological, historic, architectural, and artistic interest

For this scheme, the DBA should focus on the nature and extent of physical features ratherthan their characterisation.

An archaeologist can usually do a DBA at any time of year.

How to commission the DBA

To commission the DBA:

- create a project brief explaining the work that you need completed
- find a suitable archaeologist
- request that they complete the DBA following the industry standards set by CIfA

The project brief should include:

- the area to search, as either a radius around a central National Grid Reference, abuffer around the site boundary, or a .shp file or .dxf file
- the context and purpose of the search request; to inform peat restoration work for a NCPGS Restoration Grant application
- a brief description of the proposed restoration work
- what specific information you need (as described below)
- the formats you need search results returned as, such as mapping as GIS .shp files or .pdf maps
- when you need the search results back, within the Discovery Grant delivery window, allowing time to integrate the results into your proposals

If you miss out any of this information then your archaeologist may misunderstand the work and give inaccurate advice. For example, they may assume that this is a planning-related consultation in advance of development.

The brief should describe the work schedule in enough detail to quantify, implement and monitor the project. The brief would be the basis for a specification or project design, sometimes called a Written Scheme of Investigation (WSI), completed by your archaeologist.

What the DBA should include

You or your archaeologist should contact your local Historic Environment Record (HER) and local authority or National Park archaeologist directly for data. You should not use online data as this is often redacted. This service may incur a charge.

The DBA datasets requested should include a minimum of:

- Historic Environment Record (HER) Monument and Event data, including database records and mapping
- designated heritage assets on the National Heritage List for England
- designated heritage assets registered under the Protection of Military Remains Act 1986

Plus, any other relevant datasets required to understand the site, for example, previous palaeoecological analyses.

If land is in a live agri-environment agreement, you also need to include Selected Heritage Inventory for Natural England (SHINE) data or, for longstanding agreements, any historic features identified in your Farm Environment Plan (FEP) and accompanying Historic Environment Record (HER) consultation. These are a type of non-designated historic feature protected via agri-environment schemes. The presence of SHINE or historic features may affect the permissions you need for a restoration project. This data alone is not of high enough resolution to inform restoration plans.

You can find SHINE or historic feature data for:

- Countryside Stewardship (CS) agreements that went live within the last 3 years at the Historic Environment Farm Environment Record (HEFER) Portal (use the relevant Single Business identifier number to retrieve it)
- CS agreements over 3 years old, or Environmental Stewardship (ES) agreements, from agreement documentation

Restoration works are unlikely to physically impact some historic interest, such as:

- place names
- find spots, where the find has already been recorded and removed
- intangible cultural heritage

You do not need to include plans for how to deal with these, unless your archaeologist believes they may indicate previously unrecorded historic features.

You will not need historic landscape characterisation (HLC) data.

Outputs from the DBA

The DBA report should include the name, qualifications and any relevant professional memberships of the author.

It should identify, within all areas that the restoration plans will affect:

- designated historic features
- known non-designated historic features (plus SHINE data where relevant)
- areas where the archaeological resource is poorly understood due to lack of prior systematic survey

The DBA should also identify areas:

- unlikely to have remaining archaeological potential, such as former landfill
- where archaeological layers are buried below the level of ground disturbance, such as on warped peat

You may not need to survey these areas even if they have never previously been surveyed.

The data should be presented in map format as well as in gazeteer format. This will allow you to identify any overlaps with proposed works more easily.

Where possible the DBA should be supplemented by advice from a local authority or National Park archaeologist about:

- Whether the known historic features accurately represent the full archaeological potential.
- Recommendations for further work needed

Scoping surveys

Decide if you need scoping surveys

You need scoping surveys in areas that restoration proposals will affect, where the DBA shows that the archaeological resource is poorly understood. Your archaeologist will tell you when this is the case. This may be in areas:

- not previously surveyed
- where previous survey was a long time ago, sporadic, or at very coarse resolution

You do not need scoping surveys in areas that restoration plans will not affect, even if they were not previously surveyed.

The HEA requires you to assess potential for unrecorded historic environment featuresthat peatland restoration may impact. Scoping surveys meet this requirement.

When to do scoping surveys

Your archaeologist must do surveys at an appropriate time of year. Consider constraints in survey timing when you plan your project. These may include:

- species related issues, like avoiding disturbance during bird nesting season
- physical issues, like difficulties in conducting field survey when bracken is high
- safety issues, like grouse shooting

What scoping surveys involve

You will need a qualified archaeologist to do scoping surveys. You should discuss the type of scoping required with your archaeologist, referring to any advice which you received from the Local Authority or National Park archaeologist. If you have not received advice from a local authority or National Park archaeologists discuss with the Nature for Peatland Grant Senior Historic Environment Adviser prior to the opening of the application window.

Scoping surveys may include analysis of existing remote sensing data, like:

- LIDAR, of at least 1m resolution
- rectified aerial photography, using approaches like those used in the National Monuments Mapping Programme pilots
- any other relevant datasets

Scoping surveys may include field-based surveys, like:

- archaeological walkover surveys (Historic England Level 2)
- gouge or auger surveys
- any other relevant field survey technique

Surveys should be proportionate to the size of the site, and the benefits of restoring it. They should give the nature and extent of archaeology to a high enough resolution to inform peatland restoration. You do not need to collect information for archaeological research alone. Unless useful for the restoration project, they do not need to include:

- archaeological walkover surveys across the **entire** site, just those areas affected by work and poorly understood
- the topography of individual historic features

All archaeological work should follow industry best practice in the relevant Chartered Institute for Archaeologists standards and guidance.

You should include information collected via survey in the final HEA report and submit it to the HER. Many HERs have their own requirements for data deposition. It will be useful to consult them before finalising reporting requirements with your archaeologist.

A worked example

The figures below show how you might use a DBA and scoping surveys to inform restoration works, and their timing to apply for a Restoration Grant. This could be either within a Discovery Grant, or as part of a stand-alone Restoration Grant application.

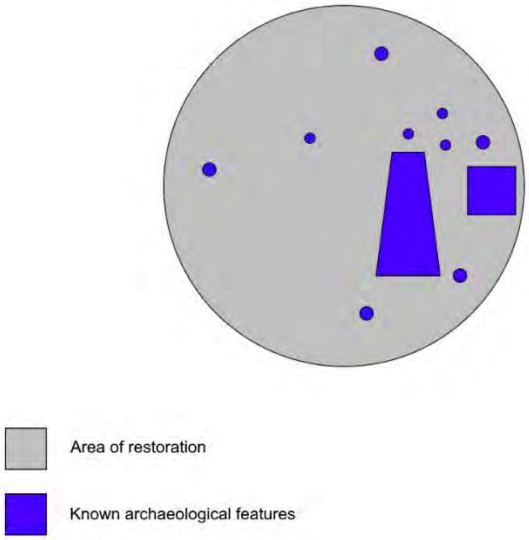

Figure 1 – Known historic features (HER monument data)

This image appears to show that the South West of the site lacks known historic features.

Maps like this are often generated as part of agri-environment agreements, such as FEP plans or HEFERS. The first stage of a DBA might look like this. This work alone would not meet the requirements of an HEA, because it does not assess the potential for significant unrecorded historic features or look at the impact of proposed works.

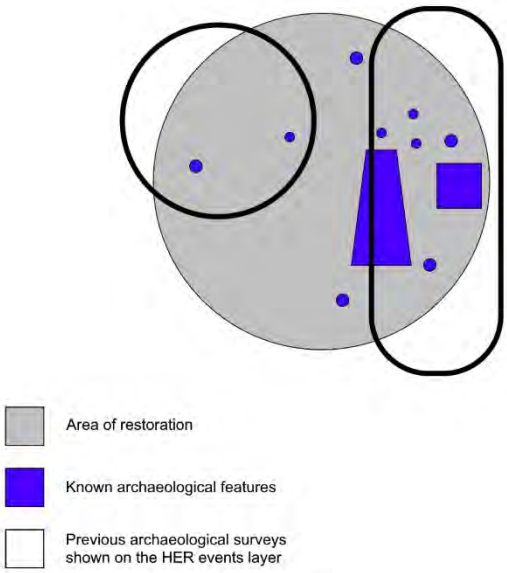

Figure 2 – Known historic features plus past surveys (HER event data)

This image shows that there have been no previous surveys in the South West of the site, although there have been surveys to the North West and East. As such the apparent lack of historic features is probably due to lack of systematic survey. Further scoping surveys are required in the unsurveyed area but you don't yet know where.

Within the previously surveyed areas you assess the impact of proposed works, using the knowledge about known historic features from your DBA. You check the impact of any works, consulting with your archaeologist, and use the mitigation hierarchy (as described in **Creating Integrated Proposals**) to ensure that this impact is considered. These are your Year 1 works.

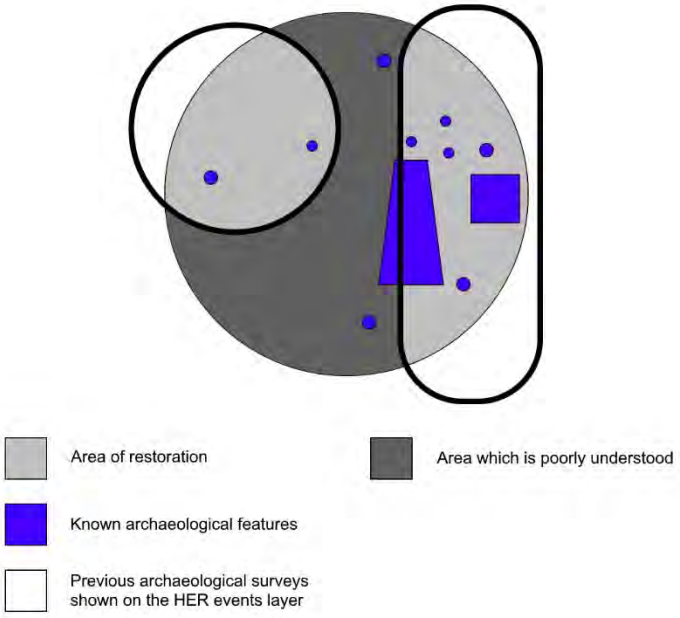

Figure 3 – Area that is poorly understood

Areas which have had no previous systematic survey may have occasional known sites but remain poorly understood. They will need further survey unless you receive advice from our archaeologist or a local authority or National Park archaeologist stating otherwise.

You will need to defer any proposed works here until Year 2 of your Restoration grant and amend your draft application accordingly.

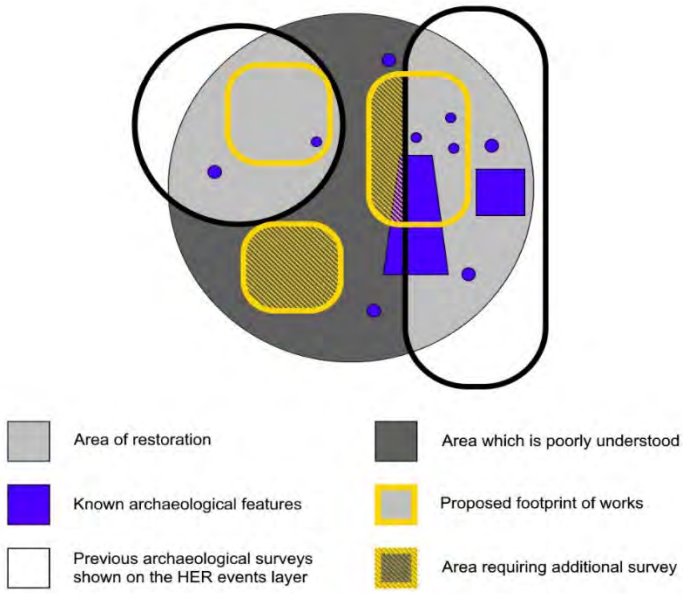

Figure 4 – Area affected by works and requiring further scoping survey

You will need to work out what costs to include in your Restoration Grant application for further scoping survey. To determine how large the survey area should be, compare the actual footprint of proposed works against the poorly understood area.

The image shows areas that are **both** poorly understood and affected by proposals as hatched areas. These areas should have further scoping and should be deferred to Year 2 of your Restoration Grant. Once you know the size of these areas you can get quotations or estimate costs.

You do not need further survey on the rest of the poorly understood areas as these will not be affected by works.

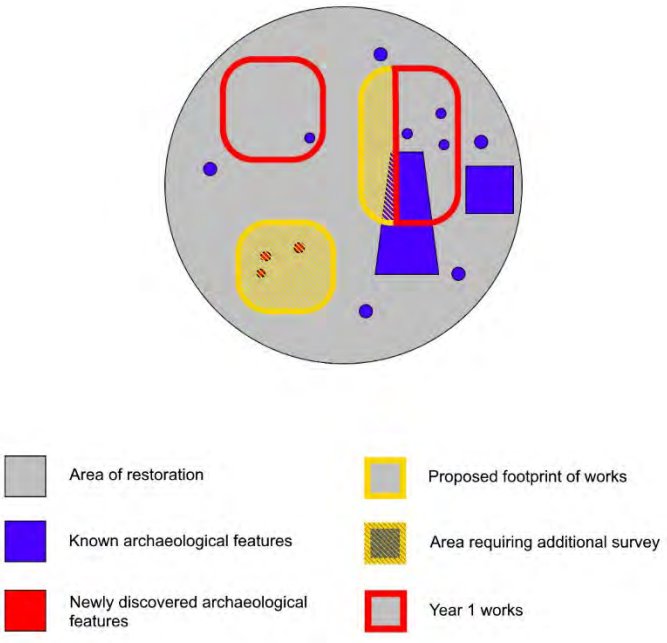

Figure 5 - After a successful Restoration Grant Application

You proceed with works as discussed in Year 1 on areas that were identified as well understood. Meanwhile your archaeologists survey the hatched areas indicating possible impact on poorly understood historic features.

The results of the scoping surveys in Year 1 will form the HEA for Year 2 of the Restoration Grant application. You can use these to inform more detailed proposals for Year 2 restoration works now the historic features are better understood.

Understanding impact

Impacts of peatland restoration on historic features can be both positive and negative.

Positive impacts can include:

- Halting or repairing erosion
- Restoring water tables on historic features that were once waterlogged (and are not yet
- fully dry)
- Removing woody or deep-rooted vegetation

Any positive impacts identified should be included in your NCPGS Restoration Grant application under Environmental Benefits - Non-carbon as historic environment benefits. This may improve your application scoring.

Negative impacts are often referred to as damage. A range of activities undertaken during peatland restoration may cause negative impacts including:

- Vegetation management
- Machine access
- Ground disturbance
- Excavation
- Altering soil chemistry, such as liming
- Redistribution or removal of historic material
- Dumping
- Altering water levels on fragile or dried-out archaeology
- Encouraging woody or deep-rooted vegetation

Some activities are complex to assess. For example, encouraging peat growth is usually desirable as it protects historic features, but it may also obscure these features from view, and reduce their accessibility to the public.

Managing the way in which restoration activities are undertaken can often change the impact from negative to neutral or even positive. Negative impact should also be seen in the context of climate change; short term or minor negative impact to historic features may sometimes be acceptable in order to avoid long-term, major impacts, or complete loss of the feature, due to loss of the peatland itself.

When considering the impacts restoration proposals will have on the historic features, this must include the entire area of peatland proposed for restoration alongside all other land that may be impacted, including:

- the footprint of works including site access routes

- the area which will experience change, such as raised water levels
- donor sites, such as (for collection of heather brash or, sphagnum, or other restoration materials)
- adjacent monuments (where their setting is affected)

Archaeologists should use standard methodologies for the assessment of heritage impact.

Impacts depend on the types of activities and historic features present. For example, vehicles could clip above ground earthworks, but are less likely to affect a below ground feature.

Impact may also depend on peat depth. Work on deeper peats is not always less likely to disturb archaeologically significant (older) material, compared to shallower peats. Some deep peats targeted for restoration, may have had extensive peat cutting/milling, or erosion in the past. It is likely that this activity will have removed the most recent peats, leaving older peats vulnerable during restoration works. As such you need to discuss restoration proposals with your archaeologist early in planning so that they can help you to understand the potential impact of works, both positive and negative, on historic features.

Potential impact to historic features and methods for avoiding damage can be presented either as a table or as text. Impact should be discussed in the HEA report or in the restoration report and used to inform restoration proposals. Failing to discuss how you plan to avoid impact may negatively affect your application scoring.

Creating integrated proposals

Your archaeologist will provide information from the DBA and scoping surveys, plus information about impact in the HEA. You will need to discuss your peat restoration proposals with them. They need enough information about your proposals to identify possible conflicts, known as impact assessment, and how to address them.

This may be an iterative process as your knowledge of the site grows and your plans develop. You could set milestones in the project to check your proposals with your archaeologist.

Your archaeologist is unlikely to be an expert in peat restoration. Understanding peat restoration works well will help them recommend more practical solutions. You should allow time and costs for them to speak with peat restoration contractors and experts. This may include:

- a joint site visit to complex areas
- online or site meetings
- sharing images of machinery
- sharing guidance on peat restoration

When proposing solutions your archaeologist should:

- avoid damage to historic environment features and the peat deposits
- minimise damage where it is unavoidable
- mitigate damage as a last resort, as approved by Natural England's Historic Environment Senior Adviser (Peatlands)

They may also be able to help you identify non-carbon benefits, such as instances where the peatland restoration addresses issues with the historic feature, or where itmay provide a future focus for recreation.

Avoiding damage

To avoid damage, you should:

- consult your historic maps when you plan where works will take place
- locate features such as bunds or borrow pits away from historic features where possible
- avoid crossing historic features to access the site
- avoid storing materials or vehicles on historic features
- consider temporary fencing or marking of sensitive areas
- explain to contractors in a Toolbox Talk what signs may indicate the presence of archaeology
- and when to stop work and seek additional expert advice
- use GPS enabled machinery to help contractors avoid features during work.

Minimising damage

It may be difficult to avoid all damaging activities on very large landscape scale historic features, for example, on mining landscapes.

Successful peatland restoration is likely to change the setting of a historic feature. It may make it more difficult to access and address its needs. It is unlikely to help the historic feature if you just exclude it from the restoration area without considering its needs, although sometimes a consenting authority may request this.

If you cannot avoid some activities, you can change how you do them in areas with historic features, in order to reduce damage.

In these cases, your contractor should:

- identify areas of the feature of lesser significance for the activity, such as siting peat borrow pits away from areas where features overlap (these often show relationships between features)

- suggest methods with lower impact, such as blocking grips with another material rather than digging peat from borrow pits or rewetting hagged areas rather than reprofiling them
- change the machinery or methods used, such as using low ground pressure vehicles, and bog mats, where machines need to cross historic features

Alternative methods may be less effective at restoring hydrology. You will need to balance protecting the historic environment with achieving the best possible results. You do not need to alter your methods across the whole site, only where historic features are likely to be affected.

Mitigating damage

Mitigation should be a last resort, always try to avoid or minimise damage first.

Mitigation can be expensive. It requires an archaeologist to attend the site before orduring works. For example:

- to survey and record a feature, or partial feature in advance of loss
- to collect artefacts, such as where finds are eroding from hagged peat and the area needs reprofiling, to avoid further loss
- to supervise machinery and record artefacts or features discovered during work, sometimes called a 'watching brief'

Your archaeologist or a Local Authority or National Park Archaeologist will usually be able to advise on when mitigation is needed. If in doubt consult the Senior Historic Environment Adviser – Peatlands.

Any mitigation work should follow the appropriate Chartered Institute for Archaeologists (CIfA) industry standards and guidance.

Land in agri-environment schemes may have conditions around loss of archaeological features. It is usually not acceptable to plan for total loss and recording of a SHINE feature. Consult the Rural Payments Agency (RPA) if you have concerns about the impact of works on SHINE features.

Contingencies

Some types of archaeology are difficult to anticipate. Plan what you will do if your peatland contractors find something unexpected of historic significance and add this information to your risk register. For example, human remains known as 'bog bodies' are sometimes found in peat bogs. If you find human remains you should stop work immediately and seek further advice from your archaeologist and the relevant authorities. You may need contingencies to cover unexpected discoveries.

You are more likely to need further archaeological advice during a multiphase project, or one including experimentation. You should include anticipated costs for this in your Restoration Grant application.

Evidence

A completed HEA consists of

- Your DBA, and any advice from the local authority or National Park archaeologist
- The results of any scoping survey (if required)
- Evidence that you have systematically considered impact of proposals on the historic environment
- Evidence of any changes you have made to proposals to avoid, reduce or mitigate impact

The HEA aims to ensure that data and evidence support your understanding. You can show this data how best suits your project. This may include:

- tables
- diagrams
- mapping, including GIS mapping
- written reports

You can have one large HEA covering multiple sites, or you can have smaller ones for each site, providing all the elements are present. It is up to you to ensure that costs are proportionate.

Identifying evidence gaps

An HEA for any proposed Restoration Grant must describe the historic environment in areas targeted for work in year 1. This applies whether the HEA is funded by Discovery Grant or not.

For a one-year Restoration Grant application this would be all works.

For a multi-annual application, along with the full HEA for the first year's works, it is best to have completed the DBA for the entire area.

This will mean you can:

- quantify areas where the historic environment is not yet fully understood
- submit costings for any scoping surveys to do before restoration work in years 2 onwards

If you will need further HEAs for works in Year 2 onwards of a Restoration Grant you should state this in your HEA report.

Permissions and consents

If you plan to work on designated sites you need to get bespoke advice from the relevant authority. Work to secure consents is eligible for funding as part of the Discovery Grant.

Designated sites may include:

- military remains
- scheduled monuments
- listed buildings
- registered battlefields
- registered parks and gardens

If the land is in a live agri-environment agreement and there are any changes to SHINE features, you may need to consult the RPA. SHINE features may include designated and non-designated sites.

You should liaise with consenting authorities early on. They may have minimum timescales to respond to requests for advice. Their advice may affect costs and the nature of proposed restoration work. For example, consent may require changes in working practices and knowing this will help you estimate costs.

If you are given advice early on that the relevant authorities will not give consent for work on a designated site, you should not include it in carbon calculations for a Restoration Grant application.

Legal requirements apply where works may affect human remains. You should follow established professional guidelines. You can find guidance on burials legislation from the Ministry of Justice and Historic England.

Monitoring

As part of your normal record keeping, you must maintain records of:

- The known historic features within the proposed restoration area (your HEA fulfils this requirement)
- Any consents or permissions obtained relating to the historic environment
- Spend on historic environment work (as part of your normal spend tracking)

You will only need to undertake further monitoring of historic environment features if:

- It is part of the way you intend to avoid, minimise or mitigate damage to historic features
- It says that you will undertake this work in your HEA or other grant application documents
- required as part of an agreement with a consenting or permitting body, for example Historic England
- it is needed to evidence societal benefits for cultural heritage proposed as part of your Restoration Grant application (for which you may have received enhanced scoring during the application process)

In these cases you will need to ensure that you meet your own stated goals and keep appropriate records to evidence this in case of audit.

Where to get help

Your archaeologist should be your main source of archaeological advice.

Natural England's Historic Environment Senior Adviser for Peatlands will give advice on live Discovery Grant or Restoration Grant projects. They will not give bespoke advice during grant application windows other than via the clarifications system.

You can find more help:

- by finding a Local Authority archaeologist
- from Historic England's science advisors

There may be a charge for some of these services.

The Nature for Climate Peatland Grant Scheme will not cover costs incurred before it is awarded, although you may undertake all your HEAs for Restoration Grants during your Discovery Grant, if you are successful in applying for one.

Feedback

Please contact the Historic Environment Senior Adviser (Peatlands) via the NCPGS mailbox with any feedback on this guidance:

peatlandscheme@naturalengland.org.uk

All requests for clarification will be dealt with via the Bravo e-sourcing platform.

Revised: NCPGS Historic Environment Senior Adviser (Peatlands), 15 Dec 2021

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