

Repeat of Benyon & Humphries survey following the earthworks in year 1, 3 and 5, then at 5 year intervals to advise on future management or remedial measures.

References

Benyon P R & Humphries R N, 2022. Nant Helen - Peatland-Heathland Complex: 2022 Vegetation Survey. PBEcology, A Report to Celtic Energy & GCRE-Wales.

Smith P L, 2012. Nant Helen Abercraf (Powys). Bryophyte and Lichen Survey. A Report to Celtic Energy Ltd, Caerphilly.

Sturgess P, 2020. Nant Helen Complementary Restoration Earthworks: Vegetation Surveys. Sturgess Ecology. A Report to Ove Arup & Partners.

Enhancement of Restored Acid Grassland – R N Humphries, Blakemere Consultants, 21st October 2020

Introduction

Acid grassland is to be established on land yet to be restored at the Nant Helen Surface Mine Site on land between the earthworks for the rain loops and land restored as part of the mining operation, in addition to areas within the Washery.

This will comprise an acid grassland mixture (Common Bent, Red Fescue, Sheep's fescue, perennial ryegrass) at Nant Helen, Selar and East Pit Sites, proven to be suited to conditions experienced in the absence of soils and the need for a reliable and resilient grassland.

Having established the base grassland, there is scope for subsequent diversification as part of the GCRE Strategic Biodiversity Plan.

Existing Habitat Information

The 'restoration' grassland mixture has been monitored as part of the on-going aftercare programmes at Nant Helen and elsewhere. Surveys in 2022 showed that a species rich sand sedge-sheep's fescue-common bent grassland typical of local grasslands has established over 30 years at Nant Helen and with over-sowing species Sheep's fescue – common bent – heath bedstraw grassland after 15 years at the Selar Site.

Habitat Enhancement

The aim is to diversify the grassland composition in the shorter term once the new grassland-soil ecosystem has become established. This approach has proved to be successful at the Selar Surface Mine Site and elsewhere (Humphries, 2012).

Method

Diversification is to be implemented in three years after establishment of the base-grassland. It is to be implemented by the annual harvesting seed from locally diverse grasslands in years 4 and 5 of the aftercare period. The Gorsllwyn Meadows SINC is available for seed collection and an appropriate sand sedge-sheep's fescue-common bent type and source. Other sources are available. A brush seed harvester would be used (Photograph 1), as at Selar, to collect seed on four occasions (early July, late July, early August and late August) according to seed maturation. The collection would be spread, without storage, on an area basis of 1:1 of harvested area over the established base-grassland.

Photograph 1: Celtic Energy's Brush Seed Harvester



Future Management

Future management is not envisaged.

Monitoring

Annual monitoring of species list and DAFOR scale of abundance 2 years after each seed application (because of lag in establishment due to seed dormancy).

References

Humphries R N, 2012. Lessons Learnt for Harvesting Seed from Semi-Natural Grasslands for Biodiversity Mitigation and Enhancement Schemes in the UK. In R.I. Barnhisel (Ed.), Proceedings of Annual National Meeting of the American Society of Mining and Reclamation: Sustainable Reclamation, June 8-15, 2012. Tupelo, Ms, USA.

Enhancement of Pasture with Woodland – R N Humphries, Blakemere Consultants, 21st October 2020

Introduction

Pasture land with small woodland and hedgerows is to be established on land yet to be restored at the Nant Helen Surface Mine Site on land between the earthworks for the rain loops and land restored as part of the mining operation. The will comprise a pasture grassland mixture of Common bent, Timothy, Smooth stalked meadow grass, Red fescue, sheep's fescue, wild white clover, ryegrass as used at the Selar and East Pit Sites these are proven to be suited to conditions experienced in the absence of soils and the need for a reliable and resilient pasture grassland.

Having established the pasture grassland, there is scope for their subsequent diversification as woodland as part of the GCRE Strategic Biodiversity Plan.

Existing Habitat Information

The land in question is currently disturbed and waiting restoration. The proposed pasture grassland, and field hedgerows and woodland have been established at the former Selar and East Pit surface mine Sites.

Habitat Enhancement

The aim is to diversify the grassland composition as woodland and scrub in the shorter term once the new grassland-soil ecosystem has become established. This is approach has proved to be successful at the Selar Surface Mine Site.

Method

The method to achieve the diversification is one of laissez-faire or the fashionable term of 'wilding' where no action is taken and reliance is upon secondary colonisation by woody species. The non-intervention would be implemented following the completion of 3 years of aftercare.

Monitoring

Triennial monitoring of species list and canopy cover following the implementation of field reversion.

References

Tree I, 2018. Wilding. Picador, London.

Drainage Features

Construction of the drainage features will be follow the drainage strategies^{Error!} and should align to Design Manual for Roads and Bridges (DRMB)⁵⁰ guidelines where possible.

Scrape Creation

Scrapes are shallow depressions with gently sloping edges, which will seasonally hold water. These are proposed in areas of marshy and acid grassland in Nant Helen and the Washery, to diversify these habitats. They will be valuable to a wide range of flora and fauna.

Location

Scrapes will be located in lower lying and more open areas, away from tall hedges and woodland. Areas with existing wildlife interest should be avoided. A cluster of scrapes of varying sizes and designs should be created in one location of, rather than a single larger scrape.

Design

Scrapes should be shallow though not uniform in depth. The middle of the scrape should be around 50cm deep, with humps and hollows throughout to provide as many niches for plants and animals as possible. The minimum size should be 20m².

Soils

Scrapes can be created on a variety of soils types. On low permeability soils, for example clays and silts with poor structure the objective is to retain ‘perched water’ in the features.

Management

Once the scrape is created, it is important to maintain open, muddy margins where wading birds can find and access food. If the margins become too overgrown with plants such as rush, wader use will decline rapidly. Either allow livestock to graze and poach the margins at low levels, and do not fence the scrape off, or periodically use excavator with ditching-bucket to revitalise the margins of the scrape. Mowing all, or some of, the margins each year may also be required. Maintain a small proportion of longer marginal vegetation to provide additional habitat variety, which will benefit invertebrates and plants and provide cover for chicks.

Swales

⁵⁰ CD 532 Vegetated drainage systems for highway runoff (guidelines now withdrawn but still regarded as good practice) <https://www.standardsforhighways.co.uk/prod/attachments/03c74aa7-d05e-48bd-8dd1-977aa30a5833?inline=true>

The design of swales shall incorporate a dense and even grass sward consisting of species with a combination of rapid establishment and recovery and tolerance of wet conditions and periodic inundation.

The grass in swales should be recommended species such as perennial rye grass (*Lolium perenne*) and creeping bent (*Agrostis stolonifera*) seeding to establish vegetation of the swale shall be uniform and carried out early in the con. The seeding of the grasses within the swales will be carried out as soils are ready, and in the late summer/autumn (August to November).

The area around the swales will not be seeded, vegetation will be allowed to regenerate naturally to encourage a plant assemblage arising from the local seed bank.

Ditches

Ditches will be earth channels lined with a native grass species (for example rye grass and/or creeping bent in order to provide resilience to flow erosion.

Vegetation should be allowed to colonise naturally to ensure maximum benefit to wildlife and local biodiversity, but if water treatment is beneficial, the incorporation of pools and areas of common reed (*Phragmites australis*) and/or mace reed (*Typhus latifolia*) can be planted.

The long-term drainage characteristics of environmentally sensitive soils, such as areas of peat, shall be preserved.

Ponds

The size of the attenuation and detention ponds will be dictated by the catchment area draining to it.

Gently sloping shelves shall be incorporated within ponds to provide conditions for emergent and marginal vegetation to establish.

Natural colonisation of the ponds and margins will be allowed.

Biodiverse roof

A biodiverse roof (also referred to as an 'extensive' roof) comprises of a substrate based system:

- generally, between 75mm and 150mm in depth, consisting of a porous substrate of similar re-used aggregates.
- generally planted with a variety of sedum species, whether as plugs, cuttings or seeded, although on continental Europe and increasingly in the UK, it is more common to plant with species of wildflowers and grasses that are typical of dry meadow habitats.
- They have the potential to support a greater variety of species, hold significantly more rainfall, have a greater thermal mass and have greater transpiration properties.
-

By varying substrate depth the roof can support a greater diversity of plants and therefore biodiversity. Mosses, succulents, herbaceous plants and grasses can be supported on a biodiverse roof. This type of green roof has low maintenance requirements.

Mat based system are not biodiverse. They have very shallow soils, typically between 20-40mm, are pre-grown to provide 100 per cent instant cover and generally consist of sedum species. These systems retain less rainfall and have less thermal mass. They have a limited value for biodiversity. These are also known as 'sedum roofs'. **This roof type will not be used on roofs within the GCRE Site.**

Key features of a biodiverse green roof include:

- Nutrient poor soil conditions;
- Mosaic of habitats;
- Wildflower rich habitats; and
- Presence of bare, loose substrate

Key design considerations for biodiverse are discussed in the following sections.

Structure and support

The roof components will dictate the required dead load capacity of a building.

Table 13 below gives the various saturated weights of the layers found within a typical biodiverse green roof system.

Table 13 Typical weight components (comparable data from Buglife and British flora guidance)

Biodiverse roof loadings	Buglife	British flora
Root barrier and drainage layer	9kg/m ²	11kg/m ²

Biodiverse roof loadings	Buglife	British flora
Depth of substrate	80-150mm	80-150mm, 10-20% organic content
Plants	5kg/m ²	Wildflowers 10kn/m ²
Weight of substrate	1080kg/m ² (80mm depth)	96kg/m ² (80mm depth)
Maintenance	-	periodic
Saturated total roof loadings (average typical roof)		117kg/m ²

Table 14 below demonstrates the differences in the dead load capacity required within a roof structure when comparing minimum and maximum substrate depths.

Table 14 Roof loadings for biodiverse roofs

Extensive	Dead load
150mm wildflower	216kg/m ²
80mm wildflower/sedum	122 kg/m ²

Drainage

Drainage is important particularly where the roof is flat, to allow water to escape and should be kept free of substrate. To reduce the likelihood of blockages a layer of pebbles should be laid around the outlets or an inspection.

Water proofing and root barriers

It is current good practice to use a number of engineered layers in the establishment of biodiverse roofs. This includes waterproofing – the integrity of the waterproof membrane must be maintained to prevent water ingress.

A root barrier membrane, which lies on top of the waterproofing layer (or can be incorporated into the waterproofing layer itself), acts as a protective layer preventing any damage which may be caused by roots. A drainage / reservoir board allows free lateral movement of excess water and in the case of some products may provide a source of water for the plants themselves.

Substrate

Commercial materials are available, usually with a pH of between 6 and 8. They will need to be porous, nutrient poor. They should also be lightweight.

Natural substrates and site spoil (demolition materials) can be used to replicate ground conditions suitable for invertebrates. Other substrates such as sand and shingle can be added. Care to be taken when using Site spoil – ensuring it is not contaminated. Also need to ensure that the additional load is accounted for.

The green roof directory⁵¹ provides a directory of green roof professionals, suppliers and installers.

⁵¹ <https://livingroofs.org/green-roof-directory/>

Substrate depth and diversity of vegetation

Research has shown that variation in substrate depth is desirable on a biodiverse roof. Their areas of substrate will be less vegetated, and deeper areas with undulations will create a micro-climate. It will also produce variation in hydrological conditions.

Plants

Biodiverse roofs should be seeded and / or plug planted with locally appropriate (and sourced) native seeds and plug plants which match the substrate type/pH/ see www.floralocale.org.

Species used should be:

- Easy to establish
- Appropriate to locality
- Suited to substrate
- Able to persist in the harsh roof environment
- Able to form resilient and permanent cover
- Low growing – generally up to 60cm

Generally established through seeding and plug planting – useful to acknowledge seeding will take longer for plants to establish:

- Good sources of nectar – ox eye daisy (*Leucanthemum vulgare*), yarrow (*Achillea millefolium*) and hawkbits (*Leontodon* spp);
- Vipers' bugloss (*Echium vulgare*) – and white dead nettle (*Lamium album*) good for bumblebees and moths; and
- White Campion (*Silene latifolia*)– white and night flowering catch fly *Silene noctiflora*) – good for moths
- Lungwort (*Pulmonaria species*) provide a source of nectar over winter

The inclusion of sedum plants on a biodiverse roof can be useful but should not comprise more than 30% of the species composition. Sedum acre is a native species.

Habitat type

Maximising biodiversity for invertebrates could include provision of the following habitats / features:

- Overwintering habitat – uncut grassland over winter;
- Bare areas of ground – stone gravel and brick;
- Log piles and deadwood;
- Water bodies – provide shallow plastic container which retains water;

It is recommended that a mosaic of species rich grassland and open areas of bare ground would provide an optimal habitat for rare and notable invertebrate species present in the local area. This would have a varying substrate depth, with grassland supporting a mix of wildflowers and grasses. Areas of bare ground

would comprise different areas of stone, gravel and sand. Additional features such as log piles would also be present. If feasible the storage of a small amount of shallow water would enhance the area, by providing a water source for wildlife.

Appendix 13

Survey Methods

Protected species survey methods guidance

Otter and Water Vole Presence/Absence Surveys

Water voles

An activity survey will be conducted in accordance with standard survey guidance³⁸³⁹. Two surveys visits will be completed; one between mid-April and the end of June and the second between July and the end of September.

A visual inspection will be undertaken within 6m of the water's edge of all freshwater features. In areas of dense vegetation (i.e. marginal plants and woodland edge), visual inspections will be made where accessible to the surveyors. Where possible, a boat will be utilised to ensure otherwise inaccessible areas are thoroughly surveyed.

Field signs indicative of water vole activity searched for include:

- Faeces – recognisable by their size, shape and content and also distinguishable from rat droppings by their smell, if not dessicated
- Latrines – faeces are often deposited at discrete locations known as latrines
- Feeding stations – food items are often brought to feeding stations along pathways and haul out platforms, recognisable by neat piles of chewed vegetation up to 10cm long
- Burrows – appear as series of holes along the water's edge distinguishable from rat burrows by size and position
- Lawns – may appear as grazed areas around burrows
- Nests – where the water table is high, above ground nests may be found
- Footprints – tracks may occur at the water's edge leading into vegetation cover, and may be distinguishable from rat footprints by size
- Runways – low tunnels pushed through vegetation near the water's edge, which are less obvious than rat runs

Otter

An activity survey will be conducted in accordance with standard survey guidance⁴⁰. Two survey visits will be undertaken between April and September (inclusive), at the same time as the water vole surveys (detailed above). The banks will be walked to search for signs of otter. Additionally, where possible a boat will be used to access areas of the lake which are otherwise impossible to inspect closely including the island.

The field signs that will be searched for will include: spraints, anal jelly, holts, laying- up sites, bank slides, runs, tunnels, prey remains and footprints. Features that have high potential to be attractive to otters were examined, including:

suitable bridges, bases of large trees, dense vegetation, crossings, confluences of water bodies, culverts and boulders.

Resting areas for otters are usually referred to as either a holt (usually a hole in the ground covered by vegetation or under the roots of a bankside tree) or a couch (an uncovered laying up or nest like structure). Natal dens are usually found away from the coast, and indeed the majority of the study area was inland

Breeding Bird Surveys

Prior to the completion of the first survey, transect routes will be identified. These transect routes will be determined with the intention of providing coverage of key areas within the Study Area which may support important species/numbers of breeding birds based on habitat type/extent.

Field surveys broadly followed the ‘territory mapping’ or Common Bird Census (CBC) methodology³³ albeit with a reduced number of visits (three). CBC territory mapping is the most accurate practical way to determine the numbers and distribution of breeding birds where a high level of detail is required. Essentially, the method will involve mapping all birds seen or heard during walkover visits to the Study Area, paying particular attention to behaviour which indicates breeding (e.g. singing or carrying nesting material or food). By combining the results of all visits, it will be possible to determine the species present within the survey area and provide an indication of the numbers of breeding territories.

Three survey visits will be completed, during which each transect will be walked. Surveys will commence around one hour after sunrise and will be completed by approximately 13:00. Surveys will be undertaken between March and June.

The start point of surveys will be alternated between visits to ensure all parts of the Study Area received adequate coverage during peak periods of bird activity. During each survey the surveyor will record all observations on field maps using standard British Trust for Ornithology (BTO) coding in relation to species and behaviour. Observations of birds outside the Study Area will also be logged when seen. The direction of surveys will be alternated between visits to ensure all parts of the Study Area received adequate coverage during different periods of the day.

Wintering bird surveys

Wintering bird surveys will be undertaken, with transects being completed monthly between November and March.

Prior to the completion of the first survey, transect routes will be identified.

This transect route will be determined with the intention of providing coverage of key areas within the Study Area which may support important species/numbers of wintering birds based on habitat type/extent.

The route of each transect will be walked (and, if necessary, driven). Where appropriate, viewpoints will also be used to undertake point counts for 15 minute period.

During each survey the surveyor will record all observations on field maps using standard British Trust for Ornithology (BTO) coding. Observations of birds outside the study area will also be logged.

The direction of surveys will be alternated between visits to ensure all parts of the survey area received adequate coverage during different periods of the day

Reptile Surveys

The reptile survey methodology will follow best practice guidelines³⁵.

Artificial refugia comprising roofing felt mats measuring 0.5 m x 0.5 m, will be spaced approximately 10 m apart, and placed in representative areas of suitable habitat for reptiles across the site. Between 5 and 10 per ha should be used. Refugia will be placed, primarily in sunny areas, on top of flattened vegetation (where possible).

Refuges will be deployed no less than a week ahead of the first survey, to allow refuges to 'bed in' to the environment. Seven survey visits will be undertaken in suitable weather conditions (which includes no rain, low wind and air temperatures between 8 and 18 degrees Celsius) in optimal months (i.e. April, May and September)³².

During each survey, the area around each refuge will initially be checked from a suitable distance before being approached. Each refuge will be approached slowly to check for basking reptiles before lifting to check the area beneath for reptiles.

Where possible, a photograph will be taken of any reptile observed. Once checked, the refuge will be replaced in its original location. The order in which all refuges are checked will be altered during each survey visit.

Incidental records of reptiles that are not under mats were also recorded during the surveys.

Badger

Dedicated searches will be made for signs of badger activity such as sett holes, footprints, latrines, hairs and paths, which constitute characteristic evidence of badger presence.

The 'Surveying Badgers' methodology defines a sett as "any structure or place which displays signs indicating current use by a badger". Harris et al. (1989)⁴³ also

interprets current use as having been used at any point in the last 12 months.

Setts will be recorded and classified in accordance with the following criteria:

- Main – normally the focal sett for a badger social group. Generally, always occupied, main setts usually have several active holes with radiating tracks, latrines and other signs of activity. The actual number of holes can vary greatly, depending on social group size and soil conditions;
- Annexe – a secondary sett, close to the main sett. It will normally be connected to the main sett with very obvious tracks. Annexes may not be occupied constantly, even when the main sett is very active;
- Subsidiary – occurring at a greater distance from the main sett and not as clearly linked to it as an annexe. These setts will fall clearly within the territory of a social group and may be seasonally used by badgers; and
- Outlier – less frequently used, these setts may be colonised by other species when not in use by badgers. Outliers may represent a temporary sett, or a habitation for migrating individuals, or those excluded from a social group.

In addition to classifying each sett, their status is recorded using the following criteria:

- Active: being clear of any debris or vegetation, are obviously in regular use and may or may not have been excavated recently;
- Partially-used: not in regular use and have debris such as leaves and twigs in the entrance or have moss and/or other plants growing in or around the entrance. Partially-used holes could be in regular use after a minimal amount of clearance; and
- Disused: not been in use for some time, are partially or completely blocked and could not be used without a considerable amount of clearance. If the hole has been disused for some time, all that may be visible is a depression in the ground where the hole used to be and the remains of the spoil heap, which may be covered in moss or plants.

Any evidence of other badger activity such as paths, latrines or signs of foraging found within and up to 30 m from the site during the walk over will be target noted and mapped.

Further monitoring / Camera Surveys

Any badger setts that are active, or partially-used will be subject to further monitoring through the use of camera traps. Camera will be placed facing the entrance to each sett which require further monitoring.

Further to deployment cameras will be checked on a monthly basis, replenishing SD cards and batteries as appropriate. All video footage will be reviewed to identify the presence of any badgers. Cameras will be collected once sufficient data had been collected to inform if the setts are active / inactive.

Preliminary Roost Assessment

The potential suitability of the buildings/structures for roosting bats within the study area will be assessed and allocated to one of the categories detailed within

Table 15. These inspections will be completed by experienced ecologists, and can be undertaken at any time of year.

Table 15 Guidelines for assessing the potential suitability of roosting habitats for bats.

Suitability	Description of Roosting Habitats
Negligible (0)	Negligible habitat features on site likely to be used by roosting bats
Low (1)	A structure with one or more potential roost sites that could be used by individual bats opportunistically. However, these potential roost sites do not provide enough space, shelter, protection, appropriate conditions and/or suitable surrounding habitat to be used on a regular basis or by larger numbers of bats (i.e. unlikely to be suitable for maternity or hibernation)
Moderate (2)	A structure with one or more potential roost sites that could be used by bats due to their size, shelter, protection, conditions and surrounding habitat but unlikely to support a roost of high conservation status (with respect to roost type only – the assessments in this table are made irrespective of species conservation status, which is established after presence is confirmed)
High (3)	A structure with one or more potential roost sites that are obviously suitable for use by larger numbers of bats on a more regular basis and potentially for longer periods of time due to their size, shelter, protection, conditions and surrounding habitat.

A systematic search of the interior and exterior of all buildings/structures within the study area will then be completed to identify potential or actual bat access points and roosting sites, and to locate any evidence of bats such as live or dead specimens, bat droppings, urine splashes, fur-oil staining and/or squeaking noises.

The external inspection will also include the examination of the ground, particularly beneath any potential bat access points, for example any windowsills, window panes, walls, behind any peeling paintwork or lifted rendering, hanging tiles, weatherboarding, eaves, soffit boxes, fascias, lead flashing, gaps under felt, and under tiles/slates where present and accessible. It should be noted that occasionally bats leave no visible sign of their presence in a building's interior or on its exterior, particularly when there are hidden cracks, crevices and/or voids.

Trees (Preliminary Ground Level Inspection (PGLI))

To evaluate the potential suitability of trees in areas to be impacted (directly or indirectly) within the study area for roosting bats a Preliminary Ground Level Inspection (PGLI) survey will be completed in accordance with relevant guidelines (Bat Tree Habitat Key (2018)⁴¹.

This requires the detailed inspection of the exterior of a tree from ground level to look for features that bats could use for roosting, in addition to any bat evidence.

This should be undertaken over the winter period if possible, when PRF are likely to be more visible.

Aerial inspection

A tree identified as having Potential Roosting Features (PRF) will subsequently be climbed by a bat licensed ecologist (also qualified in tree climbing and aerial rescue) to inspect identified features in detail using a torch, endoscope and dental mirrors.

Nocturnal Surveys (Emergence and re-entry)

Following the Preliminary Roost assessment (PRA) inspections, nocturnal bat activity surveys (i.e. emergence or re-entry surveys) of all buildings within the study area assessed to be of at least 'Low' suitability (Table 16) for roosting bats will be completed between May and August.

Table 16: Bat Suitability table.

Suitability	Number/type of nocturnal survey
Negligible (0)	No further surveys required
Low (1)	No further surveys required for trees. One emergence survey required for any buildings/structures with low suitability.
Moderate (2)	Two emergence and or reentry surveys required for buildings/structures and or trees with moderate suitability.
High (3)	Three emergence and or reentry surveys required for buildings/structures and or trees with moderate suitability.

Surveyors will be equipped with electronic bat detectors and any sound files were analysed with appropriate bat analysis software (such as Kaleidoscope) once the surveys were completed, if required.

The nocturnal bat surveys will be undertaken in weather conditions considered appropriate for surveys of this kind.

Transects

The suitability of habitats for roosting bats within the study will be determined during the updated Preliminary Ecological Appraisal in accordance with survey guidelines⁴¹.

Subsequently further transect surveys will be undertaken, in line with Good Practice Guidelines⁴¹ between April and October. The frequency of transects during this period will depend on whether the site is determined to have low, moderate or high suitability for roosting bats; although it is acknowledged that

the site was previously assessed as having moderate suitability and transects were undertaken monthly between April and October.

Amphibians (Great Crested Newts (GCN))

Habitat Suitability Assessment

All waterbodies within the study area will be assessed for their suitability to support great crested newt using the standard Habitat Suitability Index (HSI)³⁰³¹ methodology. The methodology has been designed to evaluate habitat quality in order to assess which waterbodies provide suitability habitat for great crested newts as breeding ponds. The HSI is a numerical index, which ranges from 0 to 1. It is calculated using ten key habitat criteria and is based on the assumption that habitat quality determines great crested newt presence/absence. Using this standard approach, ponds with higher scores are considered more likely to support great crested newts compared to those with lower scores (see Table 17 below).

Table 17: Predicted presence of great crested newts based upon HSI results.

HSI score	Pond Suitability	Predicted Occupancy
<0.5	Poor	0.03
0.5-0.59	Below average	0.2
0.6-0.69	Average	0.55
0.7-0.79	Good	0.79
>0.8	Excellent	0.93

National Vegetation Classification (NVC)

Plant communities within the site will be mapped using the NVC survey method, in accordance with best practice guidance (Rodwell 1991). A survey of the study area will comprise a walkover to examine and map the various plant communities, describing vegetation by recording quadrats, target notes and a species list. The main plant communities will be plotted onto an aerial plan and photographs will be taken of each vegetation type.

Species will be recorded within square 2x2m sample areas (or 4x4 where this is appropriate such as scrub habitat). Quadrat areas will be selected as being representative samples of the stand in which they occur. The cover of every species within each quadrat will be assessed using the Domin scale, as shown in the table below. An estimate will also be made of the percentage cover by vegetation and the approximate vegetation height (as an average through the quadrat).

Table 18: Domin scale for recording vegetation cover.

Percentage Cover	Domin score
91-100%	10
76-90%	9
51-75%	8

34-50%	7
26-33%	6
11-25%	5
4-10%	4
<4% - many individuals	3
<4% - several individuals	2
<4% - few individuals	1
Associate species	A

Fungi Survey

The fungi survey will be undertaken by a surveyor with experience of surveying and identifying rare/notable fungi. The survey will be undertaken during the main autumn fruiting period (September to November).

There are currently no standard survey protocols for grassland fungi, and recording is generally carried out using walk-over methods. The survey will follow a sampling-based approach due to the size of the site and will focus on areas considered to have high potential for grassland fungi. Sampling of these areas will be undertaken on these areas on 2 occasions spread out through the main autumn fruiting period. Visits will coincide with good conditions for fungi fruiting (i.e. damp conditions with no heavy frosts)

As with previous surveys, fungi should be recorded by compiling a simple species list for each survey area. No attempt was made previously to quantify or map the fungi fruiting bodies within each area.

Each visit will involve walking through the survey areas, focussing on the patches of vegetation considered to have the highest potential value for grassland fungi; particularly short grassland where there is no evidence of agricultural improvement by ploughing or use of fertilisers. Patches of scrub, woodland, marshy grassland, recently disturbed ground and other longer grassland will generally be avoided as they have low potential value for grassland fungi.

The survey will focus on three target groups that are generally recognised as being good indicators of nature conservation value for grassland fungi; namely waxcap fungi (*Hygrocybe* spp.), earth tongues (*Geoglossaceae*) and fairy clubs (*Clavariaceae*).

Pinkgill fungi (*Entoloma* spp.) can also be good indicators of grassland quality, although it may only be possible to identify to genus level due to their complex taxonomy and practical difficulties of identifying them (even with microscopy); except where the species has readily distinguishable features.

Where it is not possible to identify species during the site survey, these will need to be identified by specimens examined using a microscope.

Other fungi should also be noted incidentally during the survey, but as a lower priority.

Fungi taxonomy is currently undergoing major revision as a result of DNA studies, and several of the previously well known names for grassland fungi are changing (e.g. waxcaps are now split into several different genera in some emerging classifications). For the purposes of this study the nomenclature follows Boertmann (2010) for waxcaps, Laessle & Petersen (2019) for earthtongues, and Kibby (2019) for Fairy Clubs.

Appendix 14: Habitat creation / enhancement Tracker

Table 19: Habitat tracker

[illegible]



**DALCOUR
MACLAREN**

Midlands

4 Bredon Court
Brockridge Park
Twynning
Gloucestershire GL20 6FF

T: 01684 217 703

E: info@dalcourmaclaren.com

E: EPTeam@dalcourmaclaren.com

dalcourmaclaren.com

