



Greenham Common

Grassland and Heathland Monitoring Framework Methodology



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1.0 Introduction

In July 2011, NatureBureau were commissioned to develop a condition monitoring protocol for the grassland and heathland habitats present on Greenham Common. The primary aim of this condition monitoring protocol is to assess the intensity of grazing on these two habitats. The condition monitoring protocol is also required to be undertaken by site staff and volunteers with limited input from professional botanists. This document provides information on the development of a draft method to undertake such a survey.

2.0 Site description (from Haynes 2009)

Greenham Common is a large site (512 ha including Crookham Common) located 1.3 miles south-east of the centre of Newbury, Berkshire. Greenham Common is located on a raised plateau strip that is aligned approximately west-east. The site was commandeered for military usage at various times beginning in 1941 and during this period the heath complex was converted to a military airbase which led to the plateau being artificially widened (Parkin, 1997). In 1995 the sites runways and military installations began to be removed and in 1997 the site was sold by the MOD to The Greenham Common Trust and Newbury District Council (Parkin, 1997). A restoration project began around 1997 with heather seed spreading of former heathland areas and bioremediation of soils polluted by engine fuel.

The site was opened to the public in 2000 and grazing was also introduced to the common (by cattle and ponies) to restore pre-military management of the commons and also to substitute for the regular mowing regime undertaken by the military (Allen, 2000).

The plateau is occupied by the largest extent of open heathland and acid grassland in Berkshire (Porley, 1993) along with areas of secondary woodland, scrubland and a mixture of gravel and stony soil based communities. The sloped edges to the plateau are occupied by steep wet-woodland gullies to the north and south. Imported cement from the construction of the airbase has led to infiltration of traditionally acid based communities by more calcareous species (Porley, 1993). The introduced substrates and drainage works have also led to a series of stony scrapes and pools with varying levels of porosity.

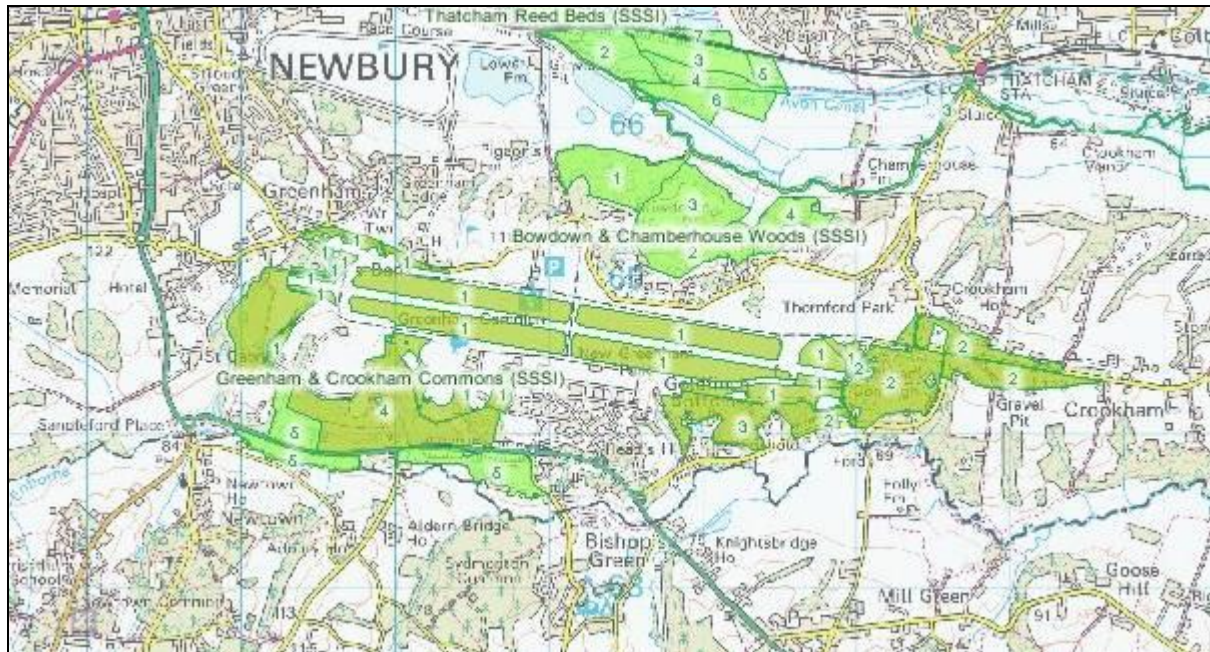
3.0 Survey area

Greenham & Crookham Common SSSI is a large site with a range of habitats and designations. In order for a site condition monitoring framework to be adequately applied it is important that the area the condition assessment will cover is defined.

It is recommended that the borders of SSSI (see Figure 1) are used to define the area under survey. The SSSI compartments include the four areas of heathland and grassland found between the former runway and taxiways (referred to as 'lozenges') and areas of heath, woodland and grassland to the south-west and south-east corners of the site (see Figure 1).

The monitoring protocol will be designed so that it can take account of the variation in the heathland and grassland areas within the survey area.

Figure 1: Map of Greenham and Crookham Common SSSI (from Nature on the map, accessed March 2012). Bowdown & Chamberhouse Woods SSSI is found to the north. The numbers indicate the SSSI units.



4.0 Review of conservation objectives

It is important that the objectives set for the heathland and grassland habitats on Greenham Common are taken into account at an early stage of the condition assessments development. To achieve this, the existing conservation objectives for the habitats were reviewed.

4.1 Greenham Common Management Plan

The Greenham Common Management Plan (Allen 2000) outlines the conservation objectives for Greenham and Crookham Commons as:

1. **Conserve and enhance the existing matrix of open heathland and grassland providing a structured vegetation (in particular Biodiversity Action Plan habitats).**
2. Conserve and enhance existing associated vertebrates and invertebrates (in particular Biodiversity Action Plan species).
3. **Increase the area of open heathland at the expense of bracken and secondary birch woodland.**
4. Ensure the establishment of a similar matrix on the exposed gravel areas (previously under concrete) where this is feasible.
5. **Encourage other heathland species to use the site (in particular Biodiversity Action Plan species).**
6. Conserve and enhance the existing habitat within the alder gullies (in particular the alder, Sphagnum and bog areas).

7. Prevent pollution and encroachment on the gullies and restore areas where this has occurred.
8. Ensure the grazing of areas identified as wood pasture.
9. Manage existing woodland in accordance with best practice and encourage neighbouring landowners to do the same.
10. Maintain and manage areas of scrub and ensure a graded woodland edge including scrub habitat.

Conservation objectives 1, 2 and 5 (highlighted in bold above) make clear the importance of maintaining the quality of the heathland and grassland habitats. Objectives 2 and 4 are also important with regard to the maintenance of the quality of grassland and heathland, due to the number of vertebrate and invertebrate species associated with the heathland and grassland habitats (e.g. Adder, Dartford Warbler and Silver-studied blue).

The open gravel areas are a form of pioneer vegetation that eventually grades into the open grassland/heathland mosaic and is a vitally important component of the sites habitat network.

One of the key operational objectives in the management of the site is identified as maintaining the structural diversity of the heathlands with: an ericaceous layer of varying heights and structures; areas of acid grassland; areas of flowery neutral grassland; some areas of scattered trees and scrub; areas of bare ground, gorse, wet heaths and bogs; and small areas of appropriate open water (Allen 2000).

The maintenance of acid grassland and heathland is identified as operational management aims for the following compartments on Greenham Common (see Table 1).

Table 1: Site compartments identified with operational management aims for grassland and heathland (from Allen 2000).

Compartment	Operational management aims relating to heathland and grassland
Compartment 1B	Maintain heathland and grassland
Compartment 1C	Maintain heathland and grassland
Compartment 1D	Heathland edge only, predominantly woodland
Compartment 2A	Heathland only
Compartment 3B	Heathland only, identified for heathland expansion
Compartment 3D	Heathland only, identified for heathland expansion
Compartment 3E	Identified for the expansion of heathland at the expense of rank grassland
Compartment 4B	Identified for the expansion of wet heathland at the expense of Birch
Compartment 5A	Heath, gorse and woodland
Compartment 5D	Small areas of heathland only
Compartment 6A	Identified for the expansion of heathland at the expense of Birch
Compartment 7D	Only small areas of gorse and grassland
Compartment 8A	Increase the area of heath at the expense of rank grassland (open neutral grassland)
Compartment 8B	Diversify neutral grassland sward
Compartment 8C	Diversify neutral grassland sward
Compartments 9A-11A	Increase the area of open heathland and acid grassland mosaic at the expense of rank neutral grassland throughout the lozenges
Compartment 10A	Increase the area of open heathland and acid grassland mosaic at the expense of rank neutral grassland throughout the lozenge and the maintenance of low competition grasslands and the retention of bare open lichen/bryophyte communities
Compartments 9B-12B	Reduce the areas of rank grassland and convert to heathland where possible, otherwise to flowery tall herb-rich grassland.

Allen (2000) recommended that the ideal management for the site was to return the majority of the site to grazing by hardy livestock (put out by commoners) and management to achieve the identified conservation objectives for the site. The priority for grazing was considered to be the open habitats, especially species rich acid grassland and heathland with back up grazing provided on species-poor grasslands.

4.2 Natural England conservation objectives

The individual designated special interest features for the SSSI, designated by Natural England (Turley 2007), important to the development of this condition assessment framework are:

- Dwarf Shrub Heath H2 *Calluna vulgaris-Ulex minor* heathland
- Lowland neutral grassland MG5 *Cynosurus cristatus-Centaurea nigra* grassland
- Lowland acid grassland U1 *Festuca ovina-Agrostis capillaries-Rumex acetosella* grassland

The conservation objectives outlined are to maintain the designated habitats in favourable condition by:

- suffering no net loss of dwarf shrub heath, with at least 25% of the open area of dwarf shrub heath occupied by NVC type H2;
- suffering no net loss of acid grassland as part of the complex heathland and acid grassland mosaic;
- suffering no reduction in the area of lowland neutral grassland.

The final point can be considered to be conflicting with some of the objectives identified in 4.1 for the expansion of heathland over neutral grassland, however Natural England identify that there should be no reduction in the lowland neutral grassland without prior consent (Turley 2007).

4.3 Heathland and grassland management objective themes

The main themes running through the management objectives for the site are:

- The maintenance and expansion of the heathland and acid grassland mosaic
- The maintenance and restoration of species rich neutral grassland
- The restoration or replacement of rank species poor grassland

Grazing is considered within the management documentation to be the primary method of achieving these objectives. But it should be noted that burning, mowing and mechanical clearance/removal of arisings are also useful methods to achieve these objectives.

5.0 Literature review

The main sources of information on the vegetation communities, plant and lower plant species of Greenham Common are shown in Table 2. Available reports are reviewed below.

Table 2: Relevant reports on the plants and communities found in the grasslands and heathlands of Greenham Common

Report Reference
Porley, R.D. (1993a) <i>A botanical survey and assessment of heathland at Greenham Common Airbase, Berkshire</i> , English Nature (Unpublished).
Porley, R.D. (1993b) <i>Berkshire's Heathland</i> , English Nature Unpublished.
Rose, F. (1995) <i>Greenham Common SSSI – Lichen Survey and Assessment</i> Unpublished.
EPR <i>Management Plan</i> (1996).
EPCG (1998a) <i>A Botanical Appraisal of the Western Heathlands. A preliminary report on the vegetation of compartments 1B and 1C.</i>
EPCG (1998b) <i>A Botanical Appraisal of the South Western Heathlands. A preliminary report on the vegetation of compartment 2B.</i>
EPCG (1998c) <i>A Reconnaissance Appraisal of Grasslands in some northern parts of the airbase.</i>
EPCG (1999a) <i>Habitat Survey.</i>
EPCG (1999b) <i>Notes on the recorded flora.</i>
Hedderson, T.A. (1999) <i>A Survey of the Bryophytes of Greenham Common, Berkshire</i> Unpublished.
Hampton, M (2009) <i>Greenham and Crookham Common data collection, mapping and review project.</i>
Haynes, T (2009) <i>Bryophyte and lichen site dossier of Greenham Common, Berkshire.</i>

Porley (1993a) investigated the heathlands of Greenham Common when the site was still under management as a military airbase. The four lozenges of land between the airfield runways were identified as approx 76 ha and had been regularly mown for many years. Of this 76 ha, 27 ha were identified as heath or heath-grass mosaic, and within these areas, wide floristic variation largely determined by soil water logging was present. Of the remaining 49 ha much of this was identified as mesotrophic grassland, some of which supported a high diversity of species. A base-rich influence resulting in calcicoles occurring alongside the more typical community calcifuges was also recognised where aggregate had been sourced from off site to develop the airbase infrastructure. The abundance and diversity of bryophytes and lichens were also identified as an important feature of the site.

Porley (1993b) classifies the heathlands of Greenham Common as high quality with areas of open ground supporting notable vascular plants and bryophytes of county importance. The need to monitor the change from regular mowing to grazing was noted.

Rose and Porley (1995) undertook a lichen survey across Greenham Common's heathland. Typical lichens of heathland communities were recorded along with species on flint pebbles and bare, stony soil. The survey concluded that the lichen community was moderately rich.

The Environmental Project Consulting Group (EPCG) undertook an assessment of the heathlands to assess the impact of the proposed grazing scheme in 1998 (EPCG 1998a-c). These reports provide useful compartment-based information on the western heathlands; detailing the dominating grass species in each area and the structure of the vegetation communities*.

*Please note that EPCG 1998a was the only report available for review when this document was developed.

In 1999 EPCG undertook a reconnaissance survey of the Greenham Common habitats to assist with site management planning (EPCG 1999a). The main component of the habitat survey was a large map that classified the habitats of Greenham Common into a classification system based on the JNCC Phase 1 methodology, but providing further detail on the habitats present and can be considered to be more detailed than Phase 1 but less detailed than the NVC classification system.

In 1999, Hedderson undertook a bryophyte survey expanding Porley's 1993 survey into other habitats on Greenham Common. Five additional bryophyte species were recorded within this survey and 18 species were highlighted that are scarce nationally and/or locally. The report concludes that Greenham Common is of high conservation value for bryophytes.

Hampton (2009) conducted a data collation exercise which took account of all known data and reports completed for Greenham Common. This work included a rationalisation of the habitats using habitat maps developed in 2007 for the Greenham Common management plan and based on Hampton's knowledge of the site. These habitats were then classified using the BAP priority habitat system. Identified knowledge gaps included a lack of clear objectives for the different habitats on site, including the area and structure of lowland heath, both for established areas and for the restoration process occurring on the gravel based areas. The requirement of suitable conservation objectives for the habitats on site and the subsequent development of a monitoring protocol were recommended.

Haynes (2009) developed a condition protocol for the various bryophyte and lichen-based assemblages found across Greenham Common's grassland and heathland areas. As part of this project, the survey transects originally established by Porley in 1994 were revisited in 2009 and all data fully analysed. The analysis concluded that the vegetation communities present in 2009 were distinct from previous years and more homogenous; being dominated by gorse. Increased grazing or mowing was recommended to reverse this trend.

6.0 Previous site monitoring protocol review

As discussed in 5.0, a number of monitoring protocols have been previously proposed for the site. It is important that such methods are taken into account while a revision on the monitoring programme for grasslands and heathland is being assessed. The most fundamental difference between the previously identified monitoring protocols and the monitoring protocol under development is the requirement for non-specialists to be able to adequately undertake the survey. Also important is the method of analysing any such data retrieved from monitoring work (as this will impact how quickly results can be translated into informed management prescriptions). These important factors will be considered in the following review.

Table 3: Monitoring protocols relating to grassland and heathland developed for Greenham Common.

Report Reference
Porley, R.D. & Hyder, B. (1994) <i>Site Quality Monitoring: Greenham and Crookham Commons SSSI, Berkshire</i> (Unpublished).
EPCG (1999c) <i>Vegetation transects within the airbase.</i>
Unknown (1999) <i>Vegetation monitoring on Greenham Common</i>
Turley (2007) <i>Conservation objectives and definitions of favourable condition for designated features of interest: Greenham and Crookham Commons, English Nature.</i>
Haynes, T (2009) <i>Bryophyte and lichen site dossier of Greenham Common, Berkshire.</i>

6.1 Porley, R.D. & Hyder, B. (1994) *Site Quality Monitoring: Greenham and Crookham Commons SSSI, Berkshire* (Unpublished)

In 1994 Porley & Hyder established a site quality monitoring programme. Part of this work included establishing a set of permanent transects in the south-east lozenge. The objective of this aspect of the monitoring programme was to detect floristic changes in the bryophyte and lichen rich open heath so that management could be modified accordingly (Porley & Hyder 1994). Data has been collected for 1994, 1996, 1998 and 2000 and was also undertaken in 2009 and all data analysed by Haynes (2009). This survey utilises nested quadrates (10cm, 20cm and 50cm) along a pre-marked line transect to provide information on the frequency and scale of repeating plant assemblages. Species are recorded by presence/absence. One of the transects is marked using radio tags and the other by wooden posts.

The percentage cover of the following vegetation types was recorded:

- the moss *Archidium alternifolium*;
- bare ground;
- *Calluna* from 1998 onwards;
- and gorse from 1998 onwards

Vegetation height was also recorded in each quadrat. This is a robust survey method with a strong dataset that has recently been analysed and converted into an electronic format by Haynes in 2009.

The methodology also describes a method of fixed point photography, but this appears to have been based on military infrastructure which has now been removed from the site.

6.1.1 Skill Level Required:

The nature of the quadrates requires that surveyors are able to record all mosses, lichens and higher plants including grasses in the sward. The skill set requires a botanist or bryologist proficient in the assessment of heathland-based mosses, liverworts and lichens to undertake this survey.

6.1.2 Analysis:

The species data requires multivariate analysis in order for any meaningful conclusions to be made from the data. However, such analysis provides very useful information from a very consistently compiled dataset which can provide useful information on variation in the vegetation structure of the south-east lozenge.

The percentage cover information is useful and can easily be compiled and contrasted using Microsoft Excel to show changes in percentage cover of gorse, heather and *Archidium alternifolium*.

Vegetation height can be subjective to surveyors if not strictly defined in the methodology. Such information is also significantly impacted by the survey being conducted at different times of the year. It is recommended that the means of measuring vegetation height be further defined.

6.1.3 Survey repetition cycle:

Porley recommended that the survey be undertaken every 2 years with a review every 10 years. Haynes recommended a revision to every 3 years in 2009.

6.2 EPCG 1999c Vegetation transects within the airbase.

As discussed in the literature review section, EPCG developed a monitoring proposal in 1999 based on extensive field work in 1998 to assess the impact of the proposed grazing regime.

Three transects were established in 1998 across the runways (approx north to south). Assessment was conducted by identifying stable habitat/vegetation communities stands and recording the abundance of each species present using the DAFOR abundance scale. The length of each individual habitat/vegetation community along the transect was measured using a measuring tape and classified as a quadrate.

6.2.1 Skill Level Required:

This survey requires the surveyor to be proficient in identifying all plants that will be found across the grasslands and heathlands including mosses and lichens. It is noted that only a small selection of mosses and lichens were recorded as part of the surveys. It is also required that surveyors are able to adequately separate habitat and vegetation community types. The skill set requires a botanist or bryologist proficient in the assessment of heathland-based mosses, liverworts and lichens to undertake this survey.

6.2.2 Analysis:

Species data requires statistical analysis for the data to provide useful information, preferably via a multivariate analysis programme. One possible cheap and simple method is the use of Hill's TABLEFIT programme, which would provide the best suited NVC classification for each sample, which could be subsequently compared over the years.

Basic information can be derived by the surveyor's classification of the habitats and vegetation communities present across each transect, but such a method leaves this survey highly exposed to the subjective assessment of the size and type of vegetation community present by the surveyor. Such assessment is already identified as being complex and difficult to assign within the heath/grassland mosaic (Porley 1993).

No vegetation structure information (percentage cover etc) was collected as part of this methodology.

6.2.3 Survey Repetition Cycle:

No recommendations were provided.

6.3 Unknown (1999) Vegetation monitoring on Greenham Common

This monitoring protocol was established to assess the grazing pressure on the open gravel areas and in the alder gullies. Fenced grazing exclosures (40x40m) were erected on the gravels and in the alder gullies and an equal number of quadrates randomly sampled from both within and outside the grazing exclosures.

One line transect was established in compartment 16 over the bare gravels. It should be noted that two further line transects were recommended and mapped for implementation of future monitoring. Quadrates were laid on alternating sides of the line transect.

All quadrates recorded the percentage cover of species and bare ground.

6.3.1 Skill Level Required:

This survey requires the surveyor to be proficient in identifying all plants that will be found across the habitats under assessment. It is noted that no mosses and lichens were recorded as part of the surveys. The skill set requires a botanist to undertake this survey.

6.3.2 Analysis:

Species data requires statistical analysis for the data to provide useful information, preferably via a multivariate analysis programme. One possible cheap and simple method is the use of Hill's TABLEFIT programme, which would provide the best suited NVC classification for each sample, which could be subsequently compared over the years.

6.3.3 Survey Repetition Cycle:

The survey was established to be undertaken every two years.

6.4 Turley (2007) Conservation objectives and definitions of favourable condition for designated features of interest: Greenham and Crookham Commons, English Nature.

This condition monitoring protocol based on Natural England's condition monitoring template identifies specific targets for the habitats and vegetation communities present on site and is based on a combination of aerial photography and structured walk techniques.

Examples of targets include: recommended coverage of different growth phases of heathland; negative indicator species; the presence of a minimum number of indicator species; the presence of herbs in neutral grassland; and sward height.

6.4.1 Skill Level Required:

The advantage of such a scheme is that only the required targets need to be assessed, thus it is possible to train surveyors to undertake such a survey. It is preferable that an experienced ecologist/botanist undertake such work, but less skilled and experience surveyors are able to undertake such a structured assessment, as long as they are familiar with the targets and species which the criteria describe (and also species which they may be mistaken for).

6.4.2 Analysis:

It is not identified in the methods reviewed how this information is recorded in the field, but such targets are relatively simple to analyse.

6.4.3 Survey Repetition Cycle:

No recommendations were provided.

6.5 Haynes, T (2009) Bryophyte and lichen site dossier of Greenham Common, Berkshire.

Haynes compiled condition monitoring tables for the various moss, liverwort and lichen assemblages present on Greenham Common. Acceptable limits of change are defined including: recommended number of species per m²; aerial photography assessment; percentage cover of gorse; and the continuation of Porley's 1994 survey methodology (see 6.1).

6.5.1 Skill Level Required

Due to the complexity of classifying mosses, liverworts and lichens it is preferable that a bryologist undertake such survey work, however many of the species identified as part of the monitoring protocol are distinctive species that could be learned through training. Porley's monitoring methodology is covered in 6.1.

6.5.2 Analysis

Such targets are simple to analyse as any changes beyond the limits of acceptable change will be considered a decline in the condition of the site.

6.5.3 Survey Repetition Cycle

It is recommended that the monitoring protocol be undertaken every 3 years for most targets.

6.6 Monitoring protocol comparison

Porley's methodology is robust and includes a considerable amount of data that reflects the composition of the vegetation both before and after grazing was introduced to the site. However, its technical requirements mean that the survey is not recommended for non-specialists to undertake. The EPCG survey also is too technical and is not considered robust enough due to the subjective nature of the assessment. Unknown's grazing assessment is also technical but well designed. The Natural England and Haynes monitoring protocols are similar and it is possible to develop certain elements of each for use by non-specialist surveyors.

7.0 Grassland and heathland monitoring methodology

7.1 Vegetation communities requiring assessment

The vegetation communities requiring assessment (as defined in the various reports reviewed in 5.0) can be considered to be analogous to the following National Vegetation Classifications:

- Heathland
 - H2 (*Calluna vulgaris* – *Ulex minor* heathland)
- Acid Grassland
 - U1 (*Festuca ovina*-*Agrostis capillaris*-*Rumex acetosella* grassland)
- Neutral Grassland
 - MG5 (*Cynosurus cristatus* – *Centaurea nigra* grassland)

7.1.1 Heathland and Acid Grassland

Within the U1 communities previously identified on Greenham Common, *Festuca ovina*, *Agrostis capillaris* and *Rumex acetosella* are considered to be the most frequent species with the much of the remaining vegetation being made up of bryophytes and lichens. This community is predominantly annual and is often found on thin soils. In areas where mosses and lichens are not so abundant the vegetation may become more mesotrophic in appearance with *Holcus lanatus*, *Anthoxanthum odoratum* and dicots becoming more prominent, however acid grassland specialists such as *Rumex acetosella*, *Hieracium pilosella* and *Senecio jacobaea* all remain common. Grazing and disturbance are considered very important factors in maintaining the typical aspect of this vegetation (Rodwell 1992). If grazing and burning management cease this vegetation has been observed to be encroached by heath, birch and pine saplings, which would eventually convert to woodland. Where the ground becomes enriched, gorse (*Ulex europaeus*) and *Rubus* spp. may invade the sward or rank grasses and tall herbs (Rodwell 1992).

H2 in this instance can be best described as similar to the vegetation of U1 but with addition of heathland dwarf shrubs. This type of heathland is dry and generally dominated by heather (*Calluna vulgaris*) with both Bell heather (*Erica cinerea*) and gorse (*Ulex minor*) being important components. Lichens and mosses also play an important role in the vegetation of the community (as they do in U1). As discussed for U1, a change in the disturbance of soils can lead to the spread of *U.europaeus* and *Rubus* spp. within the heath (Rodwell 1991).

7.1.2 Neutral Grassland

MG5 is a dicotyledon-rich grassland with the most frequent grasses being fine leaved species such as *Festuca rubra*, *Cynosurus cristatus* and *Agrostis capillaris*. MG5 shares many of the species with the more mesotrophic variant of U1, but the key calcifuges will be missing (see 7.1.1). Nutrient enrichment of MG5 can lead to conversion to MG6 (*Lolium-Cynosurus cristatus* grassland), which is ranker, grass dominated and less species rich than MG5. *Lolium perenne* is usually the most abundant species (Rodwell 1992). MG6 is present on Greenham Common in areas near the car parks where nutrient enrichment is higher.

7.2 Revised conservation objectives for grassland and heathland

As discussed in 1.0, the assessment of the grazing regime is an important factor of this monitoring protocol. It is important to recognise that grazing, burning and cutting are all tools put in place to convert and maintain heathland and grassland. Disturbance and heavy grazing

will eventually produce short grassland swards with only a few heathland shrubs present. A lack of grazing will cause heath and gorse scrub to become more abundant than grassland, which if neglected for too long will begin to form woodland.

The depth of soil and nutrient levels will determine the boundaries between the neutral and acid grassland swards, but it should be recognised that such boundaries are often difficult to define at sites such as Greenham Common where all the communities are present in close proximity. The presence of key species (as discussed in 7.1.1) can help separate such communities.

Ultimately, what is to be avoided is the conversion of species rich grassland swards to grass dominated species poor swards (as discussed in 7.1.2) and the succession of areas of heathland to woodland.

It is also important to recognise that the option of restoring Greenham Common to a previous state (such as the habitats present during military occupation, or before the military occupied the site) is not a viable conservation objective due to the number of species groups that require a wide variety of habitat types and vegetation age ranges, that now occupy the site.

To this end the following conservation objectives for grassland and heathland are recommended:

- The maintenance and expansion of the heathland and acid grassland mosaic with heathland managed at a range of growth stages for bird species in older growth phases; and thin soiled lower plant-rich pioneer phases.
- The conversion of grass dominated species poor neutral grassland to herb-rich neutral grassland
- The maintenance and prevention of nutrient enrichment of acid grassland
- The maintenance of herb-rich grassland and the prevention of nutrient enrichment.

7.3 Recommended format of future condition monitoring of the grasslands and heathlands

The following recommendations are made to produce a useful monitoring regime for Greenham that is both scientifically robust and regularly assessed:

- Continue the survey of the transects established by Porley (1994) every 10 years including the erection of 2 further transects. A professional ecologist is required to complete this work.
- Regular condition assessment using a form-based format that asks target based questions developed from JNCC best practice guidance (JNCC 2004 and 2009), Turley (2007) and Haynes (2009) using a structured walk technique.

7.4 Specialist Transects

To be undertaken by a Professional Ecologist/Botanist/Bryologist

This survey will follow the methodology developed by Porley in 1994 to ensure that data remains compatible.

Two further transects require installation to take account of the variation present on the site. It is recommended that one be erected north-south across the north-west heath lozenge and the second be erected within the neutral grassland.

The next assessment is due in 2019.

Budget allocations for such work should consider the need for approximately 2 field days; 2 days of data analysis; and 3 days report writing by a professional ecological surveyor accredited as an associate or full member of the Institute of Ecology and Environmental Management <http://www.ieem.net/>.

7.5 Regular Condition Assessment

This is to be undertaken by site staff and volunteers with an interest in ecological survey techniques, habitats and vegetation. Training will be needed for the staff or volunteers undertaking the survey.

7.5.1 Point locations and Vegetation Communities

The assessment requires surveyors to visit pre-determined locations on Greenham Common to assess the current state of the habitats and vegetation using a set of pre-formed questions for each location. Each location will detail the preferred state of a different vegetation community. The vegetation communities under investigation; including their point locations, are identified below in Table 4 (also see Figure 2):

Table 4: Point locations and habitats to be assessed as part of the regular condition assessment

Point No.	Habitat Type	BAP Classification	NVC Classification	Point Location
01.	Species Rich Neutral Grassland	Lowland Neutral Grassland	MG5 <i>Cynosurus cristatus</i> – <i>Centaurea nigra</i> grassland	North-west lozenge on the north side of the heathland.
02.	Species Rich Neutral Grassland	Lowland Neutral Grassland	MG5 <i>Cynosurus cristatus</i> – <i>Centaurea nigra</i> grassland	South-east or south west lozenge on the inside edge of the heathland.
03.	Species Rich Neutral Grassland	Lowland Neutral Grassland	MG5 <i>Cynosurus cristatus</i> – <i>Centaurea nigra</i> grassland	At the eastern edge of the former runway.
04.	Acid Grassland	Lowland Acid Grassland	U1 <i>Festuca ovina</i> - <i>Agrostis capillaries</i> - <i>Rumex acetosella</i> grassland	In the main area of acid grassland in the west of the site.
05.	Heathland and Acid Grassland Mosaic	Dwarf Shrub Heath Lowland Acid Grassland	U1 <i>Festuca ovina</i> - <i>Agrostis capillaries</i> - <i>Rumex acetosella</i> grassland H2 <i>Calluna vulgaris</i> – <i>Ulex minor</i> heathland	North-west lozenge.
06.	Heathland and Acid Grassland Mosaic	Dwarf Shrub Heath Lowland Acid Grassland	U1 <i>Festuca ovina</i> - <i>Agrostis capillaries</i> - <i>Rumex acetosella</i> grassland H2 <i>Calluna vulgaris</i> – <i>Ulex minor</i> heathland	South-east lozenge.

Figure 2: The point locations to be assessed as part of the regular condition assessment



These locations have been chosen based on the habitat survey undertaken in 1999 (EPCG 1999a) and from the authors knowledge of the site.

7.5.2 Species Rich Neutral Grassland

The first species rich neutral grassland area (Point 01) has been chosen based on its proximity to the main car parking area where the grassland will be more regularly used by walkers and dogs etc.

Point 02 has been chosen as a contrast, being closer to the centre of the site where recreation is likely to have a reduced impact and in turn is more likely to be grazed due to reduced disturbance of the cattle and ponies.

Point 03 has been chosen due to the area being noted as markedly different from surrounding vegetation in 2009 (Haynes 2009).

7.5.3 Acid grassland

This location has been chosen due to this area being a large extent of acid grassland without the associated heathland as found on other areas of the site.

7.5.4 Heathland and Acid Grassland Mosaic

Many authors have referenced the difficulty in separating the heathland and acid grassland components, so the recommended approach is to assess the mosaic as a whole. EPCG assessed most heathland areas in 1999 as being a mosaic of heathers, gorse and annual, herb-rich acid grassland (EPCG 1999a). Moss, liverworts and lichens are also very important components of the grassland, particularly in the south-east lozenge (Porley 1993; Haynes 2009).

General observations from the field work of 2009 by the author noted that the dominance of tall stands of gorse were much higher in the western lozenges. Due to this observation, Point 05 is situated within the taller gorse stands in the north-west lozenge and Point 06 is situated in the turf-like heather stands of the south-east lozenge.

7.5.5 Pre-designed forms

The pre-designed forms that will be used while undertaking the condition assessment of these habitats will be formatted in a similar fashion to those being used by Scottish Natural Heritage, which are developed from JNCC Common Standards Monitoring Guidance (<http://jncc.defra.gov.uk/page-2199>).

These forms will prompt surveyors to detail information about the condition of each point location (e.g. Is Gorse cover less than 50%?). These questions will be based on the limits of acceptable change identified by Turley (2007), Haynes (2009) and from the JNCC guidance (JNCC 2004 and 2009). Additional site specific recommendations will also be applied where necessary based on the authors knowledge of the site.

If the parameters are within the limits of acceptable change (e.g. gorse cover is less than 50%), then the condition criteria is passed for this point location.

If the parameters are outside the limits of acceptable change (e.g. gorse cover is more than 50%), then this target is failed and the point location is considered to be below the desired condition required by the conservation objectives for the habitat.

Once completed, the form will provide the total number of questions which failed their target states. Surveyors will be required to attach a note to each completed form which provides a brief justification for why targets were failed (e.g. 'gorse totalled 90% cover, grazing animals cannot gain access to this location, Photos attached').

7.5.6 Analysis of results

A general summary of the results for each year and a comparison with results from previous years will indicate whether the habitats condition is improving or declining.

7.5.7 Site Management Objectives

The aim of site managers will be to make conservation improvements to each habitat to ensure that no targets are classed as failures in all vegetation communities. If gorse cover is considered to be at a high coverage, then management should be implemented to reduce gorse cover on the common so that these targets can be met in the future. It should also be noted that these aims apply to the vegetation as a whole, not just the point locations identified.

The following table provides the areas which each point location represents:

Table 5: Areas of habitat represented by each point location (for management purposes).

Point No.	Habitat Type	Area represented
01.	Species Rich Neutral Grassland	Neutral grasslands that borders the footpaths identified as NG1 to NG4 on the EPCG maps of 1999.
02.	Species Rich Neutral Grassland	Neutral grassland near the form airstrip areas away from the footpaths. Identified as NG1 to NG4 on the EPCG maps of 1999.
03.	Species Rich Neutral Grassland	Areas of Autumn Ladies Tresses
04.	Acid Grassland	Areas where acid grassland is found on its own on the common identified AG on the EPCG maps of 1999.
05.	Heathland and Acid Grassland Mosaic	The heath/gorse and acid grassland areas of north-west and south-west lozenges identified as H6 on the EPCG maps of 1999.
06.	Heathland and Acid Grassland Mosaic	The heath/gorse and acid grassland areas of north-east and south-east lozenges identified as H6 on the EPCG maps of 1999.

7.5.8 Repetition Cycle

To begin with this survey should be undertaken each year to maximise the benefit of training volunteers and surveyors to undertake the survey, but this survey is suitable for application every 2-3 years.

7.5.9 Field Testing

The draft forms and questions for the monitoring protocol were developed and field tested in July 2012. Any areas where questions were ambiguous were revised and the questions refined.

7.5.10 Final forms

The final site condition monitoring forms are grouped into two sets:

- Species rich neutral grassland site condition monitoring forms
- Heathland and acid grassland site condition monitoring forms

Each form has two scales of survey (fine-scale and coarse-scale) which require completion. A Datasheet for data entry and summary statistics were also developed. See the 'Condition Monitoring Guidance for Grassland and Heathland Habitat (2013)' document for further information.