Natural England Commissioned Report NECR071

Lugg Meadows Vegetation Study

First published 25 October 2011

www.naturalengland.org.uk

NATURAL ENGLAND

Foreword

Natural England commission a range of reports from external contractors to provide evidence and advice to assist us in delivering our duties. The views in this report are those of the authors and do not necessarily represent those of Natural England.

Background

The National Vegetation Classification (NVC) identifies and describes different types of plant communities in Britain. It is a working tool that provides a framework to support land management, conservation and monitoring. Vegetation systems are complex and the classification cannot be comprehensive. However, as more data and information becomes available it can be refined and developed.

The grassland community known as MG4 grassland is found on seasonally flooded land that has traditionally been cut for hay. With improvements to grassland productivity and to river drainage this community is now very restricted.

The Lugg Meadows Site of Special Scientific Interest (SSSI) has been notified for its species-rich MG4 community. However, when assessed against the common standards monitoring devised by the Joint Nature Conservation Committee (JNCC) for this grassland type the site consistently underperforms.

This study was commissioned to:

- Analyse vegetation data from the Lugg Meadows SSSI collected systematically by annual quadrat surveys between 2006 and 2009
- Attempt to identify any temporal changes indicating success or failure of the current site management regime.
- Identify the possible existence, identity and relative influence of other variables driving community dynamics, as distinct from site management.
- Attempt to identify that the vegetation may represent a local or regional sub-type of the recognised suite of alluvial grassland communities.

The findings will be used to maintain and enhance the conservation value of Lugg Meadow. They are being published so that they can contribute to the wider ongoing re-assessment of the vegetation of floodplain grasslands.

This report should be cited as:

WOODFIELD, D. M. G. (2010b). *Lugg Meadows Vegetation Study*. Natural England Commissioned Reports, Number 071.

Natural England Project Managers - Dr Val Cooper & Katey Stephen, Natural England, Block B, Government Buildings, Whittington Road, Worcester, WR5 2LQ **val.cooper@naturalengland.org.uk** **katey.stephen@naturalengland.org.uk**

Contractor - Dominic Woodfield CEnv MIEEM, Bioscan UK Limited

Keywords - Lammas meadow, flood meadow, alluvial grassland, Lugg Meadows, MG4

Further information
This report can be downloaded from the Natural England website: **www.naturalengland.org.uk**. For information on Natural England publications contact the Natural England Enquiry Service on 0845 600 3078 or e-mail **enquiries@naturalengland.org.uk**.

ISSN 2040-5545

Summary

The purpose of this commission was to survey and classify the vegetation of Upper and Lower Lugg Meadow, including areas outside the designated SSSI, in order to inform future conservation and management planning for the entirety of the Lugg Meadows site.

Plant species and cover data were recorded from one hundred and seventy nine 2x2m quadrat samples at Lugg Meadows, near Hereford in May and June of 2010. Each species' overall cover in the sample was recorded as a percentage estimate, with an indication of frequency provided by recording first occurrence in a sequence of 'nested' quadrats within the 2x2m sample. The data were analysed for groupings potentially indicative of distinct vegetation types using TWINSPAN and for the existence and nature of any environmental gradients determining these groupings using DECORANA and simple tests of correlation between species diversity and indices of fertility, soil reaction and soil moisture derived from Ellenberg values.

At least eight sample groupings identified by TWINSPAN are considered to represent more or less distinct nodes in a continuum of variation, as they remain generally identifiable from the outputs of a suite of analyses within and across datasets. For the purposes of classification these are adopted as Lugg Meadows grassland 'types' and they include some assessed to be robust for use in describing and classifying the vegetation on the site, as well as others that may be less reliable due to their distinguishing characteristics being more subtle. The species composition of these different nodes or grassland types is presented in a synoptic table, and a key is provided to enable samples from future formal or informal surveys to be readily allocated.

DECORANA analysis, consideration of autecological attributes and simple tests of correlation between species-richness and scores for each community derived from Ellenberg values suggest that the vegetation groups are distributed along one or both of two principal axes of variation: soil moisture and fertility. This suggests that collection of further data on flooding patterns, the nutrient load of Lugg floodwaters and soil-nutrient levels generally may be profitable in helping to understand the origins and successional dynamics of the Lugg Meadows grasslands and for informing future management at both the site level and at a catchment scale. The influence of changes in the timing of the hay cut on the vegetation, including on the prominence of what may be local phenotypes of key species, also merits further investigation.

The Lugg Meadows vegetation continues to defy ready classification to the NVC. In general terms, a spectrum ranging from 'dryer' MG5-related grasslands through to wetland vegetation appears to be present, but the expected middle-ground transition through 'textbook' MG4 grassland is not manifested. This applies even in the light of emerging work by others to expand the formal definition of MG4 in recognition that the datset used to compile the constancy tables for this community presented in the NVC volumes is unrepresentatively restricted. Whilst some suppression of botanical quality from excess fertility may be implicated, the communities of this middle ground remain closer to MG4 than they are to the 'degraded' or 'improved' flood meadow grasslands represented by certain sub-communities of MG7, and they retain a suite of plant species indicative of 'unimproved' grasslands.

Past assessments of the grassland interest of the site have often been overly focused on this 'poor' degree of fit to the NVC, without fully recognising the limitations of the NVC as an evaluation tool, nor that the idiosyncrasies displayed by the Lugg Meadows grasslands may actually add to the site's value rather than detract from it. Amongst other things, such idiosyncrasies include one of the largest British populations of the nationally scarce *Oenanthe silaifolia* as well as significant populations of other species of conservation value The conclusion is offered that the current delimitation of the SSSI is too narrowly drawn to encompass the full complement of special interest features of the site and that the underlying factors that make the site's vegetation stand apart from comparators merit further study.

Acknowledgements

Particular thanks go to Sue Holland and Neville Hart at the Herefordshire Nature Trust for invaluable discussion, information and encouragement, Val Cooper and Katey Stephen at Natural England for administering the project and obtaining LiDAR and other information, Joe Costley at Plantlife for useful information on management history in Lower Lugg Meadow and Hilary Wallace and Richard Jefferson for useful comment and data related to the emerging work of the Floodplain Meadows Partnership. At Bioscan, Geoff Moxon, Denice Cullen and Ben Carpenter all provided invaluable support in particular on the production of graphics.

Contents

Appendices

List of tables

List of figures

1 Introduction

1.1 Lugg Meadows (or the Lugg Meadow) is a large expanse of traditionally managed hay meadow in the floodplain of the River Lugg, east of Hereford. At approximately 132 hectares it is believed to represent the largest survival of its type nationally (Brian 1990). Around fifteen and a half hectares in the northern part of the site is a designated Site of Special Scientific Interest (SSSI), but the remainder has no statutory designation, although various parts are owned and/or managed as nature reserves by Plantlife and/or the Herefordshire Nature Trust (HNT).

1.2 There has been no attempt to survey and classify the vegetation across the entirety of the site since 1990 (Bingham 1990), although since the 1970's there have been various surveys on a smaller scale, mostly focussing on the SSSI. Since 2004, the SSSI has also been the focus of annual survey effort as part of a long-term monitoring programme to assess site condition and management efficacy, with a recent analysis of results suggesting that subtle changes in the vegetation have occurred, at least in parts of the site, in the five years to 2009 (Woodfield 2010a).

1.3 Certain of the earlier surveys (e.g. Bingham 1990, FPCR 1994, FPCR 1996) have precipitated or even encouraged the suggestion that much of the vegetation both within and outside the SSSI has deteriorated to a point where it is effectively indistinguishable from the agriculturally 'improved' grassland types represented in the National Vegetation Classification (NVC). More recent assessments of the SSSI and adjoining areas (Gibson 2004, Woodfield 2010a), whilst recognising that the vegetation shows signs of having been influenced by negative processes to a greater or lesser degree, have challenged such suppositions, and in particular have questioned the validity of conservation evaluations based primarily on the extent to which the vegetation 'fits' the formal framework of the NVC.

1.4 In March 2010 Natural England commissioned Bioscan to undertake a vegetation survey of the non-SSSI components of the Lugg Meadows site (Figure 1). This report presents the results of that survey, offers a prototype classification of the grassland vegetation of the site in its entirety, identifies likely drivers of vegetation composition and change and comments on the nature conservation value of the non-SSSI components of the site. It is hoped that it will serve as a basis for informing future conservation and management planning for the site as a whole, and as a catalyst for further studies to better understand the environmental factors influencing the nature and importance of the grasslands.

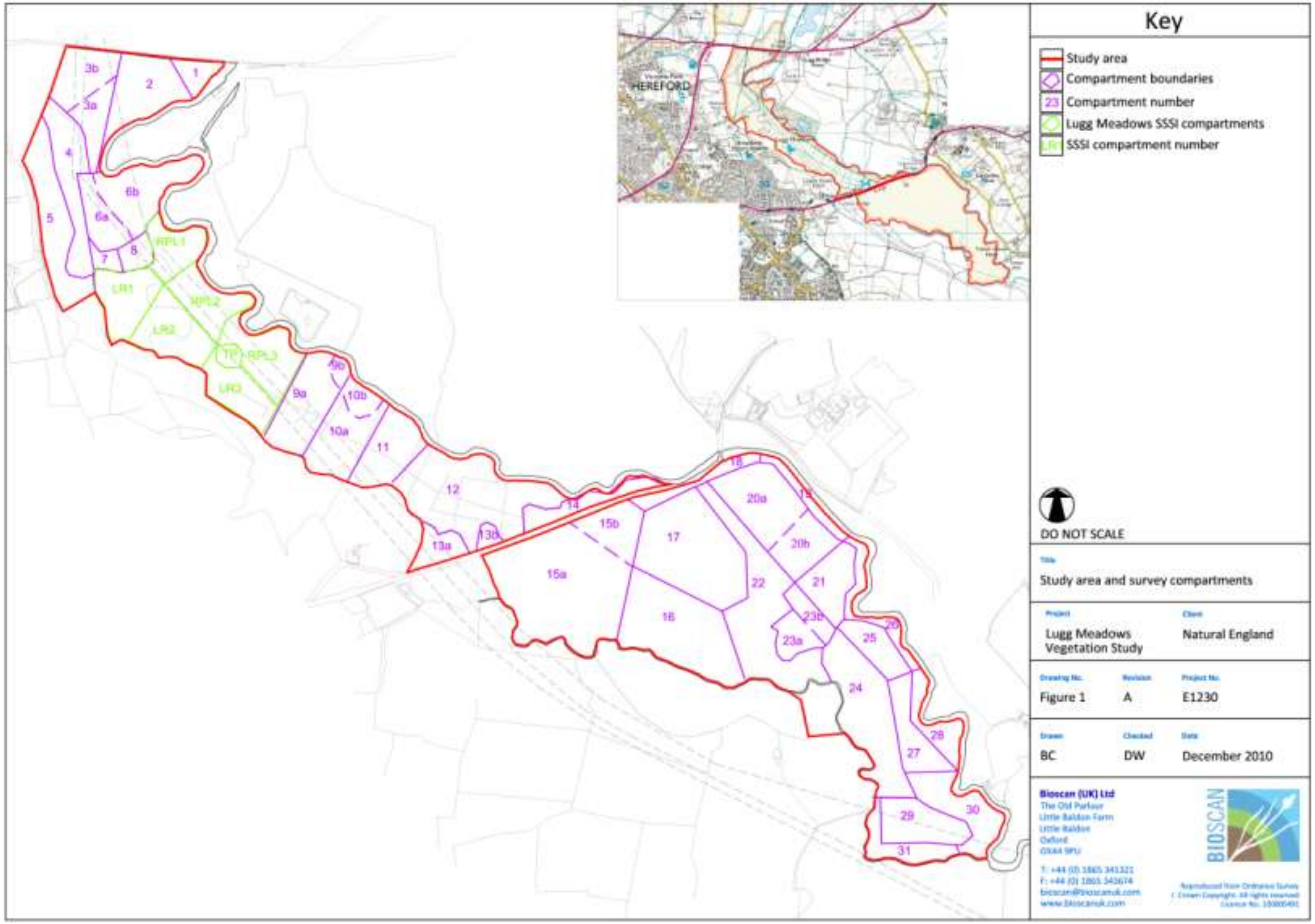


Figure 1 Study area and survey compartments

2 Methods

Baseline data collection

Approach

2.1 It was identified at the outset of the commission that the baseline data collected needed to be in a form that would best facilitate comparison with other datasets relevant to the site. In particular these include the 2004-2009 monitoring work within the SSSI (in order to permit a comprehensive overview of the site in its entirety), but also formal surveys pre-dating that work, as well as older historical data, in case any temporal change in the nature or quality of the vegetation could be detected. Compatibility with the data recording and presentation systems underpinning the NVC was also important, not only to test previous evaluations based on its use, but also to facilitate cross-site comparisons, in order that the Lugg Meadows vegetation could be put into a regional and/or national context.

2.2 In view of these requirements, the recording system settled upon for use at the site closely followed that used for the 2004-2009 SSSI monitoring work, as devised by Gibson (2004). This results in data for each vascular or lower plant species being collected in two formats; as an index of frequency derived from each species' first occurrence in sub-divisions of increasing size within each quadrat ('nested' quadrats), and as a percentage estimate of each species' overall coverage within the quadrat (percentage data). The system used in 2010 differs slightly from the 2004-2009 studies in that 'Domin' categorisations were not used for recording cover, however these can be readily derived from the percentage data if necessary for future analyses.

Identification of sample plots

2.3 Sample plots were chosen from a review of documentary evidence of historic/current tenure and ownership boundaries as presented in Brian (2001) and as gleaned from Herefordshire Nature Trust (HNT) files held at Lower House Farm (especially where such units were known to still be in use). This was refined by analysis of recent aerial photographs (Multimap and Google Earth) and historic mapping from various sources to identify vegetation patterning or physiographical features such as drainage lines that might represent actual vegetation boundaries or logical delimitations for sample plots. Reports of previous surveys of the site were also consulted to try and marry sample plots up to those used in the past. LiDAR data to 2m resolution was later obtained from the Environment Agency and reviewed, but this did not suggest that any plot boundaries should be altered.

2.4 This process resulted in a total of 31 survey compartments initially being identified (Figure 1). In agreement with Natural England these excluded the SSSI because data for this part of the site were available from the 2009 field season and it was felt that resources and survey effort were better maximised in areas that have received scant, if any, systematic sampling in the past. In the event, seven quadrats ended up being taken from the SSSI in error, and these have proved to be valuable as a calibration tool in the analyses. The survey compartments were submitted to Natural England (West Midlands Team) and HNT for final review before being adopted for fieldwork.

2.5 The original aim was to take eight quadrat samples from each survey compartment so that sample size was consistent with that taken annually from each of the permanent monitoring plots within the SSSI. In the event, the identification of sub-compartments where different vegetation was likely to be encountered required that these eight samples were often subdivided in broad proportion to the relative area occupied by the sub-unit within each compartment. This is consistent with the approach devised by Hodges, Colosanti & Sutton (1995) and previously used by Plantlife on their landholdings within the site. Additional sampling units were also identified once fieldwork commenced, which meant that strict adherence to the 'eight samples per plot' protocol would have resulted in a somewhat open-ended fieldwork burden. Initial work on site also identified that vegetation was sometimes homogenous across plot and/or sub-plot boundaries, and therefore a flexible approach was maintained to ensure that sampling resources were used in the most effective way.

Sampling methods

2.6 Sampling took place over five dates in May and June 2010; 19th May, 16-17th June, and 23rd-24th June. Fieldwork was carried out by a single surveyor (DW) accompanied by an assistant on one date (24th June). Use of a single surveyor was considered advantageous in standardising any error or bias, but it was also desirable for practical reasons to minimise the scope for disturbance to breeding curlew in Lower Lugg Meadow.

2.7 The site was surveyed in a broadly north-south sequence, although this was broken up between the May and June visits to try and combat the possibility of bias being introduced from seasonal changes in the prominence and/or cover of individual species, as well as to attempt to standardise bias from increasing sward heights over the period. Hay cutting in Upper Lugg Meadow commenced early, in mid-June, and this unfortunately led to one sub-compartment earmarked to be returned to (6b) not being surveyed in time.

2.8 Within each sampling plot, data recording followed the sequence below:

1) Random sample points were derived in the field using an eight-sided die for compass point direction and two ten-sided dice for distance (1-100 paces). For larger plots, e.g. 15a and 16, the ten-sided dice were used to generate two sets of random numbers in the range 2-200 which were added together. If the edge of the plot was encountered the surveyor 'bounced' off at 90 degrees. On occasion, random points were sampled along a linear transect to avoid excessive 'edge' sampling in broadly rectilinear sample plots.
2) Once the random point was reached, this was taken to represent the south-western corner of the sample. A 2m square sample area was then marked out, extending from this south-western point, using a tape measure and canes.
3) Three height estimates were then recorded from the sample area using a 30cm diameter dropped-disc weighing 200g (after Stewart *et al* 2001).
4) The position of the quadrat was then taken using a hand-held GPS unit placed at the south-western corner of the sample.
5) A 1m square fixed quadrat divided into a wire frame of 100 10x10cm cells was then placed within the larger sample area, positioned so that it occupied the south-western 1x1m quadrant of the 2m square.
6) Estimated percentages of bare ground and litter (any dead material accumulated from previous years' growth) were taken.
7) All vascular and (where present) lower plant species present in the south-western 10x10 cm cell of the fixed quadrat frame were then recorded, with additional species recorded in cells moving up to the 20cm, 30cm, 40cm, 50cm, 1m and finally the full 2m square.
8) The 2m square was then re-recorded with percentage estimates of cover attributed to each of the species present.
9) Data were recorded on bespoke field sheets, with notes made of any additional observations of sward structure, local micro-topography etc.
10) Species of fauna noted during the survey were also recorded incidentally as were habitat and plant species observations outside quadrats which are included as an appendix to this report.

Preparation of data

2.9 Data were transferred from the field recording sheets to MS Excel spreadsheets for analysis. The raw data have been provided to Natural England and HNT in electronic form. A further copy of the percentage cover data was sent to the Floodplain Meadows Partnership at the Open University, Milton Keynes.

2.10 Nested data were converted for analysis to an inverse scale intended to be representative of their frequency in the sample. For example, species recorded at the first 10x10cm sample cell of the quadrat were assigned a value of 1 (i.e. 100%), with those recorded only at the 2x2m level assigned a value of 0.0025 or a quarter of one percent.

2.11 For the purposes of examining the compatibility of the 2010 dataset with quadrat data for the SSSI (collected by the Herefordshire Nature Trust as part of long-term monitoring of that site, and held by Bioscan as part of previous commissions) the Domin values from the most recent (2009) data for that site were converted to percentage scores using the 'Domin 2.6' conversion (Currall 1987). The same conversion was used where appropriate for other historical datasets for the site.

Analysis

2.12 The software package CAP4 (version 4.1.3) (Seaby & Henderson 2007) was used for all SIMPER, TWINSPAN and DECORANA analyses.

Compatibility of datasets

2.13 A Bray-Curtis matrix was assembled to compare individual samples and allow initial exploration of the overall extent of variation within each of the nested and percentage datasets. As a separate exercise the 2009 data from the SSSI, after conversion from Domin scores, was combined with the 2010 percentage data to allow initial comparison across datasets.

2.14 SIMPER analysis of the 2010 percentage-versus-nested datasets informed an assessment of which was likely to be of more value in characterising the vegetation. In particular, consideration of the 'between groups' SIMPER outputs enabled the variables most prone to the introduction of error from use of the nested data to be isolated and considered.

2.15 SIMPER analysis between the 2009 (Lugg Meadows SSSI) and 2010 (wider Lugg Meadows) percentage datasets allowed an appraisal of whether they could be safely combined for analytical purposes. The analysis permitted consideration of whether any observed differences in the data were due to a genuine change in the prominence of certain species within and outside the SSSI boundary, or to what extent factors such as survey timing, recording technique and/or observer bias might be responsible. For this assessment, the quadrat samples mistakenly taken from the SSSI in 2010 provided useful calibration, as did five samples taken in 2009 by HNT staff from an area outside the SSSI known as 'Lot 4' (coterminous with Compartment 12).

Vegetation classification

2.16 The data were analysed for clusters or groupings of similar samples potentially indicative of vegetation communities or sub-communities using TWINSPAN. Initially this also included subjecting the nested data to TWINSPAN to enable any patterns common to both outputs (and which might therefore be representative of robust similarities) to be identified, but this avenue of investigation was curtailed after SIMPER analysis suggested that the process of converting the nested data for analysis rendered it less reliable for use in characterising the vegetation.

2.17 Set-up parameters for TWINSPAN of the percentage dataset included the input of customised cut values (0, 2, 5, 10, 25, 50 and 75 percent) and the initial limitation of the number of divisions to a maximum of four to arrive at larger, and thereby ostensibly more robust, groupings. All cut values were assigned an equal weighting. A second TWINSPAN was then run to explore further divisions that might be representative of the existence of additional, more subtle community distinctions, in case these were of further assistance in understanding and describing the vegetation on the site.

2.18 Constancy tables for each of the putative 'Lugg Meadows grassland communities' identified from this process were then derived, both to provide further detail on their composition for use in subjective comparisons, and to facilitate more formal comparison with the NVC and other external datasets.

2.19 A further TWINSPAN was run using the 2010 percentage dataset combined with the most recent (2009) data taken from the SSSI. This was based on presence/absence scores for individual species to eliminate potential sources of error identified by SIMPER analysis of the two datasets

2.20 The prominent characteristics of each of the sample groupings identified by TWINSPAN were used to construct a prototype 'key' to the grasslands on the site. This was initially drawn up based on the indicator species and pseudo-species identified at each level of division identified by TWINSPAN of the percentage data from 2010. It was then refined by comparison with the other TWINSPAN outputs from the nested data and the combined 2009-2010 dataset to ensure that the groups were as robust as possible. The key is provided in this report but has yet to be tested in the field.

Gradient analysis

2.21 Exploration of the data for environmental gradients that could potentially explain the nature and distribution of the various TWINSPAN groupings was undertaken with detrended correspondence analysis (DCA) using the program DECORANA. This was run for the 2010 percentage data alone, and again for the combined 2010/2009 percentage data. Outputs included ordination plots for both samples and species. The nature of any perceived gradients was assessed through consideration of the particular attributes of individual species, or common attributes of groups of species, with reference where appropriate to widely adopted systems of conveying autecological attributes e.g. Ellenberg (1988), Hill *et al* (1999), Hill *et al* (2000), Grime *et al* (1988).

2.22 The putative 'Lugg Meadows grassland communities' identified from TWINSPAN analysis (LM1-LM8) were also explored for any associations with the environmental variables of soil moisture, pH and fertility (nitrogen). This was done by deriving a simple score for each of these variables for each community based on the use of Ellenberg values. A score for each variable in each community was derived from the mean Ellenberg values of each of the plant species that was 'constant' in each. Each score was plotted against the mean species-diversity values of each 'community' and the scores tested with Pearson correlation coefficient assuming a linear relationship.

2.23 Consideration of any relationship between the observed gradients and the species-diversity of the vegetation on the site was also informed by producing a map with sample locations coloured according to their species-diversity, as presented in increments from the lowest diversity samples in the dataset (those with 11 or fewer species) to the highest (those with 21 or more species).

Comparison with external datasets

2.24 Comparison with previous classifications of the vegetation within and in some places outside the SSSI and with the formal dataset for the NVC were made through comparing the extent to which 'constant' species in the various Lugg Meadows grassland communities (i.e. those occurring in >60% of samples) matched those from external datasets. These external datasets included the constancy tables of MG4 through to MG11a of the NVC, as well as Gibson's TWINSPAN types 1 to 6 from 2004 and constancy values derived from older (pre-1994) data for the site as assembled by Gibson (Gibson 2003). Comparisons with the emerging results from studies carried out by the Floodplain Meadows Partnership (Jefferson *et al* 2009, Wallace *et al* 2009), which have expanded the scope of the limited formal dataset for MG4, were also made using the same 'matched constants' approach.

2.25 A more formal comparison was made with data from a preceding study (Frith 2003) using DECORANA. This involved incorporating data from twenty-five quadrats taken in 2003, after conversion from Domin values, to the 2010 dataset and then comparing the positioning of samples, and sample groupings, on the resultant ordination plot. The results were used to assess whether there was any indication of change in the vegetation of the relevant areas in the period since that study, as well as the possible nature of any change that had occurred.

2.26 Finally, the intrinsic 'quality' of the Lugg Meadows vegetation was also considered against preceding and external datasets by comparing the number of indicator species of unimproved mesotrophic grassland (Rowell & Robertson 1994) found in each of the TWINSPAN communities against the constancy tables of MG4 through to MG11a of the NVC, as well as Gibson's TWINSPAN types 1 to 6 from 2004, and the constancy values taken from the emerging sub-communities of MG4 identified by the Floodplain Meadows Partnership (Jefferson *et al* 2009, Wallace *et al* 2009).

Distribution and zonation

2.27 For all of the TWINSPAN outputs, an interactive map of the results was produced by using Google Earth to plot the location of each sample onto an aerial photograph, using the GPS co-ordinates taken in the field, coloured according to the group to which each sample was assigned by TWINSPAN. The results from this exercise were then reviewed in the context of information on management history, as well as LiDAR data and vegetation patterning discernable on aerial photographs, to inform a discussion on the distribution, character and affinities of all of the putative 'Lugg Meadows grassland communities' identified. The Google Map file with this information on was sent to HNT and NE. For the formal graphical outputs presented in this report, the same data were plotted onto an electronic OS base map provided by HNT.

3 Results

Compatibility of 2010 and 2009 datasets

Nested data

3.1 SIMPER analysis highlighted that conversion of the raw nested data to simple indices of frequency, such as that adopted to enable TWINSPAN analysis in the past by Gibson (2004) and as replicated by Woodfield (2010a), results in excessive upward distortion of cover scores for more frequent species, and excessive downgrading for less frequent species.

3.2 As such, whilst the technique helps to militate against observer bias and sampling error during recording, in the absence of any means to correct this distortion the resulting data are of less value for use in characterisation of the vegetation, at least using techniques such as TWINSPAN.

3.3 The nested data do however provide invaluable information on sward diversity at various scales and they therefore provide an important baseline for future use in identifying and monitoring changes in individual species abundance or overall community composition that may be too subtle to be picked up by other means.

Percentage and Domin data

3.4 Compatibility between the percentage cover data for the site collected in 2010, and the Domin data collected in previous years by different observers was explored in more detail, in particular to assess whether data collected from the SSSI in 2009 could be subsumed into the 2010 dataset to provide comprehensive coverage of the whole of the Lugg Meadows, not just the area outside the SSSI.

3.5 After conversion of Domin scores to percentage values, an initial inspection of patterns of similarity or dissimilarity within the dataset were made from reviewing a matrix of Bray-Curtis values. Amongst the 2010 data, these identify significant (i.e. values >0.90) dissimilarity between samples from Compartments 29 and 30 and those from elsewhere on the site. This provided the first statistical indication that the vegetation in this area is distinct from the remainder. When the 2009 dataset is added, quadrats from areas of the SSSI believed to be ‘disturbed’ (Gibson 2004), including the ‘Thistle Patch’ and adjoining plots in the eastern (riverward) part of the SSSI, also frequently exceed the threshold level, suggesting that vegetation in these areas is also distinct from that elsewhere on the site. In contrast, high levels of apparent homogeneity are exhibited amongst quadrats within Compartment 11, and also amongst quadrats from areas in the northern part of Lower Lugg Meadow such as Compartments 21, 16 and 20.

3.6 Similarity within the combined 2009 and 2010 datasets, derived from SIMPER analysis, is relatively low (average score 45.28%). Most of the observed similarity is explained by the ubiquitous occurrence of a suite of grasses (most prominently *Agrostis capillaris, Alopecurus pratensis, Poa trivialis* and *Lolium perenne*) together with the scarcely less ubiquitous *Ranunculus acris*.

3.7 ‘Within-group’ similarity increases when the SSSI dataset is considered independently from the rest of the site, suggesting that in general terms the SSSI boundary encompasses less variation than that contained within the wider site. Average within-group similarity for the 2009 SSSI dataset rises to 58.87%, and the value returned for the seven SSSI quadrats taken in error in 2010 is very similar at 57.34%. For the rest of the site, the dataset returns a little altered value of 48.03%.

3.8 The ‘between group’ scores produced from SIMPER analysis, and their breakdown by contributing variable, start to highlight some key differences in the 2009 and 2010 sample sets which are relevant in considering their suitability for combined analysis.

3.9 SIMPER dissimilarity between the 2009 SSSI dataset and the 2010 dataset for the wider site is 61.30%. Most of this dissimilarity is due to variations in the recorded abundance of species, not because of any change in the dominant species between the sample groups: in fact the same species that are responsible for most of the *dissimilarity* between the groups also account for most of the *similarity*. This suggests a difference in their abundance that is either real or an artefact of the data collection process.

3.10 Variation in the recorded abundance of six species within, as compared with outside, the SSSI accounts for over 50% of the dissimilarity. Four of these species (*Agrostis capillaris*, *Alopecurus pratensis, Hordeum secalinum* and *Festuca rubra*) are indicated as more abundant outside the SSSI than within it and two (*Lolium perenne* and *Poa trivialis*) are indicated as marginally more abundant within the SSSI than outside it (Table 1).

Table 1 SIMPER dissimilarity between 2009 (SSSI) and 2010 percentage cover datasets

2009 With 2010	**Average Dissim**	**61.3074**			
	2009	**2010**			
Name	**Ave Abund**	**Ave Abund**	**Ave Dissim**	**% Contribution**	**Cumulative %**
AGROCAP	10.3929	37.343	9.86081	16.0841	16.0841
ALOPRAT	6.83929	29.2267	8.21732	13.4034	29.4876
HORDSEC	0.714286	12.25	4.0931	6.67633	36.1639
LOLPERR	16.3214	12.4884	3.7506	6.11767	42.2816
POATRIV	17.0536	15.8837	3.46855	5.65761	47.9392
FESRUB	2.76786	10.7791	3.32466	5.42291	53.3621
HOLCLAN	7.55357	9.28488	3.26568	5.32671	58.6888
RANUACR	12.6429	6.09884	3.24478	5.29262	63.9814
RANUREP	6.82143	3.94186	2.9193	4.76172	68.7431
PHLEPRA	1.46429	4.74419	1.67794	2.73692	71.4801
LATHPRAT	4.08929	3.86628	1.36227	2.22203	73.7021
RUMACET	5.44643	2.3314	1.25196	2.04209	75.7442
BROCOMM	3.82143	2.4593	1.22152	1.99245	77.7366
CARHIRT	1.21429	2.94186	1.19626	1.95125	79.6879
FILIULM	2.69643	1.04651	1.1895	1.94021	81.6281
OENASIL	3.30357	0.552326	1.10435	1.80133	83.4294
ANTHODO	0.142857	3.1686	1.08923	1.77667	85.2061
TARAGG	2.85714	1.62209	0.806967	1.31626	86.5223
CIRSARV	1.16071	1.52907	0.779885	1.27208	87.7944
PLANLAN	1.98214	1.03488	0.761817	1.24261	89.037
HERASPHO	1.05357	1.18605	0.691249	1.12751	90.1645

3.11 As a test of whether such differences are genuine or attributable to recording method or observer bias, this result can be compared with the 'between group' dissimilarity between the 2009 SSSI dataset, and the quadrat samples taken in error from the SSSI in 2010.

3.12 Five of the seven samples mistakenly taken from the SSSI in 2010 appear to fall within the semi-permanent monitoring plots of either RPL3 or the 'Thistle Patch'. Average dissimilarity between these five samples and the sixteen taken from these two plots in 2009 is 55.25%. A difference in between-dataset abundance of four species accounts for over 50% of this dissimilarity; *Poa trivialis, Lolium perenne, Alopecurus pratensis* and *Ranunculus repens* are all suggested by the outputs to be more abundant in 2010 than in 2009.

3.13 Such differences may simply be caused by natural variation in species abundance 'captured' by the samples being from different locations within the same plots and as such unrelated to either the gap in time between the samples or the change of observer and recording technique. Further tests were however run to see if the possibility of observer bias and/or estimation error and/or transformation error related to the use of Domin values could be eliminated.

3.14 The test for dissimilarity between the five 2010 samples and each of the RPL and TP groups of samples was run independently as a further refinement. The 2010 samples are found to be marginally less dissimilar to the 2009 samples from the RPL plot (average dissimilarity 76.44%) than they are to the 2009 samples from the TP plot (78.81%). Notably, differences in the abundance of easily recognisable species such as *Ranunculus repens* account for up to 9% of the observed dissimilarity. This suggests that the observed variation between the datasets may be a simple product of different sample locations within the monitoring plots, as much as it has anything to do with observer bias and/or error introduced by using Domin values for recording rather than estimates of percentage cover (and vice versa).

3.15 However, when the same test was run using five samples taken by HNT staff in 2009 from an area in the south of Upper Lugg Meadow known as Lot 4, which is coterminous with compartment 12, a possible source of error was revealed. Average dissimilarity between the five samples taken in 2009 and the eight taken in 2010 is 68.57%. A difference in between-dataset abundance of just three species accounts for over 50% of this dissimilarity; *Agrostis capillaris, Poa trivialis* and *Alopecurus pratensis* are all suggested by the SIMPER outputs to be much more abundant in 2010 than in 2009. A significant proportion of this appears to be recording error associated with *Agrostis* species, with *A. capillaris* the most abundant grass in the 2010 data but almost absent in 2009, whereas *A. stolonifera*, absent in 2010, is the fourth most abundant species in the 2009 data. Standardising this by combining the scores for these two species into one variable ('*Agrostis* spp') reduces the dissimilarity score to 54.99%, although differences in the abundance of *Agrostis* spp still account for over 20% of this dissimilarity.

3.16 Whilst these results suggested that combining the 2009 and 2010 datasets risked introducing sources of error, they did not indicate that combining the datasets could not be valid for analytical purposes provided appropriate cautions were exercised, in particular when dealing with abundance scores and a very few specific taxa.

Vegetation classification

Lugg Meadows grassland types

3.17 The text output from TWINSPAN of the 2010 percentage cover data to a maximum of five levels of division is attached at Appendix 1. Figure 2 shows the groupings considered robust enough to represent putative 'Lugg Meadows grassland types', hereafter referred to as LM1 to LM8, as well as a ninth group (Lugg Meadows Wetland Group - LMWG) of eleven samples partitioned out at the first level of division (eigenvalue 0.19) and clearly very different from the remainder.

3.18 Subsequent divisions of the LMWG group indicated by TWINSPAN are ignored because the starting sample size is small, and the divisions result in groups containing very few quadrats, and as such likely to be of limited value in explaining the nature of any vegetation type being indicated without significant scope for error. That said, it is evident that more than one community is lumped together in LMWG, an observation supported by the high eigenvalues associated with some of the further subdivisions (e.g.>0.5) as well as being immediately apparent 'on the ground' in the distinction between tall herb communities (e.g. dominated by *Filipendula ulmaria* with very few grasses), intermediate-height sedge beds (dominated by *Carex disticha*) and short swards dominated variously by *Eleocharis palustris*, *Alopecurus geniculatus* or *Agrostis stolonifera*.

3.19 The 'Lugg Meadows grassland types' LM1 to LM8 are mostly drawn from the groups created at the fourth level of division and therefore derived from relatively subtle distinctions, as reflected in relatively low associated eigenvalues (range 0.11 to 0.21). These divisions are nevertheless considered robust enough for use in characterising the vegetation, partly because they are indicated by multiple species and pseudo-species and partly because the resultant groups of samples are fairly large. In contrast, the fifth level of division exhibits a preponderance of single pseudo-species indicators suggesting that the further divisions made by the program are predominantly based on borderline distinctions that could much more easily be confounded with normal intra-community variation. In many instances the resultant groupings are also too small (e.g. 1 or 2 quadrats) to be reliable. The exception is in the case of the division of the large group LM6 into two sub-groups based on the presence or absence and relative abundances of a suite of species, in particular *Holcus lanatus*, *Hordeum secalinum* and *Phleum pratense*. The resultant group sizes alone suggest that this might be a reasonably robust division, even if the low eigenvalue (0.10) does not. The Level 4 grassland type LM6, which in theory dominates much of the site, has therefore been tentatively divided into the sub-types LM6a and LM6b, the characteristics of which are shown on Table 2.

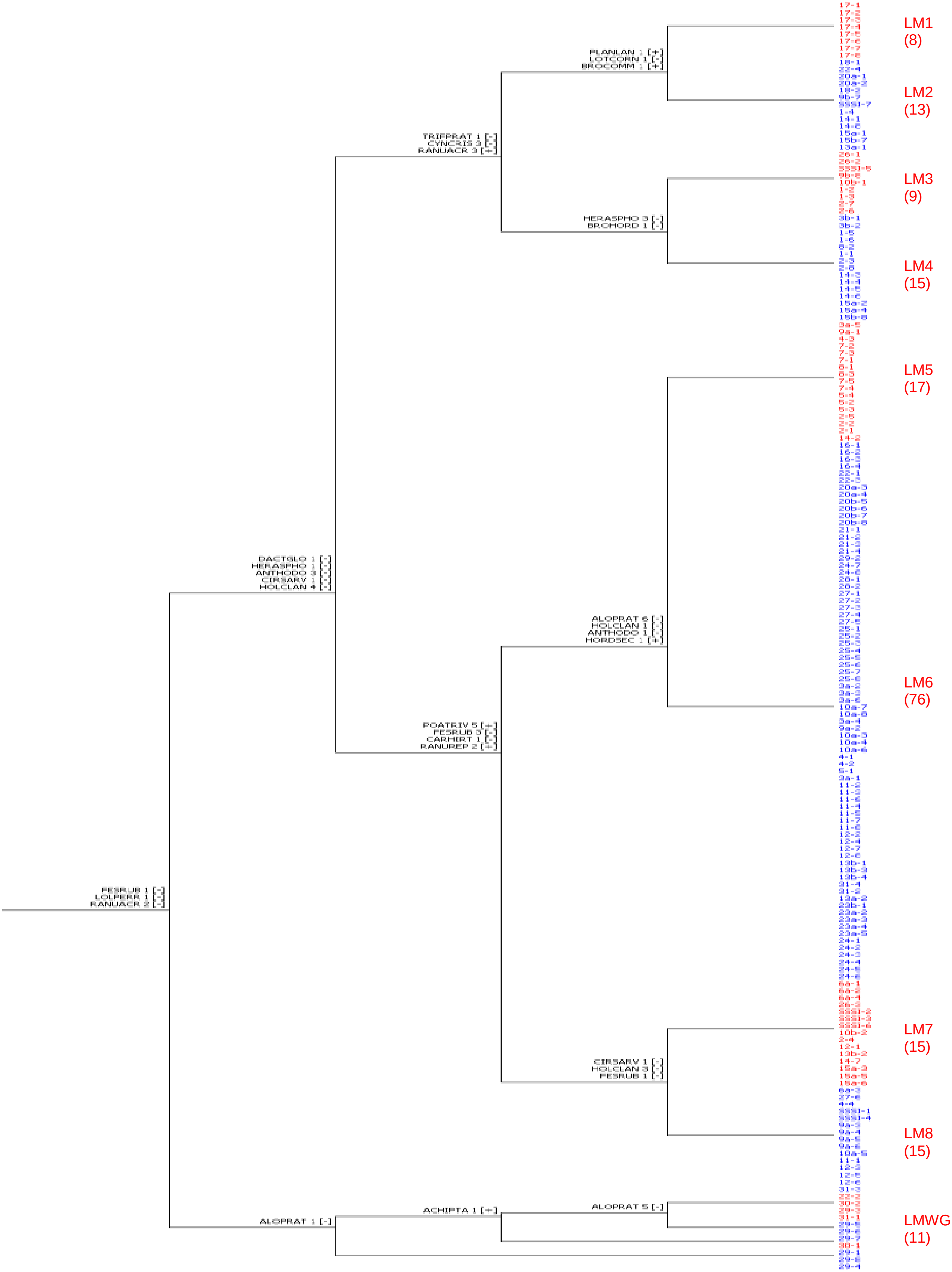


Figure 2 TWINSPAN of samples (2010 percentage cover data)

Table 2 Constancy table for LM1-LM8

Community name:	LM1		LM2		LM3		LM4		LM5		LM6a		LM6b		LM7		LM8	
	%Q	C	%Q	C	%Q	C	%Q	C	%Q	C	%Q	C	%	C	%Q	C	%Q	C
1. Species constant (occurring in >60% of quadrats) in one or more community																		
Agrostis capillaris	**100**	**V**	**100**	**V**	**66.7**	**IV**	**100**	**V**	**100**	**V**	**100**	**V**	**97.8**	**V**	**93.3**	**V**	**100**	**V**
Ranunculus acris	**100**	**V**	**92.3**	**V**	**100**	**V**	**100**	**V**	**100**	**V**	**96.8**	**V**	**93.3**	**V**	**73.3**	**IV**	**93.3**	**V**
Alopecurus pratensis	**75**	**IV**	**84.6**	**V**	**100**	**V**	**86.7**	**V**	**100**	**V**	**100**	**V**	**100**	**V**	**100**	**V**	**100**	**V**
Rumex acetosa	**75**	**IV**	**92.3**	**V**	**88.9**	**V**	**93.3**	**V**	**82.3**	**V**	**96.8**	**V**	**93.3**	**V**	**93.3**	**V**	**86.7**	**V**
Lolium perenne	**87.5**	**V**	**92.3**	**V**	**77.8**	**IV**	**86.7**	**V**	47	III	**93.5**	**V**	**84.4**	**V**	**93.3**	**V**	**100**	**V**
Holcus lanatus	**100**	**V**	**84.6**	**V**	**100**	**V**	**100**	**V**	**94.1**	**V**	**80.6**	**V**	8.9	**I**	**86.7**	**V**	40	**II**
Poa trivialis	0	-	**69.2**	**IV**	**100**	**V**	**93.3**	**V**	**82.3**	**V**	**96.8**	**V**	**100**	**V**	**93.3**	**V**	**100**	**V**
Festuca rubra	**100**	**V**	**100**	**V**	**66.7**	**IV**	**93.3**	**V**	**82.4**	**V**	**93.5**	**V**	**88.9**	**V**	**80**	**IV**	0	-
Taraxacum agg.	37.5	II	**92.3**	**V**	**88.9**	**V**	**80**	**IV**	**76.5**	**IV**	**83.9**	**V**	**64.4**	**IV**	60	III	60	III
Bromus commutatus	0	-	**84.6**	**V**	55.6	III	**66.7**	**IV**	**64.7**	**IV**	**80.6**	**V**	42.2	III	**86.7**	**V**	60	III
Lathyrus pratensis	**100**	**V**	**84.6**	**V**	44.4	III	**100**	**V**	0	-	**96.8**	**V**	**88.9**	**V**	**66.7**	**IV**	60	III
Cirsium arvense	**75**	**IV**	**100**	**V**	**100**	**V**	**80**	**IV**	17.6	**I**	16.1	I	17.8	**I**	**66.7**	**IV**	6.7	**I**
Anthoxanthum odoratum	**100**	**V**	**100**	**V**	22.2	II	**80**	**IV**	**82.3**	**V**	12.9	I	4.4	**I**	6.7	I	0	-
Phleum pretense	**62.5**	**IV**	15.4	III	22.2	II	26.7	II	47	III	58.1	III	**80**	**IV**	40	III	60	III
Hordeum secalinum	37.5	II	53.8	III	11.1	I	6.7	I	5.9	I	**83.9**	**V**	**84.4**	**V**	60	III	**80**	**IV**
Plantago lanceolata	0	-	**61.5**	**IV**	55.6	III	60	III	35.2	II	48.4	III	20	I	53.3	III	33.3	II
Heracleum sphondylium	50	III	**69.2**	**IV**	**100**	**V**	60	III	5.9	I	9.7	I	-	-	26.7	II	0	-
Ranunculus repens	0	-	0	-	55.6	III	40	II	17.6	I	16.1	I	42.2	III	60	III	**93.3**	**V**
Dactylis glomerata	**62.5**	**IV**	46.2	III	**77.8**	**IV**	60	III	0	-	9.68	I	-	-	0	-	0	-

Table continued...

Community name:	LM1		LM2		LM3		LM4		LM5		LM6a		LM6b		LM7		LM8	
	%Q	C	%Q	C	%Q	C	%Q	C	%Q	C	%Q	C	%	C	%Q	C	%Q	C
Trifolium pretense	**87.5**	**V**	**84.6**	**V**	33.3	II	6.7	I	5.9	I	22.6	II	4.4	I	13.3	I	0	-
Cynosurus cristatus	**100**	**V**	**69.2**	**IV**	11.1	I	20	I	11.7	I	22.6	II	-	-	13.3	I	0	-
Carex hirta	**75**	**IV**	15.4	I	0	-	6.7	I	**70.6**	**IV**	38.7	II	35.6	II	0	-	0	-
Lotus corniculatus	**75**	**IV**	7.7	I	0	-	20	I	5.9	I	35.5	II	26.7	II	0	-	0	-
Cardamine pratensis	0	-	15.4	I	0	-	20	I	**64.7**	**IV**	3.2	I	24.4	II	0	-	6.7	I
Bromus hordaceus	0	-	0	-	**77.8**	**IV**	0	-	0	-	-	-	-	-	6.7	I	0	-
Allium vineale	50	III	38.5	II	0	-	20	I	17.6	I	**64.5**	**IV**	42.2	III	6.7	I	6.7	I
2. Species with at least 21% frequency in one or more community																		
Centaurea nigra	37.5	II	53.8	III	11.1	I	53.3	III	23.5	II	32.3	II	8.9	I	0	-	0	-
Festuca pratensis	12.5	I	23.1	II	33.3	II	46.7	III	23.5	II	12.9	I	6.7	I	6.7	I	0	-
Oenanthe silaifolia	0	-	7.7	I	0	-	0	-	29.4	II	25.8	II	28.9	II	13.3	I	53.3	III
Trifolium repens	50	III	30.8	II	0	-	13.3	I	5.9	I	3.3	I	-	-	6.7	I	0	-
Geranium dissectum	0	-	15.4	I	44.4	III	0	-	0	-	6.5	I	13.3	I	33.3	II	0	-
Leontodon autumnalis	50	III	15.4	I	0	-	0	-	5.9	I	6.5	I	15.6	I	6.7	I	6.7	I
Ranunculus bulbosus	25	II	38.5	II	22.2	II	0	-	0	-	-	-	-	-	6.7	I	0	-
Rumex crispus	0	-	7.7	I	0	-	13.3	I	0	-	9.7	I	17.8	I	6.7	I	33.3	II
Trisetum flavescens	0	-	46.2	III	11.1	I	0	-	0	-	3.2	I	2.2	I	13.3	I	0	-
Cerastium fontanum	0	-	0	-	33.3	II	20	I			-	-	2.2	I	6.7	I	6.7	I
Filipendula ulmaria	0	-	0	-	0	-	0	-	11.8	I	19.4	I	31.1	II	0	-	13.3	I
Potentilla reptans	0	-	7.7	I	0	-	0	-	5.9	I	6.5	I	8.9	I	26.7	II	0	-

Table continued…

Community name:	LM1		LM2		LM3		LM4		LM5		LM6a		LM6b		LM7		LM8	
	%Q	C	%Q	C	%Q	C	%Q	C	%Q	C	%Q	C	%	C	%Q	C	%Q	C
Leucanthemum vulgare	37.5	II	7.7	I	0	-	0	-	0	-	-	-	-	-	0	-	0	-
Silaum silaus	37.5	II	0	-	0	-	0	-	0	-	3.2	I	4.4	I	0	-	0	-
Anthryscus sylvestris	0	-	0	-	33.3	II	0	-	0	-	3.2	I	-	-	6.7	I	0	-
Lotus pedunculatus	0	-	7.7	I	0	-	20	I	11.8	I	-	-	2.2	I	0	-	0	-
Tragopogon pratensis	0	-	30.8	II	0	-	6.7	I	0	-	-	-	2.2	I	0	-	0	-
Luzula campestris	37.5	II	0	-	0	-	0	-	0	-	-	-	-	-	0	-	0	-
Elytrigia repens	0	-	0	-	0	-	0	-	0	-	6.5	I	-	-	6.7	I	26.7	II
Crepis biennis	0	-	7.7	I	22.2	II	0	-	0	-	-	-	-	-	0	-	0	-
Quercus robur (seedling)	25	II	0	-	0	-	0	-	0	-	-	-	-	-	0	-	0	-
3. Other species																		
Deschampsia cespitosa	12.5	I	7.7	I	0	-	0	-	5.9	I	16.1	I	4.4	I	0	-	6.7	I
Equisetum arvense	12.5	I	7.7	I	11.1	I	0	-	0	-	-	-	-	-	0	-	0	-
Poa pratensis	0	-	0	-	0	-	6.7	I	5.9	I	3.2	I	-	-	0	-	6.7	I
Agrostis stolonifera	0	-	0	-	0	-	0	-	5.9	I	-	-	-	-	13.3	I	0	-
Vicia cracca	0	-	0	-	0	-	6.7	I	0	-	6.5	I	4.4	I	0	-	6.7	I
X Schedolium loliaceum	12.5	I	0	-	0	-	0	-	0	-	-	-	2.2	I	0	-	0	-
Vicia sativa	0	-	7.7	I	0	-	0	-	5.9	I	-	-	-	-	0	-	0	-
Achillea millefolium	0	-	0	-	11.1	I	0	-	0	-	-	-	-	-	0	-	0	-
Stellaria graminea	0	-	0	-	0	-	0	-	0	-	6.5	I	8.9	I	0	-	0	-
Ranunculus ficaria	0	-	0	-	0	-	0	-	5.9	I	-	-	-	-	0	-	0	-
Trifolium dubium	0	-	0	-	0	-	0	-	0	-	-	-	-	-	6.7	I	0	-

Table continued…

Community name:	LM1		LM2		LM3		LM4		LM5		LM6a		LM6b		LM7		LM8	
	%Q	C	%Q	C	%Q	C	%Q	C	%Q	C	%Q	C	%	C	%Q	C	%Q	C
Sanguisorba officinalis	0	-	0	-	0	-	0	-	0	-	-	-	2.2	I	0	-	0	-
Rhinanthus minor	0	-	7.7	I	0	-	0	-	0	-	-	-	-	-	0	-	0	-
Galium aparine	0	-	0	-	0	-	0	-	0	-	-	-	-	-	6.7	I	0	-
Kindbergia praelonga	0	-	0	-	0	-	0	-	5.9	I	-	-	-	-	0	-	0	-
No. quadrats	**8**		**13**		**9**		**15**		**17**		**31**		**45**		**15**		**15**	
MESOIND	10		13		6		9		10		12		16		8		7	
Mean height cm.	21.4		32.7		45.2		35.1		26.0		32.6		33.1		40.5		33.6	
Species / quadrat mean	20.1		19.9		16.8		16.9		14.7		16.3		14.1		14.5		12.5	
Min	12		14		14		15		11		11		9		12		10	
Max	26		26		22		20		21		21		19		19		15	

Table 3 Key to sample groupings / communities identified from TWINSPAN of percentage cover data

<table>
<tr><td>Level 1</td><td colspan="9">Two or more of Festuca rubra, Lolium perenne and Ranunculus acris present in predominantly ‘grassy’ (although often herb-rich) swards.</td><td rowspan="5">F. rubra, L. perenne and R. acris very sparse or absent in generally species-poor vegetation often dominated by sedges, Eleocharis or tall herbs. If grassy, Alopecurus geniculatus and Agrostis stolonifera often dominant.</td></tr>
<tr><td>Level 2</td><td colspan="4">Dactylis glomerata, Heracleum sphondylium and Cirsium arvense typically present, often together. Anthoxanthum odoratum and Holcus lanatus common to abundant (typically at >5% cover >10% cover respectively)</td><td colspan="5">Dactylis glomerata, Heracleum sphondylium and Cirsium arvense typically rare, at low cover or absent. Anthoxanthum and Holcus, if present, generally only at low cover. Oenanthe silaifolia and/or Hordeum secalinum often present.</td></tr>
<tr><td>Level 3</td><td colspan="2">Trifolium pratense common. Cynosurus cristatus typically present at >5% cover. One or more of Ranunculus bulbosus, Allium vineale and Lotus corniculatus commonly present. Ranunculus acris constant but at low cover.</td><td colspan="2">Trifolium pratense scarce. Ranunculus acris present and generally abundant, frequently with Festuca pratensis.</td><td colspan="3">Carex hirta present with Festuca rubra at >5% cover. One or more of Filipendula ulmaria, Lotus corniculatus and Allium vineale usually present.</td><td colspan="2">Poa trivialis present and often at high (>25%) cover with Ranunculus repens and abundant Holcus lanatus and Lolium perenne.</td></tr>
<tr><td>Level 4</td><td>Bromus commutatus and Plantago lanceolata absent. Lotus corniculatus present often with one or more of Luzula campestris, Silaum silaus and Leucanthemum vulgare.</td><td>Bromus commutatus and Plantago lanceolata present. Lotus corniculatus rare or absent.</td><td>Heracleum sphondylium constant and often abundant with Bromus hordaceus. Geranium dissectum and Anthriscus suylvestris occasional to frequent. Anthoxanthum only ever at low cover and Centaurea nigra rare.</td><td>Bromus hordaceus absent. Heracleum sphondylium may be present but only at low cover. Anthoxanthum odoratum common and Centaurea nigra frequent</td><td>Holcus lanatus and Anthoxanthum odoratum constant and abundant with Alopecurus pratensis normally attaining>50% cover.</td><td colspan="2">Hordeum secalinum constant and often abundant with Alopecurus pratensis at <50% cover. Holcus and Anthoxanthum may be present but only at low cover. Allium vineale common and Filipendula ulmaria and/or Lotus corniculatus frequent.
(LM6)</td><td>Cirsium arvense and Festuca rubra present, with Holcus lanatus at >5% cover. Geranium dissectum and Heracleum sphondylium frequent with Oenanthe silaifolia and Rumex crispus only ever rare.</td><td>Cirsium arvense and Festuca rubra absent. Oenanthe silaifolia and Rumex crispus can be frequent.</td></tr>
<tr><td>Level 5</td><td></td><td></td><td></td><td></td><td></td><td>H. lanatus present, even if only at low cover. H. secalinum abundant, often with C. nigra and C. cristatus. A. pratensis generally at low cover</td><td>H. lanatus rare or absent. A. pratensis abundant often with P.pratense and R. repens</td><td></td><td></td></tr>
<tr><td></td><td>LM1</td><td>LM2</td><td>LM3</td><td>LM4</td><td>LM5</td><td>LM6a</td><td>LM6b</td><td>LM7</td><td>LM8</td><td>LMWG</td></tr>
</table>

3.20 Table 2 provides a synopsis of the constituent species of LM1-LM8 and their frequency of occurrence. The mean, minimum and maximum values for species diversity within the constituent samples are also presented for each grassland type, as are the total number of indicator species of unimproved mesotrophic grassland found within each community.

3.21 The mean species-diversity values show that the TWINSPAN divisions result in groupings that show a declining spectrum of species diversity from the 'negative' or 'left hand' side of the divisions (LM1 and LM2) to the positive or 'right-hand' side of the divisions (LM7 and LM8). However the number of indicators of mesotrophic grassland associated with each community does not follow a parallel pattern of decline. This suggests that the gradient of declining species-diversity is not necessarily representative of increasing departure from 'unimproved' semi-natural vegetation, particularly in respect of the communities falling at the 'right-hand' end of the TWINSPAN divisions. This is explored further by DECORANA and other analyses (see below).

3.22 Table 3 sets out the most prominent and/or defining characteristics, in terms of indicator species and their abundance, of each of the putative grassland types LM1-LM8 from the level four TWINSPAN divisions, as well as the level five division of LM6 into LM6a and LM6b. In doing so it provides a prototype 'key' which may be used to test the workability of the classification on the ground, and if appropriate to inform future surveys of the site.

3.23 Figure 3 shows the location on the site of each of the 2010 samples coloured according to their TWINSPAN allocation.

The SSSI grasslands

3.24 As discussed above, SIMPER analysis suggested that combining the 2010 cover data with that collected from the SSSI in 2009 could not be done without certain cautions, primarily in respect of observed differences in the estimated abundance of individual species between the two datasets which probably arise from either recording technique or observer bias. However analysis that excludes this component of the data (i.e. that is based only on the presence or absence of species) can still be performed.

3.25 The combined 2010 and 2009 cover data was therefore subjected to TWINSPAN analysis based on presence/absence alone. The TWINSPAN text output is attached at Appendix 2. The resulting dendrogram (Figure 4) permits consideration of how the SSSI vegetation fits in to the wider pattern of variation across Lugg Meadows.

3.26 The spectrum of declining species-diversity across the TWINSPAN classifications resulting from the 2010 data is still observable after combination with the 2009 data. Because of this, the positioning of the 2009 samples along this gradient can be used to provide an initial indication of where within the range of communities LM1-LM8 the SSSI grasslands are most likely to fall.

3.27 Figure 4 suggests that most of the SSSI grasslands would appear to fall into the 'middle-ground' of the spectrum of variation (e.g. as represented by communities LM5-LM7), with the more species-rich vegetation from the Lugg Rhea (LR) plots in the western part of the SSSI placed towards the more 'species-rich' end of the spectrum and the more species-poor 'disturbed' or enriched vegetation from the 'River Power Line' (RPL) plots in the eastern part of the SSSI generally placed towards the more 'species-poor' end. Quadrats from the highly disturbed 'Thistle Patch' (TP1-09 to TP8-09) are placed at the outer extremity of the species-poor end.

3.28 Confidence that this analysis provides a useful indication of how the SSSI vegetation compares with that for the wider site is provided by two things. Firstly, it fits closely the gradient of diversity within the SSSI that was first identified by Gibson (2004) and re-confirmed by Woodfield (2010a), and secondly it can be observed that three of the quadrats taken in error from the approximate area of the Thistle Patch in 2010 (SSSI-2, SSSI-3 and SSSI-5) are grouped together with the 2009 Thistle Patch samples in the dendrogram.

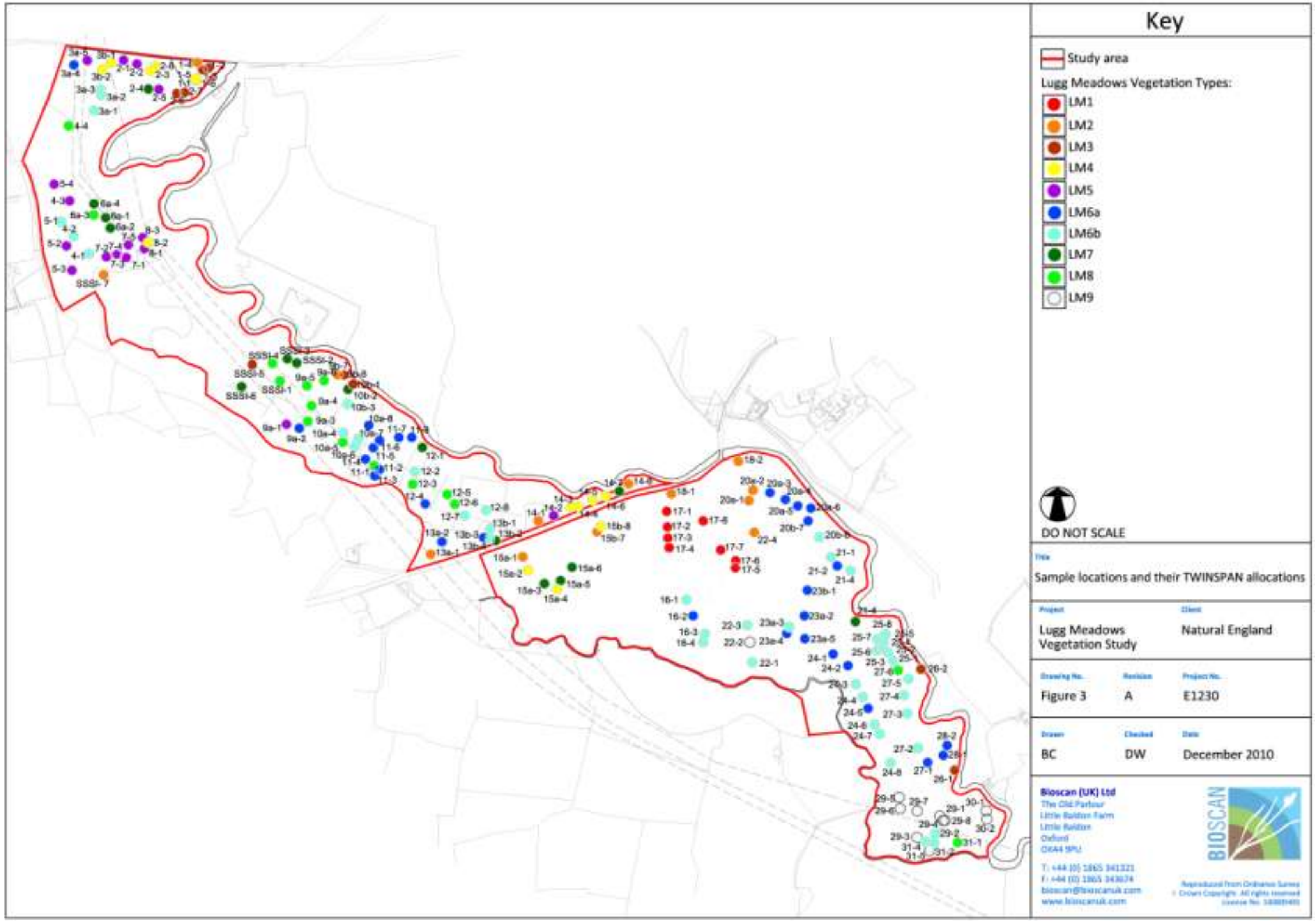
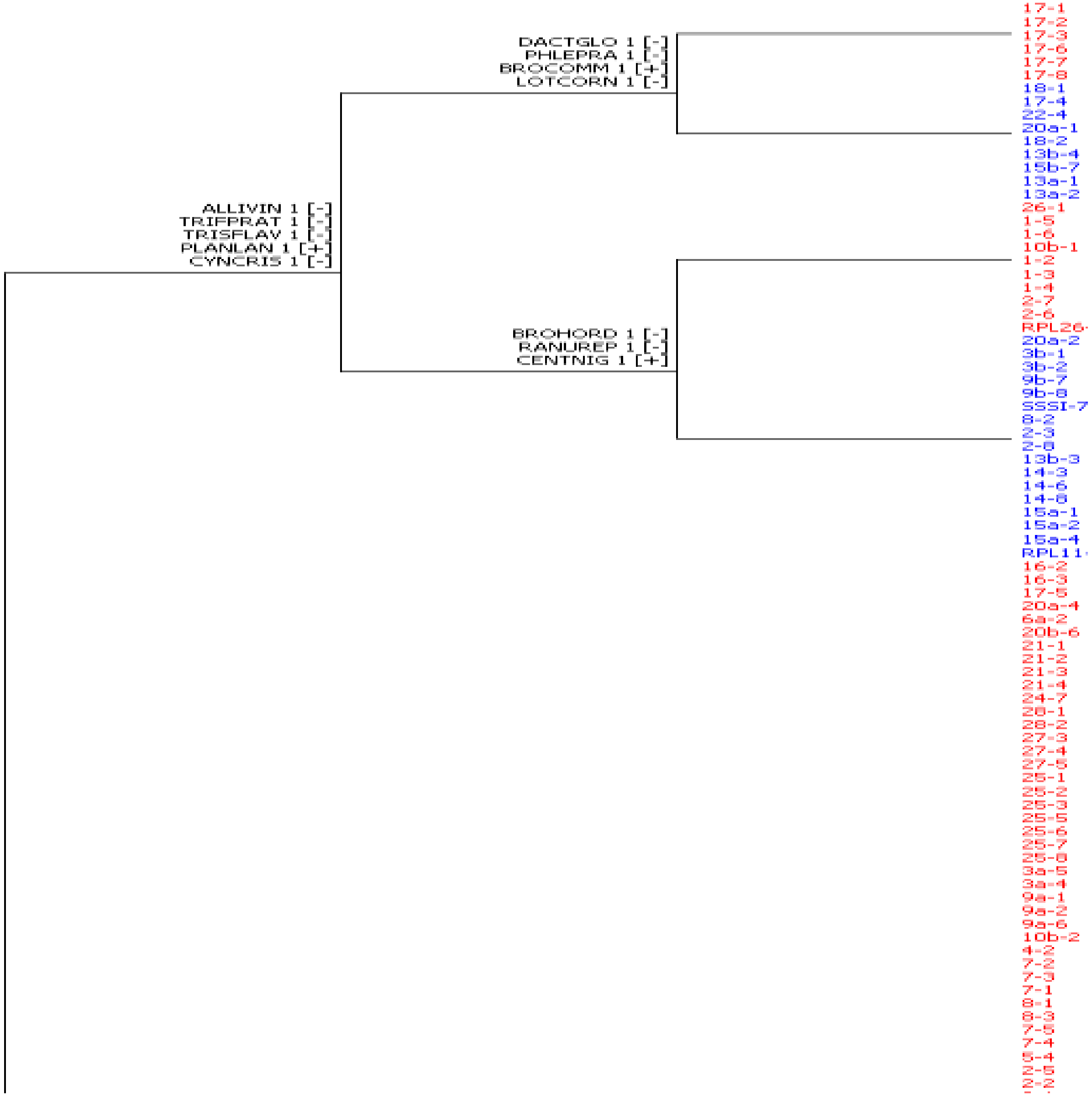
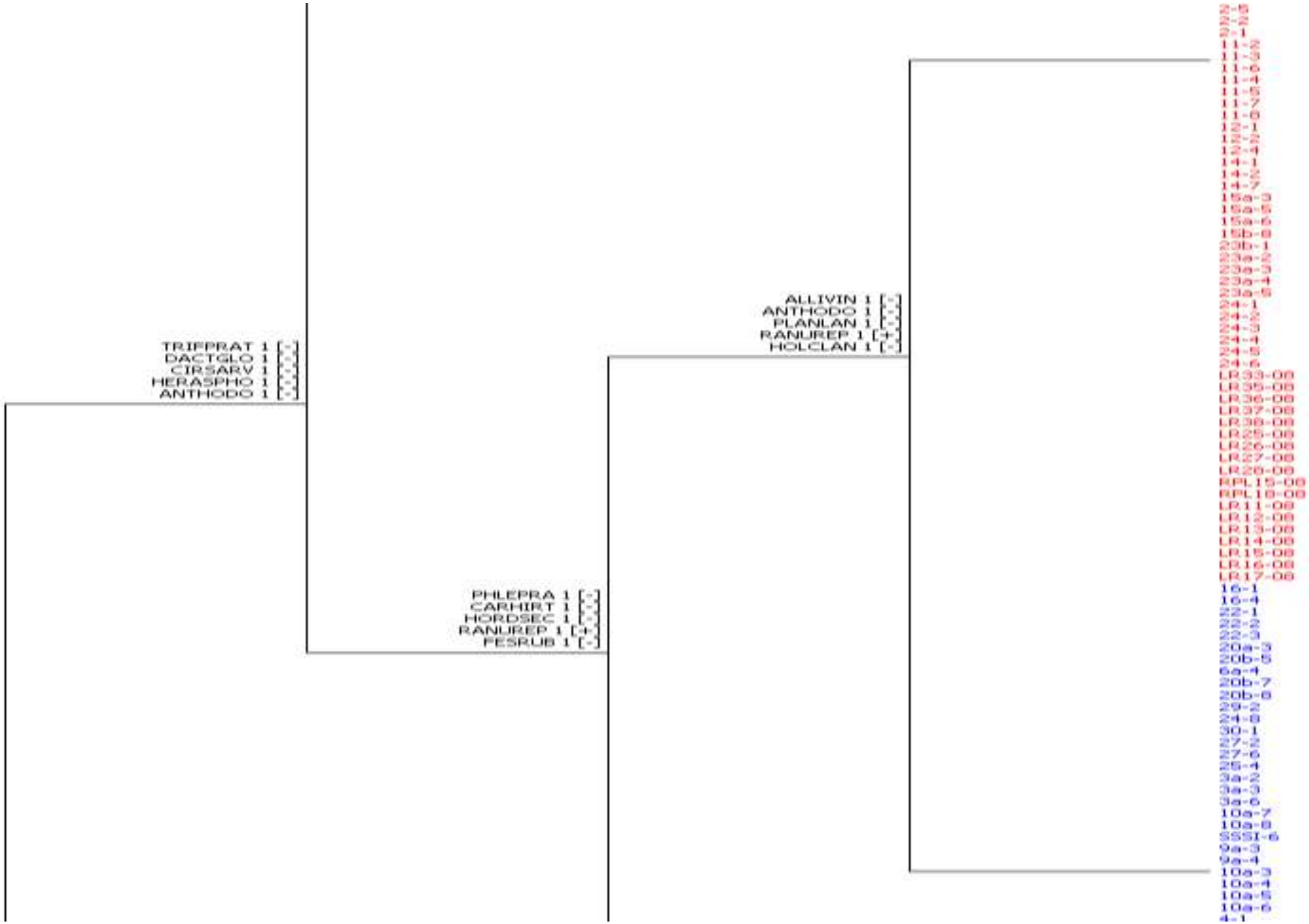
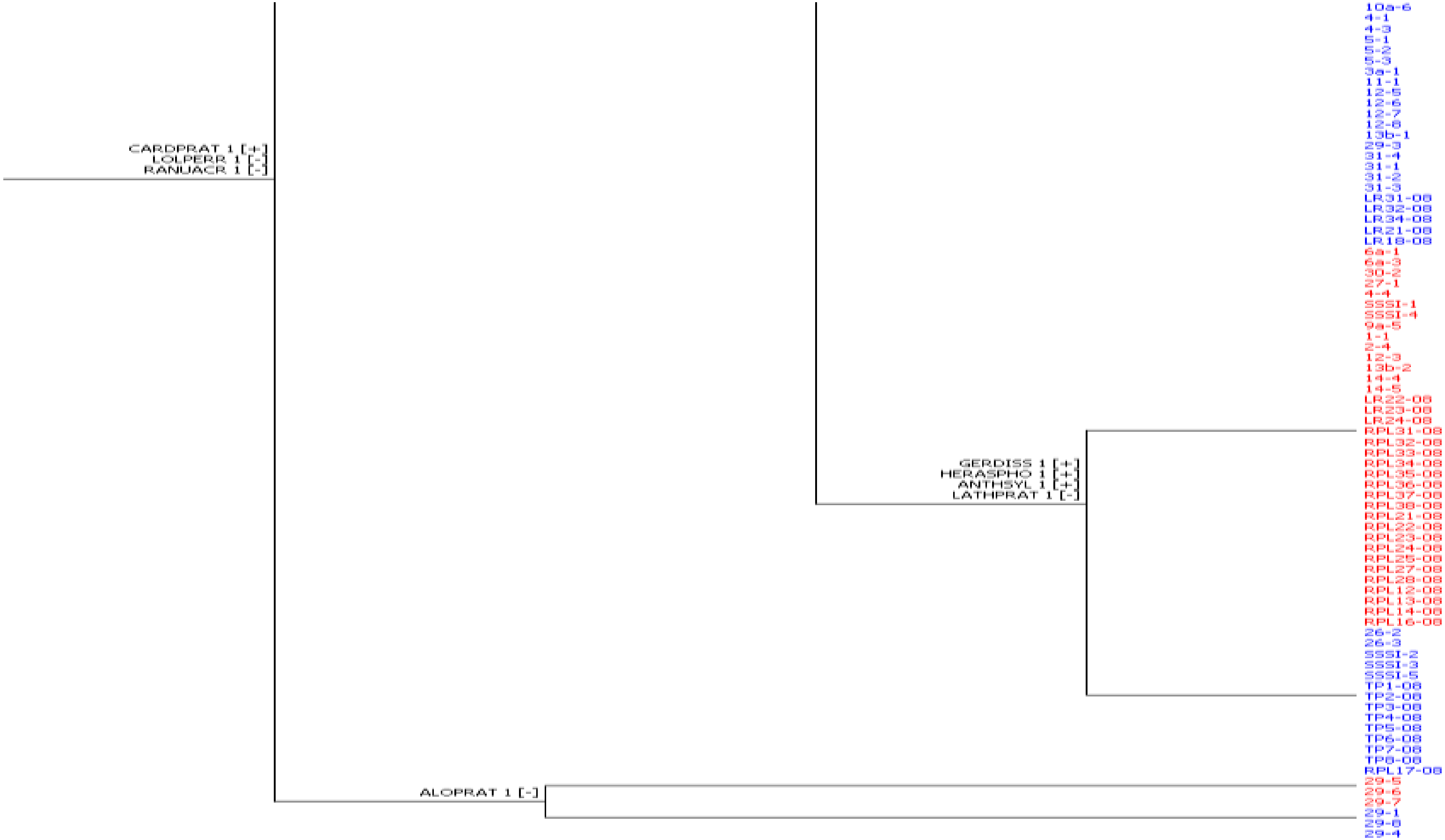


Figure 4 TWINSPAN of samples (combined 2010 and 2009 % cover data)


DACTGLO 1 [-]
PHLEPRA 1 [-]
BROCOMM 1 [+]
LOTCORN 1 [-]
ALLIVIN 1 [-]
TRIFPRAT 1 [-]
TRISFLAV 1 [-]
PLANLAN 1 [+]
CYNCRIS 1 [-]
BROHORD 1 [-]
RANUREP 1 [-]
CENTNIG 1 [+]
17-1
17-2
17-3
17-6
17-7
17-8
18-1
17-4
22-4
20a-1
18-2
13b-4
15b-7
13a-1
13a-2
26-1
1-5
1-6
10b-1
1-2
1-3
1-4
2-7
2-6
RPL26
20a-2
3b-1
3b-2
9b-7
9b-8
SSSI-7
8-2
2-3
2-8
13b-3
14-3
14-6
14-8
15a-1
15a-2
15a-4
RPL11
16-2
16-3
17-5
20a-4
6a-2
20b-6
21-1
21-2
21-3
21-4
24-7
28-1
28-2
27-3
27-4
27-5
25-1
25-2
25-3
25-5
25-6
25-7
25-8
3a-5
3a-4
9a-1
9a-2
9a-6
10b-2
4-2
7-2
7-3
7-1
8-1
8-3
7-5
7-4
5-4
2-5
2-2


TRIFPRAT 1 [-]
DACTGLO 1 [-]
CIRSARV 1 [-]
HERASPHO 1 [-]
ANTHODO 1 [-]
PHLEPRA 1 [-]
CARHIRT 1 [-]
HORDSEC 1 [-]
RANUREP 1 [+]
FESRUB 1 [-]
ALLIVIN 1 [-]
ANTHODO 1 [-]
PLANLAN 1 [-]
RANUREP 1 [+]
HOLCLAN 1 [-]
2-5
2-2
2-1
11-2
11-3
11-6
11-4
11-5
11-7
11-8
12-1
12-2
12-4
14-1
14-2
14-7
15a-3
15a-5
15a-6
15b-8
23b-1
23a-2
23a-3
23a-4
23a-5
24-1
24-2
24-3
24-4
24-5
24-6
LR33-08
LR35-08
LR36-08
LR37-08
LR38-08
LR25-08
LR26-08
LR27-08
LR28-08
RPL15-08
RPL18-08
LR11-08
LR12-08
LR13-08
LR14-08
LR15-08
LR16-08
LR17-08
16-1
16-4
22-1
22-2
22-3
20a-3
20b-5
6a-4
20b-7
20b-8
29-2
24-8
30-1
27-2
27-6
25-4
3a-2
3a-3
3a-6
10a-7
10a-8
SSSI-6
9a-3
9a-4
10a-3
10a-4
10a-5
10a-6
4-1


CARDPRAT 1 [+]
LOLPERR 1 [-]
RANUACR 1 [-]
GERDISS 1 [+]
HERASPHO 1 [+]
ANTHSYL 1 [+]
LATHPRAT 1 [-]
ALOPRAT 1 [-]
10a-6
4-1
4-3
5-1
5-2
5-3
3a-1
11-1
12-5
12-6
12-7
12-8
13b-1
29-3
31-4
31-1
31-2
31-3
LR31-08
LR32-08
LR34-08
LR21-08
LR18-08
6a-1
6a-3
30-2
27-1
4-4
SSSI-1
SSSI-4
9a-5
1-1
2-4
12-3
13b-2
14-4
14-5
LR22-08
LR23-08
LR24-08
RPL31-08
RPL32-08
RPL33-08
RPL34-08
RPL35-08
RPL36-08
RPL37-08
RPL38-08
RPL21-08
RPL22-08
RPL23-08
RPL24-08
RPL25-08
RPL27-08
RPL28-08
RPL12-08
RPL13-08
RPL14-08
RPL16-08
26-2
26-3
SSSI-2
SSSI-3
SSSI-5
TP1-08
TP2-08
TP3-08
TP4-08
TP5-08
TP6-08
TP7-08
TP8-08
RPL17-08
29-5
29-6
29-7
29-1
29-8
29-4

Gradient analysis

3.29 The TWINSPAN outputs indicate a gradient of declining species diversity from communities LM1 to LM8, but they do not afford a ready insight into the possible drivers for this. Comparing sample and species positions on DECORANA ordination plots allows a better appreciation of the nature and strength of this gradient, including whether its effects are in any way complicated by other environmental variables acting on the vegetation.

3.30 Figure 5 shows the output from DECORANA ordination of species from the 2010 percentage dataset as a two-way plot. Axis 1 (eigenvalue=0.38) appears to represent a gradient between more moisture loving species (represented by high Axis 1 scores) such as *Alopecurus geniculatus*, *Achillea ptarmica* and *Lysimachia nummularia* and those typical of drier pastures and/or ungrazed areas (*Crepis biennis, Achillea millefolium, Ranunculus bulbosus*).

3.31 Axis 2 (eigenvalue 0.18) is more difficult to interpret. It may indicate any one or all of fertility, disturbance or grazing pressure, with species such as *Galium aparine* and *Agrostis stolonifera* positioned at opposite ends from *Leucanthemum vulgare* and *Luzula campestris* – the latter two species both being 'weak' indicators of unimproved grasslands.

3.32 Figure 6 shows the ordination of samples from the 2010 percentage dataset. Samples from the LMWG group are notably disjunct from the remainder, with high Axis 1 scores reflecting the prominence of wetland species in this vegetation. The positioning of samples on Axis 2 broadly reflects a trend from species-rich samples (low Axis 2 scores) to species-poor samples (high Axis 2 scores) thereby mirroring the spectrum of variation identified by TWINSPAN, and reflected in the Level 2 to 4 divisions made by the program.

3.33 More subtle patterns are revealed when DECORANA is re-run with the 11 LMWG quadrats omitted (Figure 7).

3.34 Axis 1 (eigenvalue 0.22) appears to retain much of the same character, although the plot reverses the gradient on this occasion with the samples with low Axis 1 scores on Figure 7 characterised by species such as *Filipendula ulmaria* and *Deschampsia cespitosa* and those at the opposite end of the axis characterised by species such as *Luzula campestris* and *Achillea millefolium*.

3.35 It is clear that DECORANA consistently suggests an association between Axis 1 and soil moisture. Both the Level 1 and Level 2 TWINSPAN divisions would appear to be placed along this axis, with 'drier' samples placed to the negative side of each division, and 'wetter' samples to the positive side. The parallels with the transition that separates most alluvial hay-meadow grasslands of a broad MG4 character with drier MG5 communities also cut for hay are hard to ignore.

3.36 The nature of any gradients being indicated by Axis 2 of the above DECORANA plots, and potentially at the root of the TWINSPAN level 3 and 4 divisions, requires further exploration. In the absence of any empirical data on relevant environmental variables, this was attempted through simple tests for any relationship between the mean species diversity of each of the communities LM1-LM8 and the variables of soil moisture, soil chemistry (pH) and nitrogen (N) (as an expression of soil fertility) using derived average scores for each community for each of these variables based on Ellenberg indicator values.

3.37 Simple tests of correlation were applied to the two sets of scores. For soil moisture (F) and soil chemistry (R) no correlation with species diversity was observed, but a statistically significant negative correlation ($r = -0.72$) was identified between species-diversity and the mean N-values for each community. The nature of this relationship is shown at Figure 8 (the square root of species-diversity values is shown for presentational purposes).

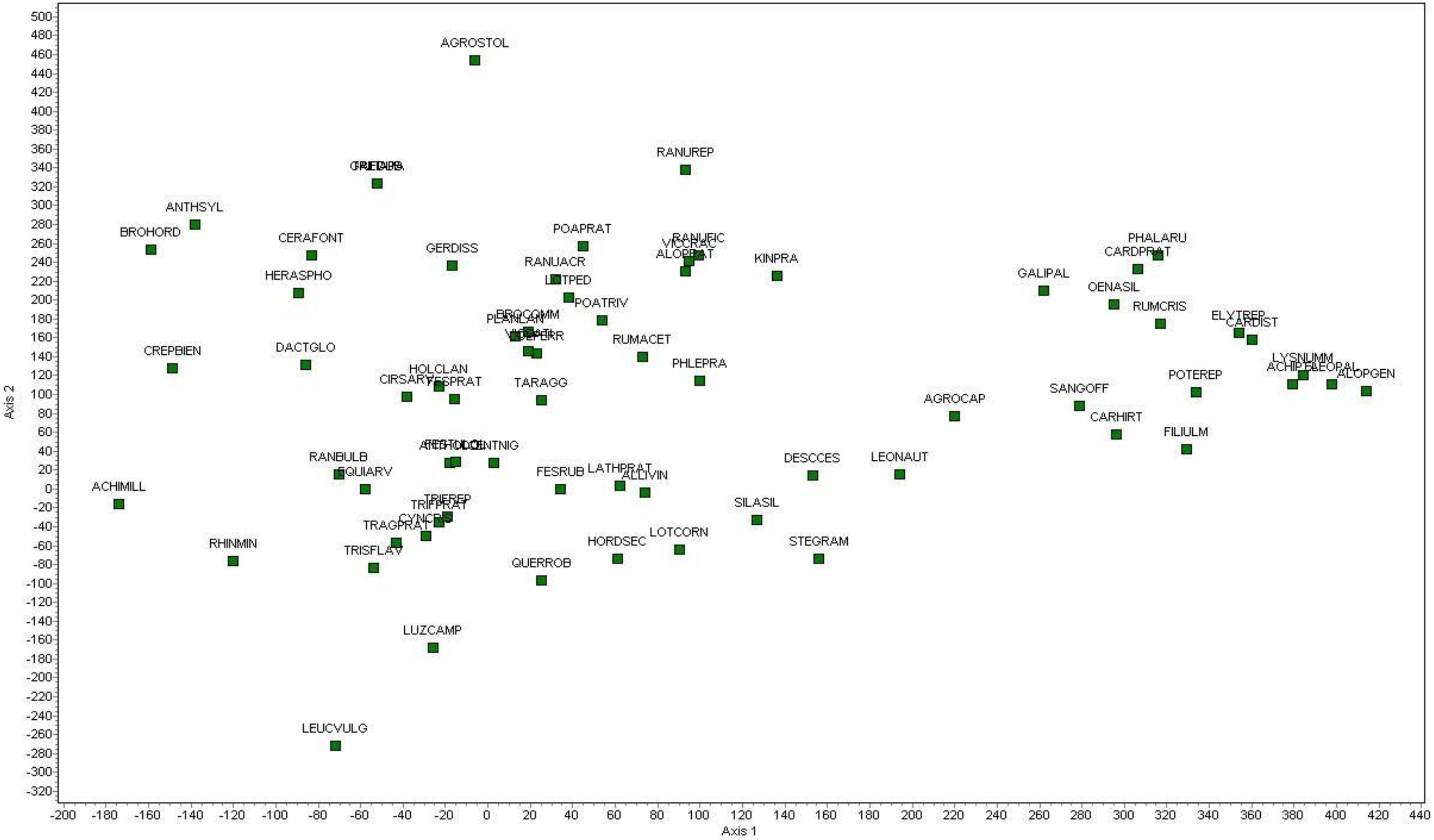


Figure 5 DECORANA Plot - % data (species)

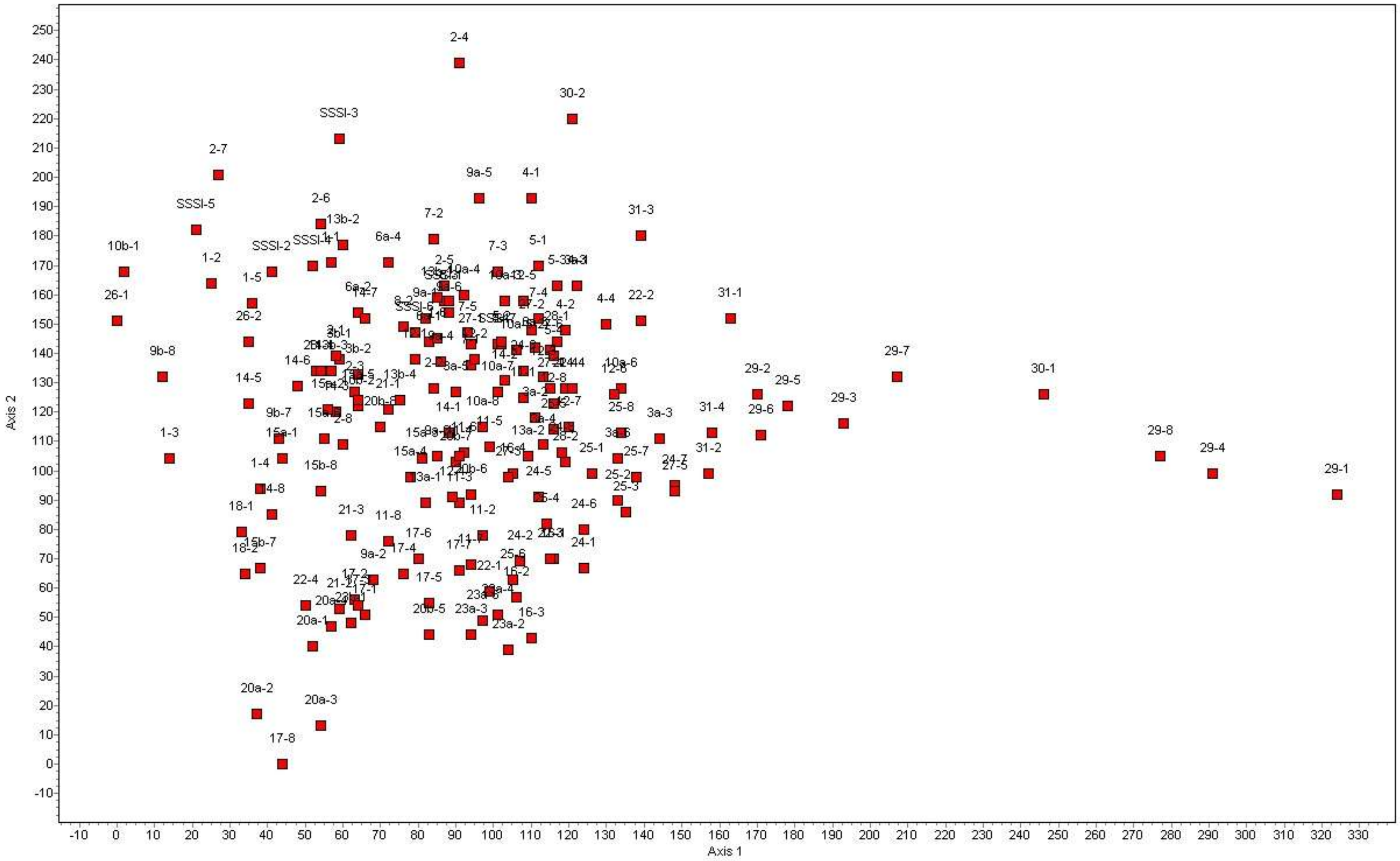


Figure 6 DECORANA Plot - % data (samples)

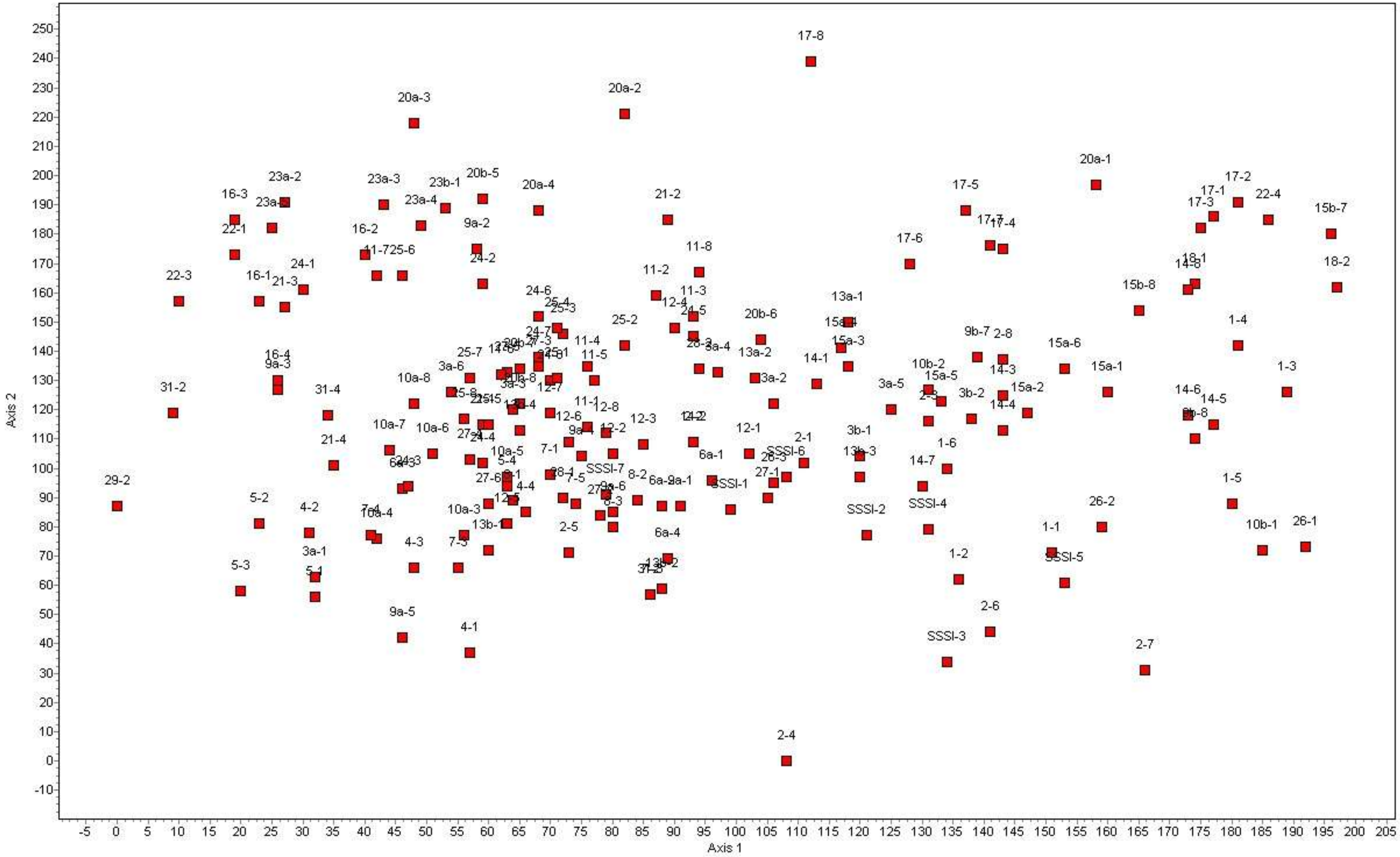


Figure 7 DECORANA Plot of samples (LMWG removed)

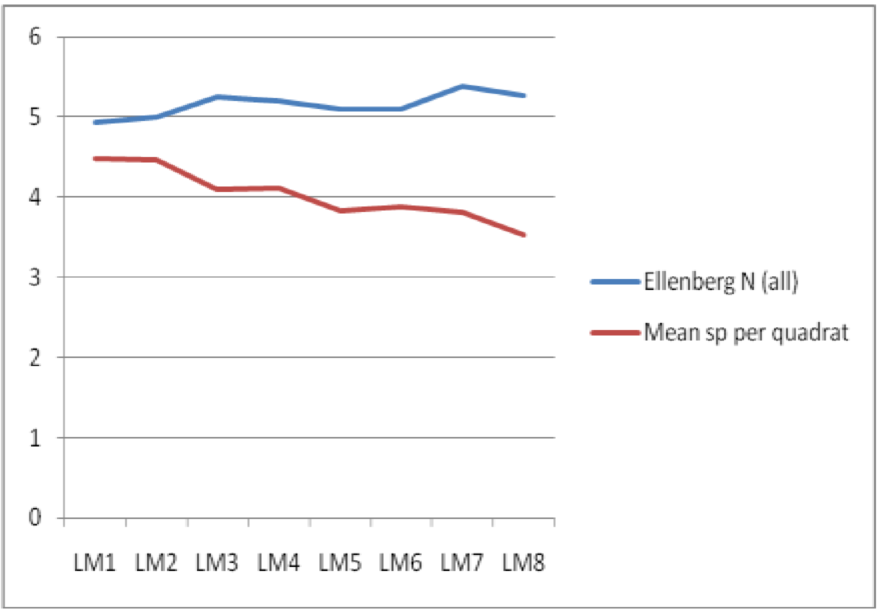


Figure 8 Relationship between species-diversity and mean Ellenberg 'N' Values

3.38 A significant positive correlation was also observed between N-values and sward height. Whilst this could be interpreted as further supporting the case for fertility being a suppressing influence on species diversity, this relies on the relationship between productivity and species-diversity being simple (i.e. broadly linear and uncomplicated by other factors). The result also needs to be considered in the context that sward heights increased generally across the sample period, and whilst an attempt was made to standardise this source of bias during recording, the influence of temporal change on the results has not been tested. Inherent sources of bias were also noted in the use of the dropped disc technique, with height scores likely to be disproportionately biased towards higher values in 'bulkier' (e.g. *A. pratensis* dominated) swards as compared with those with a high proportion of 'laxer' grasses (such as *A. capillaris* or *F. rubra*).

3.39 Nevertheless the suggestion from the results of these exercises is that soil fertility is a determinant of community composition and distribution at Lugg Meadows that is subordinate only to soil moisture, and also that excessive levels of fertility may be suppressing the diversity of the grasslands. If this is the case, identification of those areas of the site where species-poor samples are concentrated could be informative in assessing which of the various likely sources of fertility inputs to the site (from a range that includes Lugg floodwaters, stocking and grazing patterns and insidious inputs from atmosphere) is most likely to be implicated.

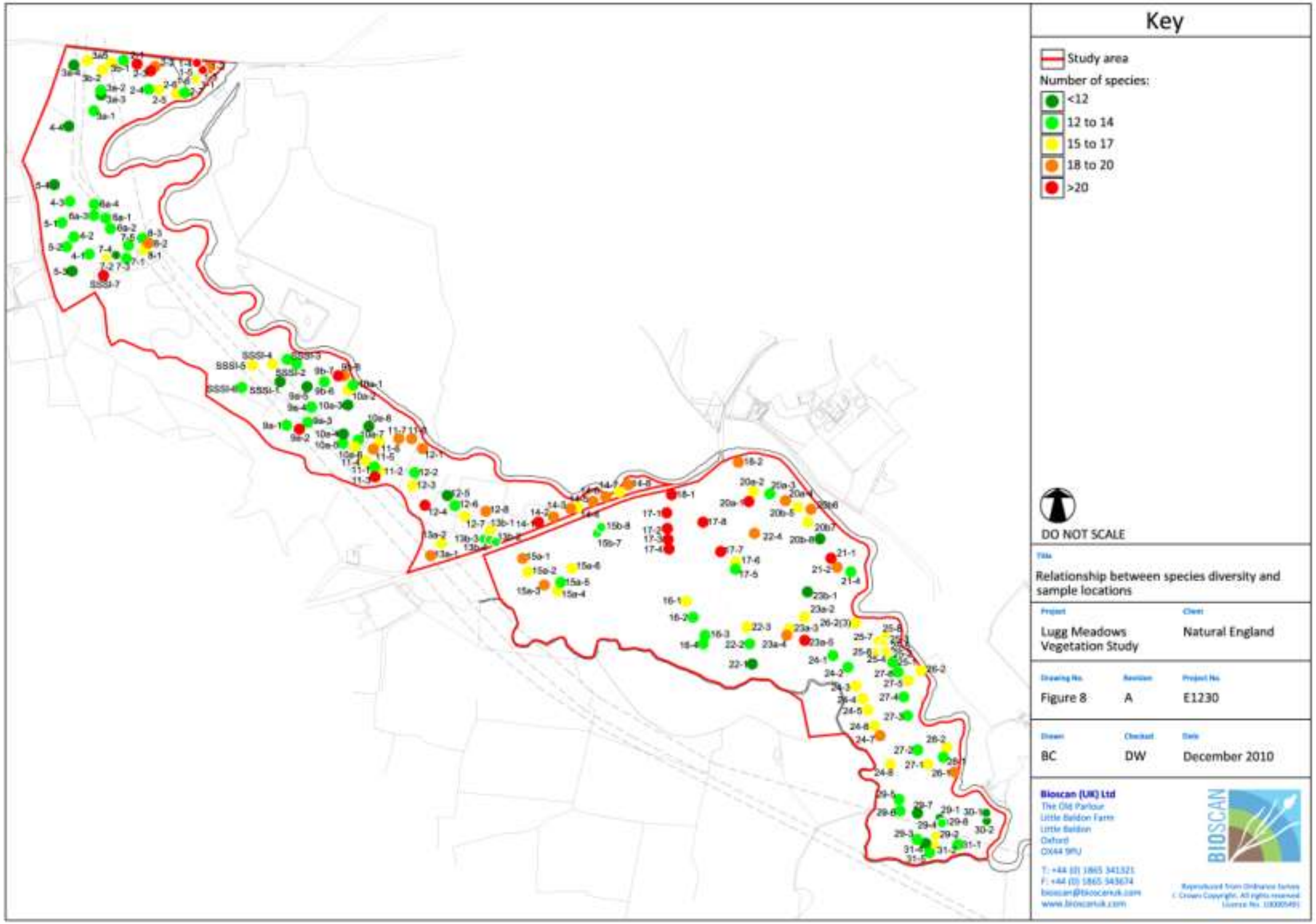


Figure 9 Relationship between species diversity and sample locations

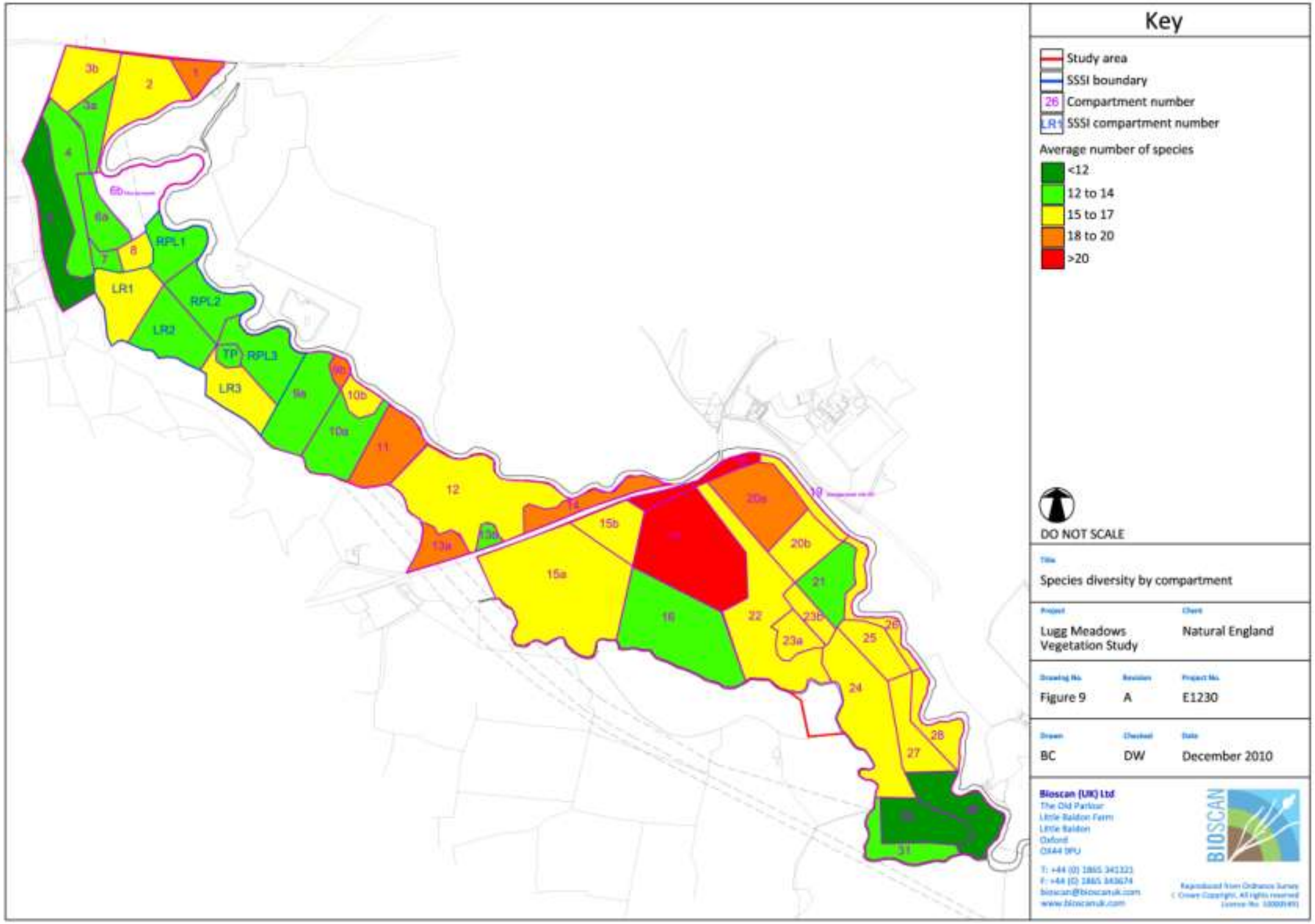


Figure 10 Species diversity by compartment

3.40 Figure 9 shows the distribution across the site of samples categorised into increments of species-diversity from species-poor samples (less than 12 species per quadrat) to the more species-rich samples (in excess of 20 species per quadrat). The overall pattern is broadly similar to that represented by the TWINSPAN Level 2 divisions, with Compartment 17 and adjoining areas, and peripheral parts of Upper Lugg Meadow, picked out as the locations of more diverse vegetation samples.

3.41 What is notable from examination of these distributional patterns is that the most species-poor vegetation on the site appears almost universally to be associated with areas in close proximity to the River Lugg, at least in Upper Lugg Meadow. This suggests that floodwaters are the most likely source of external inputs: excess fertility derived from insidious sources such as atmospheric deposition of Nitrogen is unlikely to be a significant contributor as the pattern is clearly not one of blanket distribution. Atmospheric deposition rates in the locality do not appear to currently exceed accepted thresholds for the vegetation type in any event[1]. Neither does N-deposition from current levels of traffic exhaust emissions appear likely to be involved, given the concentration of species-rich vegetation close to the A438 causeway.

3.42 For a simplistic comparison with the SSSI, for which the specific quadrat locations for the 2009 data are not known, Figure 10 shows average species richness scores per compartment as derived from the mean of the samples. Again, Compartment 17, marginal areas close to the A438 and the 'drier' Compartment 1 are picked out as having the highest species diversity. The SSSI exhibits higher species-diversity on this measure in the Lugg Rhea (LR) plots than in the riverward plots and Thistle Patch, a pattern common to that identified by Gibson (2004). Figure 9 also suggests that diversity is higher overall in Lower Lugg Meadow than in Upper Lugg Meadow.

3.43 The most profitable route for further testing of the question 'to what degree is excess fertility suppressing the species-diversity of the Lugg Meadows vegetation' is therefore likely to be through comparing the vegetation data from this study with such data as there may be available (or which can be collected) on the fertility of Lugg floodwaters, seasonal variations in that fertility and how this relates to the sequence in which various areas of the Lugg Meadows become inundated during flood events, as well as the pattern of drainage after flood events.

Comparison with external datasets

Previous studies

3.44 Gibson (2003) undertook a review of studies and historical datasets for the site dating back to 1970, with a focus on the SSSI designated areas. He commented that the majority of data available since the original SSSI designation was in the form of lists of species from various botanists, with a few formal 1m square quadrat samples taken in 1987 and 1998. He assembled these disparate data into an "overall constancy table" for that part of it which was locatable to the SSSI, and compared this with constancies derived from a Highways Agency sponsored study of the SSSI (FPCR 1994, FPCR 1996), although that study only recorded herbs and not grasses.

3.45 Table 4 compares the constant species from each of LM1 to LM8 with this historical data, as well as with each of the six TWINSPAN groups Gibson arrived at after detailed studies in 2004 that included the SSSI and Compartments 7, 8, 4 and 5 adjoining it to the north-west (Gibson 2004).

[1] Source: UK Air Pollution Information System **www.apis.ac.uk**

Table 4 Occurrence of Lugg Meadows community constants in other vegetation datasets

Community name:	LM1	LM2	LM3	LM4	LM5	LM6	LM7	LM8	MG4	MG5	MG6	MG7 c/d	MG8	2004-1	2004-2	2004-3	2004-4	2004-5	2004-6	MG4/5	SVEG1	SVEG2	MG4T	MG4spp	MG4Ca	MG4CP	HA 94	Other pre-94
Agrostis capillaris	V	V	IV	V	V	V	V	V	II	IV-V	III-V	III	I	V	IV	III	I	-	-	-	-	I	-	-	-	-	n/a	II
Ranunculus acris	V	V	V	V	V	V	IV	V	V	II-IV	I-IV	II-III	V	V	V	V	V	IV	IV	IV	II	V	V	IV	IV	V	V	V
Alopecurus pratensis	IV	V	V	V	V	V	V	V	IV	I	I-II	V	-	V	V	V	V	V	V	I	V	V	III	III	II	I	n/a	V
Rumex acetosa	IV	V	V	V	V	V	V	V	V	III	I-III	III	IV	V	V	V	V	V	III	II	V	V	V	IV	II	II	V	V
Lolium perenne	V	V	IV	V	III	V	V	V	IV	I-IV	V	IV-V	II	V	V	V	V	V	V	III	III	V	IV	IV	II	I	n/a	V
Holcus lanatus	V	V	V	V	V	II	V	II	IV	IV-V	III-V	III	V	V	V	III	IV	IV	V	V	II	IV	IV	IV	IV	IV	n/a	V
Poa trivialis	-	IV	V	V	V	V	V	V	I	I-II	II	II-III	IV	V	V	V	V	V	V	III	III	V	V	V	IV	II	n/a	V
Festuca rubra	V	V	IV	V	V	IV	IV	-	V	V	III-IV	II	V	V	V	V	III	III	I	V	I	II	V	V	V	IV	n/a	IV
Taraxacum agg.	II	V	V	IV	IV	IV	III	III	V	III	II-III	III-IV	II	III	V	IV	V	V	IV	III	I	II	IV	II	II	II	V	V
Bromus commutatus	-	V	III	IV	IV	III	V	III	-	-	-	-	-	-	-	-	-	-	-	I	-	-	I	I	I	I	n/a	V
Lathyrus pratensis	V	V	III	V	-	I	IV	III	IV	-	I	I-II	-	V	V	V	V	V	-	III	IV	III	IV	IV	IV	III	IV	IV
Cirsium arvense	IV	V	V	IV	I	I	IV	I	I	I-II	II-III	I-II	-	I	I	I	I	II	V	-	I	-	-	-	-	-	I	II
Anthoxanthum odoratum	V	V	II	IV	V	I	I	-	III	IV-V	I-V	II	IV	V	II	I	I	-	-	IV	III	IV	IV	II	II	III	n/a	III
Phleum pratense	IV	III	II	II	III	IV	III	III	I	I	I-V	I	-	-	-	I	-	-	-	I	III	I	III	II	II	II	n/a	III
Hordeum secalinum	II	III	I	I	I	V	III	IV	-	-	-	-	-	-	III	I	-	II	-	II	III	-	IV	IV	II	I	n/a	II

Table continued…

Community name:	LM1	LM2	LM3	LM4	LM5	LM6	LM7	LM8	MG4	MG5	MG6	MG7 c/d	MG8	2004-1	2004-2	2004-3	2004-4	2004-5	2004-6	MG4/5	SVEG1	SVEG2	MG4T	MG4spp	MG4Ca	MG4CP	HA 94	Other pre-94
Plantago lanceolata	-	**IV**	III	III	II	II	III	II	**V**	**IV-V**	II-**IV**	II	III	I	**V**	III	**IV**	-	-	**V**	-	I	**V**	III	**IV**	**IV**	III	**IV**
Heracleum sphondylium	III	**IV**	**V**	III	I	I	II	-	I	II-III	-	-	-	-	III	-	II	-	II	I	-	I	I	I	-	-	II	II
Ranunculus repens	-	-	III	II	I	II	III	**V**	III	I-II	I-II	II	III	**IV**	II	III	**IV**	**V**	**IV**	**I**	**IV**	II	II	**I**	**I**	II	II	**IV**
Dactylis glomerata	**IV**	III	**IV**	III	-	I	-	-	III	**IV-V**	III-**IV**	III-**V**	I	-	-	-	I	-	-	V	-	I	II	II	II	I	n/a	I
Trifolium pratense	**V**	**V**	II	I	I	I	I	-	**V**	**IV**	I-II	II	III	**V**	**V**	**IV**	I	-	-	II	I	III	II	I	-	I	III	**IV**
Cynosurus cristatus	**V**	**IV**	I	I	I	I	I	-	**V**	**V**	**IV-V**	-	**V**	**V**	**IV**	-	-	-	-	**IV**	**IV**	**IV**	III	I	I	II	n/a	**V**
Carex hirta	**IV**	I	-	I	**IV**	II	-	-	I	-	-	-	-	**V**	III	III	I	-	-	I	I	I	I	I	I	I	-	II
Lotus corniculatus	**IV**	I	-	I	**I**	**II**	-	-	III	**V**	-	-	I	**IV**	I	III	-	I	-	**V**	**I**	**I**	**IV**	II	III	**IV**	II	III
Cardamine pratensis	-	I	-	I	**IV**	I	-	I	II	I	I	0-I	II	-	I	I	I	I	-	I	III	III	II	I	II	II	I	I
Bromus hordaceus	-	-	**IV**	-	-	-	I	-	I	I	I-II	I	I	III	**V**	**V**	**V**	**V**	**V**	-	I	-	-	-	-	-	n/a	II

Key to acronyms: (LM1-LM8: Lugg Meadows Vegetation Types; MG4, MG5, MG6, MG7c/d, MG8: NVC communities (Rodwell 1992); 2004-1 to 2004-6: SSSI TWINSPAN types (after Gibson 2004); MG4/5, MG4T, MG4spp, MG4Ca, MG4Cp: expanded MG4 definitions derived from data collected at the Oxford Meads in 2008 (Jefferson et al 2009); SVEG1 and SVEG2: Severn Vales End Groups 1 and 2 (Wallace et al 2009); HA 94: herb-only quadrat data from the SSSI (FPCR 1994, 1996); Other Pre-94: data from various pre-1994 sources assembled by Gibson (2003).

3.46 Figure 11 explores these relationships further by plotting the percentage of constants from each of these forerunning datasets for the site that are matched in community LM1 to LM8, as a blunt measure of their similarity. The data from the Highways Agency sponsored studies cannot be used for this purpose as it excludes grasses.

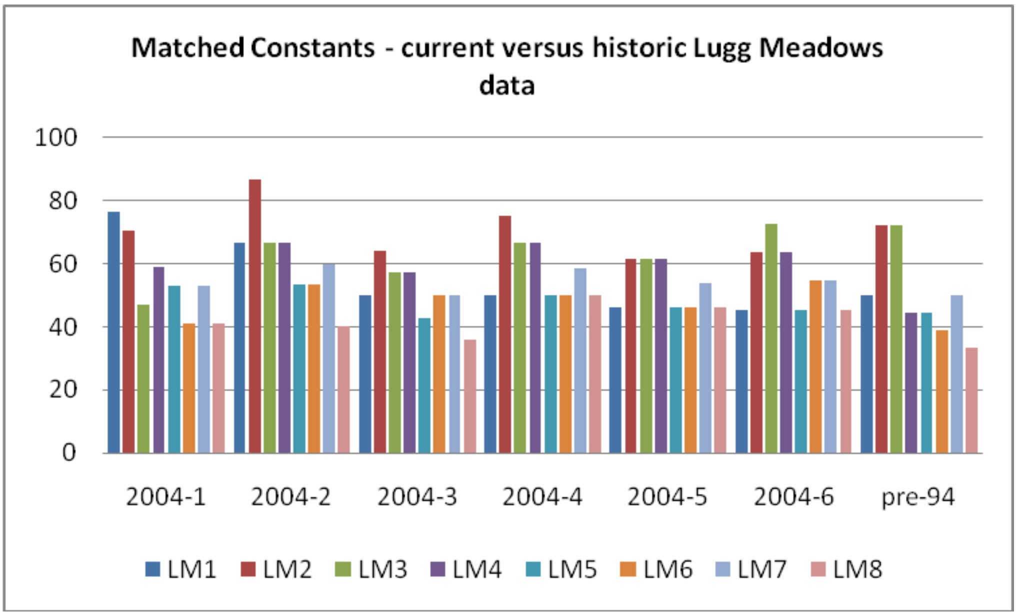


Figure 11 Matched Constants – current versus historic Lugg Meadows data

3.47 Headline observations from this graph are that Gibson's TWINSPAN 1 and TWINSPAN 2, which he recorded mainly from Compartments 7/8 and 4/5, but also within the north-westernmost part of the SSSI, share more constant species with LM1 and LM2 than with any other community. Gibson noted these communities to have affinities with drier MG5 type grasslands. The SSSI vegetation from Gibson's 2004 classification would appear to be more closely aligned to LM3 and LM4 than to the somewhat 'wetter' LM5 through LM8, with the species-poor 'Thistle Patch' vegetation represented by Gibson's TWINSPAN 6 showing a clear affinity with the similarly ruderal invaded Lugg-side vegetation of LM3. This offers a somewhat different suggestion of how the SSSI vegetation fits in with the LM1-LM8 classification than the results of TWINSPAN of the combined 2009 and 2010 datasets (see Figure 4). This may merely be exposition of the scope for error associated with matching of constants as a measure of similarity – particularly when dealing with relatively subtle variations in vegetation, but it could also be representative of the subtle changes within the SSSI in the period 2004-2009 noted previously by the current author (Woodfield 2010a). The degree of correspondence with the derived constancies from the historic (pre-94) dataset appears broadly consistent with that between the 2004 and 2010 datasets.

3.48 The only historical data that permits a more robust comparison with the 2010 dataset is from a 2003 NVC survey of land under the ownership of Plantlife (Frith 2003). DECORANA was employed to compare the data from this survey with the 2010 data for the same compartments to assess the similarity or otherwise of the sampled vegetation, and also to consider whether there may have been any change in the timescale between the studies.

3.49 Figures 12 and 13 show the ordination of samples from the 2010 dataset to which has been added the sample data for compartments 10 and 15 collected by Frith in 2003, after conversion to percentage values from Domin scores (total=25 quadrats). The 11 outlying LMWG quadrats have been removed from the dataset to allow greater detail to be observed.

3.50 Frith's Compartment 1 corresponds to the 2010 Compartment 10, and he recognised the same sub-compartment divisions adopted in 2010 as sub-compartments 10a and 10b and took five 2x2m samples from each. Figure 12 shows that Frith's five samples from 10a have very similar Axis 1 and Axis 2 scores to those from 2010 (Axis 1 means=42.6 and 37.2; Axis 2 means=122.4

and 122.6 respectively), resulting in their occupying similar locations on the ordination plot; indeed the groups overlap on the diagram. Compartment 10b is distinct in both datasets, with much higher Axis 1 scores, but the 2003 and 2010 groups of samples occupy different positions on the plot because of different Axis 2 scores (mean=71.8 versus 130 respectively). This could suggest that the vegetation in this sub-compartment has changed in the seven years between the surveys, and, if Axis 2 does indeed represent a gradient of reducing species-diversity, that it has reduced in quality somewhat. The mean species-diversity per sample is indeed lower in the 2010 data (15) as against the 2003 data (19.4), but any conclusions do have to be framed in the context that the 2010 data comprises just two samples from this area.

3.51 Figure 13 shows that the two datasets for Compartment 15 are also grouped in a very similar position on the ordination plot, with the two groups of samples overlapping. The 15b samples have broadly similar Axis 2 scores, but different Axis 1 scores.

3.52 The implication is that the vegetation in Compartment 15 contains a higher proportion of moisture loving species now than in 2003. A simple test of this can be performed by comparing the sums of Ellenberg moisture values for the two datasets (i.e. with scores derived for each species based on multiplication of the Ellenberg value by their mean presence/absence in the quadrat samples). The results do not suggest any difference in the presence or absence of moisture-loving species in the vegetation (sum of mean scores = 81.12 in 2010 versus 89.66 in 2003) and indeed the absence of an Axis 2 divergence in Figure 13 also suggests that the vegetation has remained of broadly the same diversity. However, if abundance is factored in to the calculation (i.e. each species' Ellenberg value is multiplied by its mean percentage cover in the sample), the sum total of scores for the 2010 dataset is around 10% higher than that for 2003 (1033.22 versus 1171.88). Given the problems with cross-compatibility of 2009 Domin versus 2010 percentage cover datasets revealed by SIMPER analysis this use of abundance scores has to be treated with some caution, but investigation of the sample data reveals that conspicuous species less likely to be prone to error in cover-estimation (such as *Lathyrus pratensis*) are responsible for a large part of this difference. As such, Figure 13 could be indicating a genuine qualitative improvement in the vegetation in this part of the site since 2003.

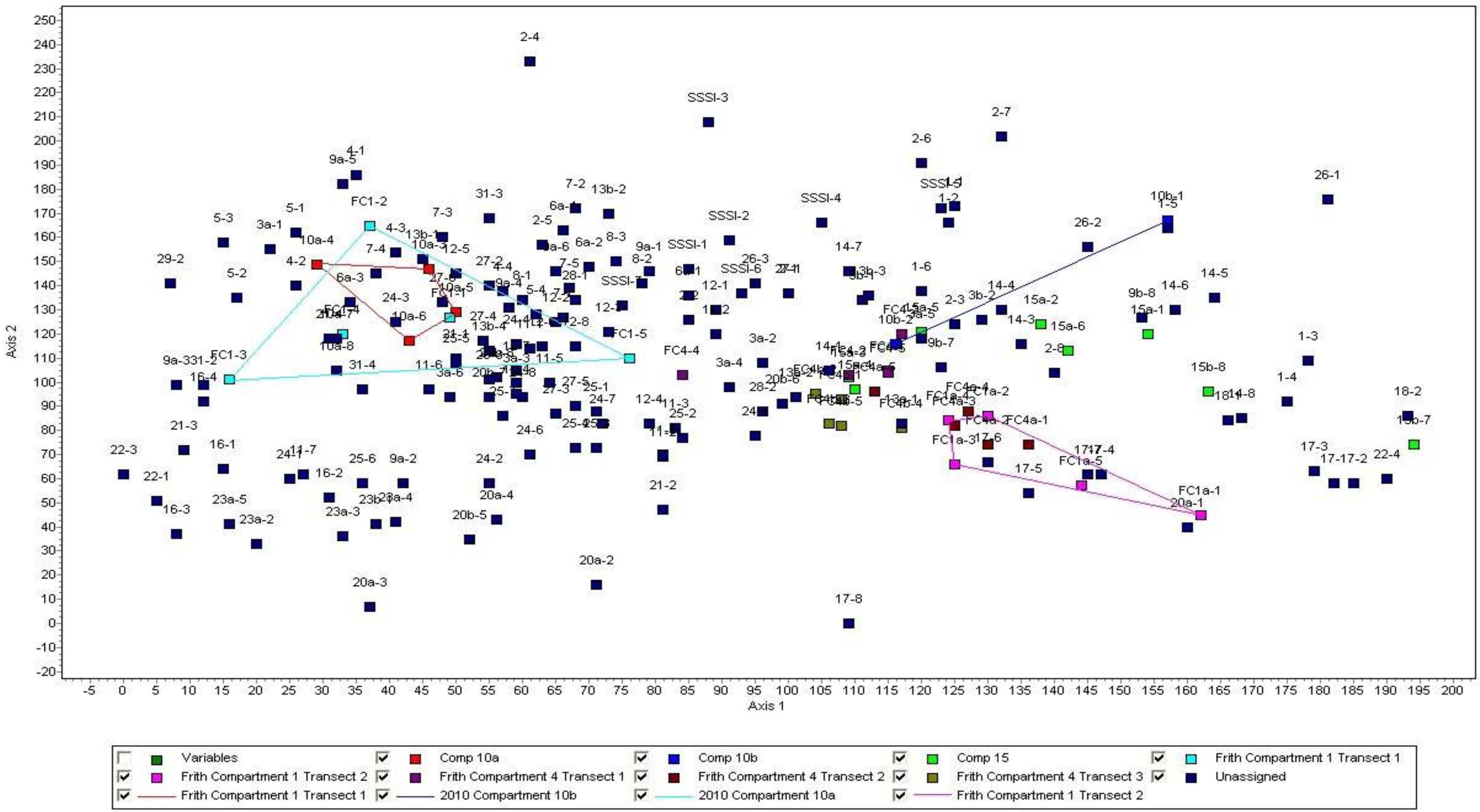


Figure 12 Frith (2003) data comparison – Compartment 10

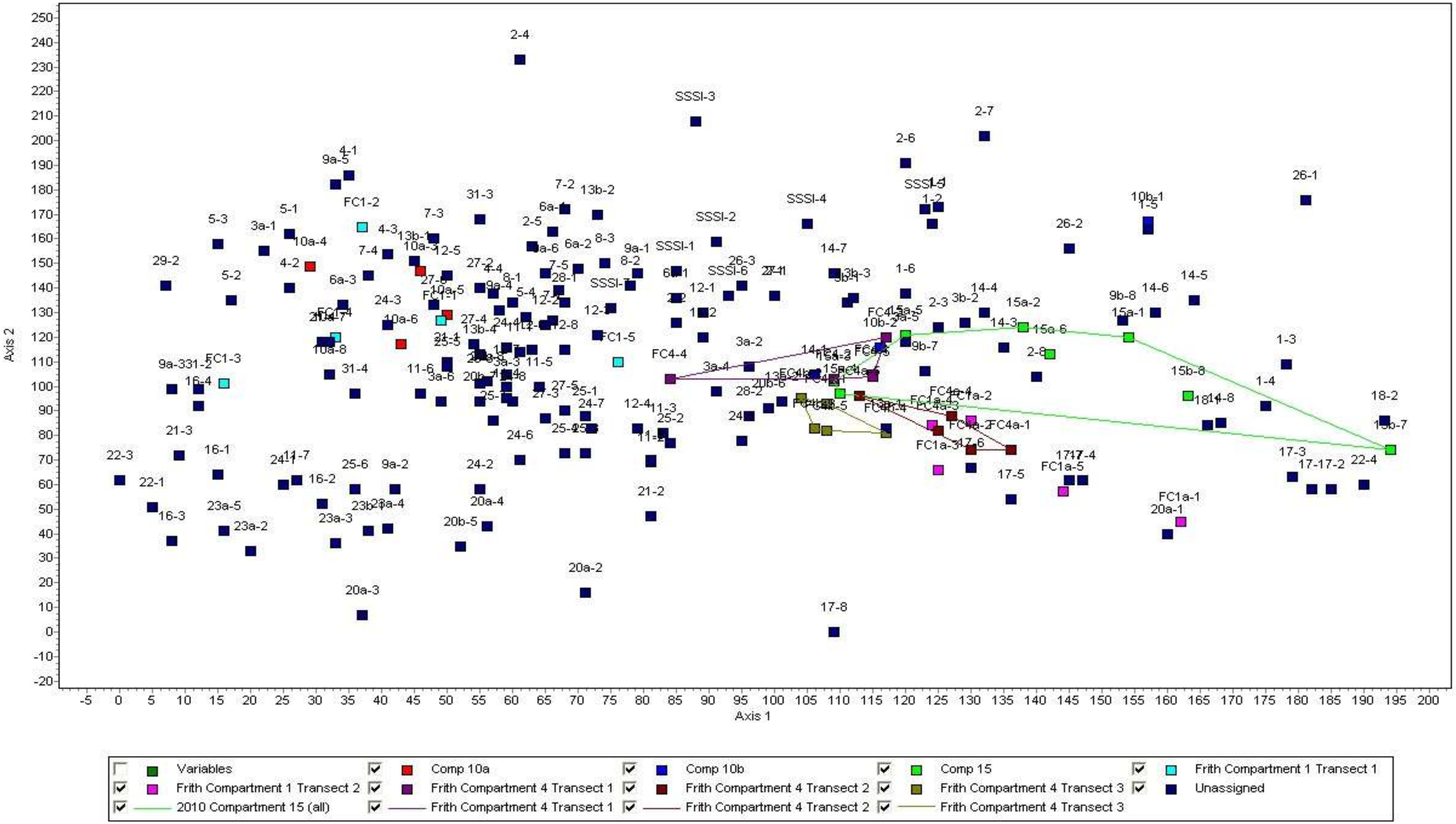


Figure 13 Frith (2003) data comparison – Compartment 15

Comparison with the NVC

3.53 Figure 14 shows the proportion of the total number of NVC constant species for communities MG4 through to MG11a that are found within each of the Lugg Meadows types LM1 to LM8. Also included for comparison are the constants from a suite of emerging transitional or sub-communities of MG4 arising from work carried out by the Floodplain Meadows Partnership (e.g. Jefferson *et al* 2009, Wallace *et al* 2009), which expand the rather restricted formal dataset for that community in the NVC.

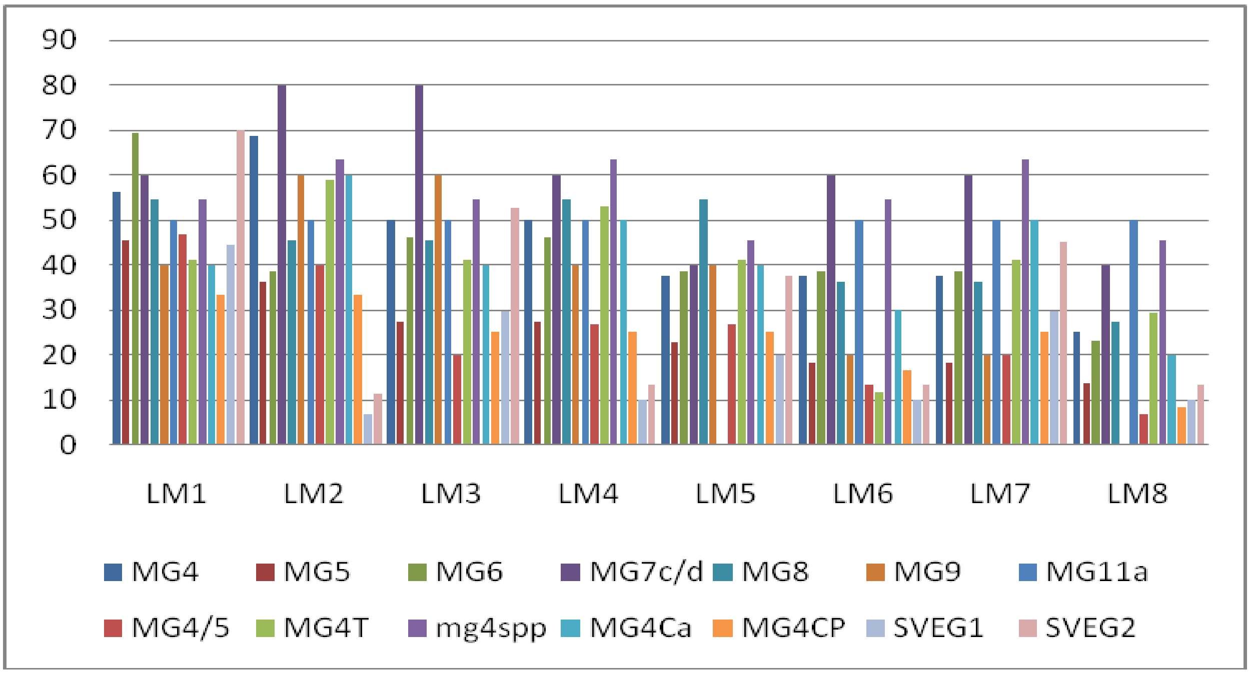


Figure 14 Percentage of NVC constants matched

3.54 On initial examination, this exercise would appear to suggest that much of the Lugg Meadows vegetation is closest in character to MG6 or certain sub-communities of MG7. Such conclusions have been reached in the past, but they are overly simplistic as the low overall number of constants in these species-poor communities means that high degrees of apparent 'fit' are likely to be achieved within what is actually a very broad range of actual variation. With more complex communities that have larger numbers of constants, similar degrees of fit are only likely to be achieved where the community composition is much more precisely matched. It is also the case that the constants in these communities are more or less ubiquitous species that also attain constancy in a wide variety of other grassland vegetation. This can be seen in Figure 14 by the fact that nearly all communities show a 50% match with MG11a constants because of the ubiquitous occurrence of *Lolium perenne*.

3.55 Therefore the existence or otherwise of any underlying affinities with the NVC are, using this method, potentially masked by the prominence of ubiquitous species common to both datasets. Such affinities can be better revealed by the exclusion of ubiquitous species from such comparisons. Figure 15 shows the effect of removing *Lolium perenne*, which is a constant in all of MG4, MG5, MG6, MG7, as well as all the Lugg Meadows communities other than LM5.

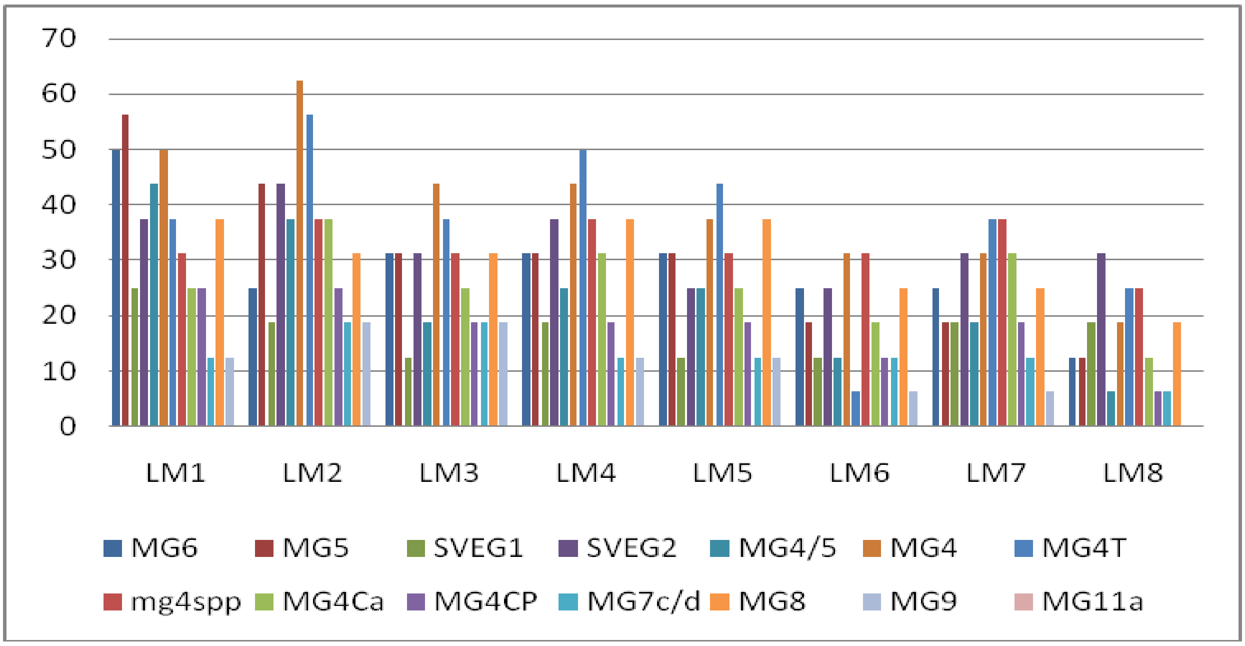


Figure 15 Percentage of NVC constants matched (minus *L. perenne*)

3.56 Initial observations from Figure 15 are that the soil-moisture gradient identified within the 2010 data by TWINSPAN and DECORANA appears to be manifested again in the diminishing affinity to MG5 from LM1 along the gradient to LM8. LM1 in fact has more constant species from MG5 than MG4. Community LM2 appears closest to 'type' MG4, while LM4 has as much, or more, in common with the 'expanded' definitions of MG4 emerging from the work of the Floodplain Meadows Partnership. The remaining communities share less than 50% of the constants of either 'type' MG4 or its expanded definitions, but they nonetheless appear closer to this community than to MG5 or MG8. The affinities between LM3 and MG4 are also clear, suggesting that the prominent ruderal component of the LM3 vegetation at Lugg Meadows, whilst representative of degradation, does not completely mask its origins.

3.57 The above exercises highlight how the prominence of ubiquitous species such as *Lolium perenne* in the vegetation at Lugg Meadows, allied to the near-complete absence of the expected constant *Sanguisorba officinalis*, is likely to explain the greater part of the justification for past classifications of parts of the site as a combination of MG6 and MG7 grasslands, and the conclusion following on from that that the vegetation should be classed as 'semi-improved' or even 'improved', notwithstanding that there is little or no evidence for any significant agricultural improvement taking place on the site since 1970. The weighting given to these species' respective abundance and scarcity would appear to mask the fact that the underlying character of the vegetation is closely aligned with semi-natural alluvial grasslands within the broad compass of MG5, MG4 and even MG8, even if species-diversity appears suppressed across much of the site.

3.58 This can be examined further by looking at the number of associated 'indicator' species of semi-natural 'unimproved' mesotrophic grasslands (Rowell & Robertson 1994) that are present within the vegetation at Lugg Meadows as compared with 'type' examples of such communities such as MG5 and MG4, and with communities representative of 'improved' grasslands such as MG6 and MG7 (Figure 16). As the results do not correct for sample size, this will bias for lower numbers of indicators in smaller datasets, because in semi-natural vegetation, the number of species recorded can be expected to accumulate with area and, correspondingly, sample size. This said, the use of indicators in this way does provide a broad indication of the intrinsic 'quality' of the vegetation in nature conservation terms, and as can be seen from Figure 16 most of the vegetation of the Lugg Meadows is placed above that of semi-improved or improved MG7 and MG6 grasslands on this measure, even if it does fall short of what might be considered the highest quality alluvial grasslands. The exceptions are the communities where ruderals are prominent, including the immediate river-side vegetation and the Thistle Patch within the SSSI, where the measure of quality does appear to be equivalent to that of improved or semi-improved vegetation. However even here the effect of bias associated with these communities' small datasets needs to be considered.

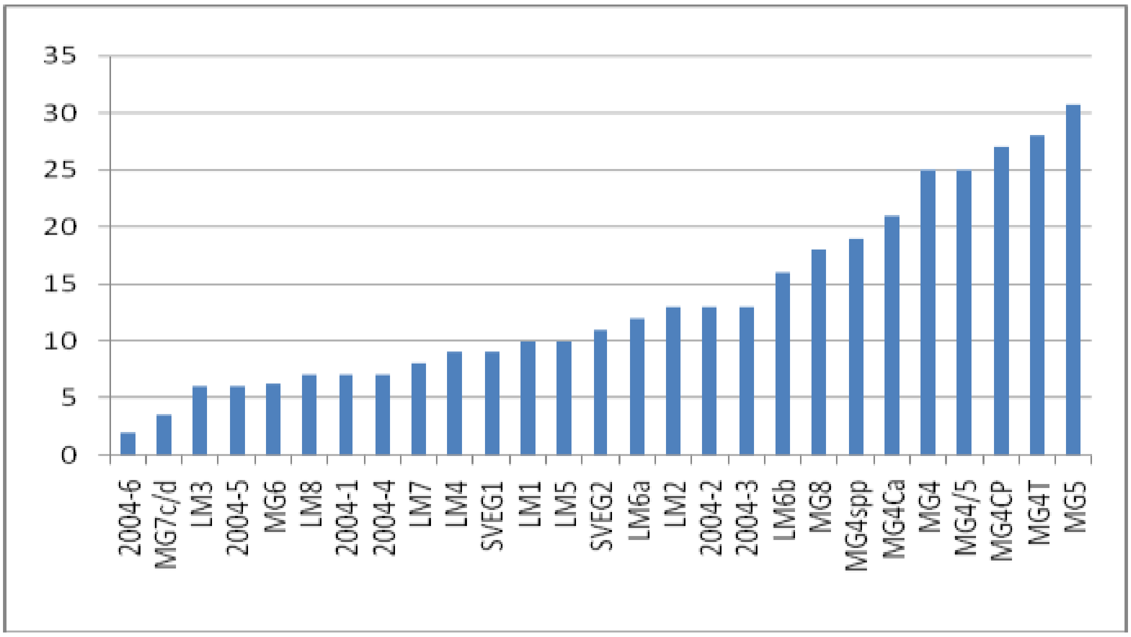


Figure 16 Number of mesotrophic indicators by community

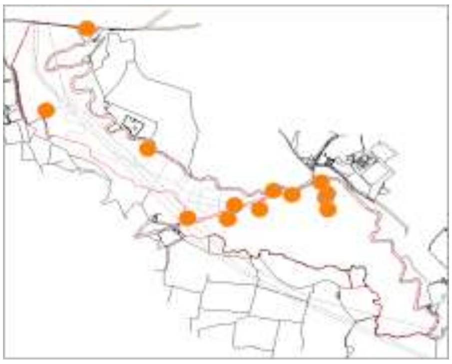
3.59 A further external analysis of the dataset was generously undertaken by Hilary Wallace of the Floodplain Meadows Partnership in January 2011 to assess how the identified Lugg Meadows grassland types compared with data in their possession on communities at the interface between MG4 and MG7C, as well as emerging re-definitions of MG4 and MG8. The results of this analysis are attached at Appendix 4 with the headline conclusion being that most of the Lugg Meadows vegetation could be placed broadly within the *Alopecurus-Sanguisorba* floodplain meadow community.

4 Discussion

The nature of the Lugg Meadows vegetation

4.1 The plotted distribution of the TWINSPAN types LM1 to LM8, when considered in the light of the results of other analyses of the data for explanatory variables, and further compared with available information on tenure/ownership and management history, as well as topography, and tonal patterning visible on aerial photographs, gives rise to the following conclusions about the nature of the vegetation on the site:

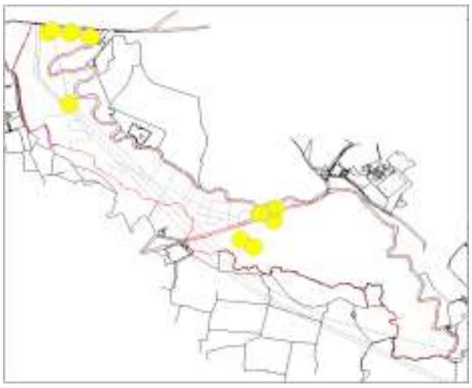
4.2 LM1 is a species-rich vegetation type that is readily identifiable in the field from the high proportion of fine-leaved grasses and comparatively low sward heights. All samples came from compartment 17 which, at least in recent times, has had a varied management history. In the past (e.g. before 1995) it has been cut very early for silage[2], perhaps regularly, but more recently it has been cut very late and "has often been the last patch to be cut" (S. Holland *pers comm*). Low associated eigenvalues suggest that the apparent physical delimitation of this community from similar 'finer' grasslands on adjoining land is subtle, and TWINSPAN based on presence/absence alone reveals that it is predominantly based on variations in species abundance rather than compositional change, with this type of analysis resulting in quadrats from compartment 17 becoming intermingled with those from adjoining areas.

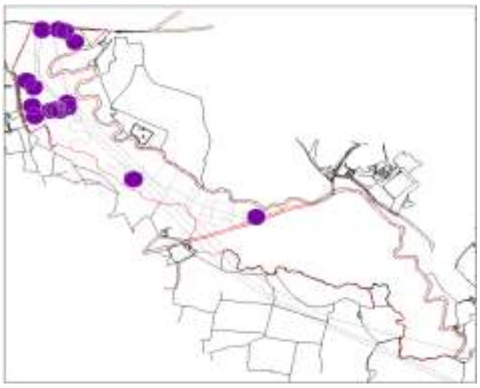


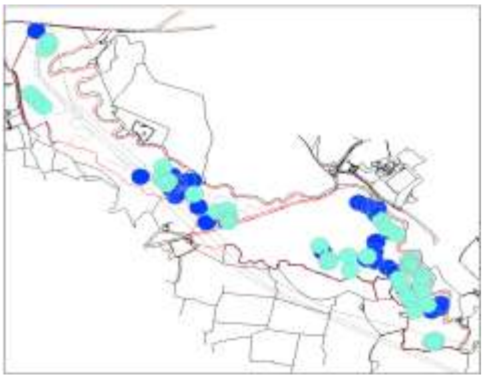
4.3 LM2 includes similarly diverse areas of grassland in the nearby compartment 20. For about thirty years prior to 2005 the owner of this area "would usually be the first to take his hay on Lower Lugg" (J. Costley *pers. comm*). It was classed as 'poor' MG7 by Bingham in 1990. Since 2005 however, it has been owned by Plantlife and cut not before 1st July due to a restriction imposed by them on the purchasers of the hay. It bears little relationship to MG7 now and the suggestion that there has been a qualitative improvement following this change of management regime merits further investigation. LM2 also includes grasslands either side of and close to the A438 causeway, including areas that have previously been classed as closest in affinity to MG4 (Bingham 1990, FPCR 1996, Frith 2003), as well as generally species-rich vegetation often associated with marginally elevated and 'drier' ground (often indicated by the presence of moles *Talpa europaea*) elsewhere in Upper Lugg Meadow.

[2] John Bingham's survey for the NCC in 1990 mapped this area as having been "cut for silage" by 4th June.

4.4 Vegetation with a much lusher aspect and a high component of robust herbs exemplified by constant *Cirsium arvense* and *Heracleum sphondylium* (LM3) occurs mainly in a band typically 20-40m wide adjoining the River Lugg and generally on elevated ground formed either from past dumping of tailings or as a natural levee created by silt deposition. In Lower Lugg this band of ground is also subject to disturbance associated with its historic use for access to tenurial plots (the 'Swilley Swarth'). It appears to represent a 'disturbed' community derived from MG4 but where enrichment or ground disturbance has allowed invasion and persistence of ruderal species. The 'Thistle Patch' within the SSSI is also likely to fall within the compass of this community, although it may already be transitional to LM6-LM8 as a result of targeted management to reduce the cover of *Cirsium arvense*.

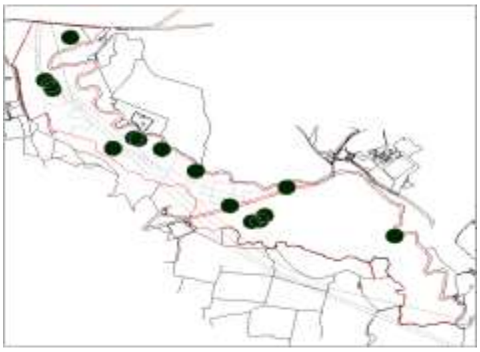
4.5 LM4 vegetation appears very close to LM2 in character, with a similar distribution that includes areas close to the A438 which have in the past been allocated to MG4 (Frith 2003, FPCR 1996, Bingham 1990). It also includes areas in Compartment 15 in the north-west of Lower Lugg Meadow that were classed as 'poor MG7' in 1990 (Bingham 1990) but which have subsequently been brought under the ownership and management of Plantlife. Frith classified Compartment 15 as having a "stronger affinity to MG4 than MG7" in 2003 (Frith 2003) suggesting that a qualitative improvement had taken place. LM4 vegetation also occurs in areas at the northern edge of Upper Lugg Meadow which appear to be on marginally elevated ground.

4.6 LM5 vegetation, which amongst its defining features includes *Cardimine pratensis* and *Carex hirta* as constants, is restricted to Upper Lugg Meadow, and then concentrated in the area north of the SSSI. In distributional terms there are close affinities with Gibson's TWINSPAN types 1 and 2 (Gibson 2004) which he noted as extending northwards from SSSI plot LR1 and which he described as being "equally good in MG5 representation as in MG4", as well as with the area earlier described by Bingham as "good quality MG4-MG6 grassland running in a wide strip [from the north-western edge of the SSSI] towards the road" (Bingham 1990).

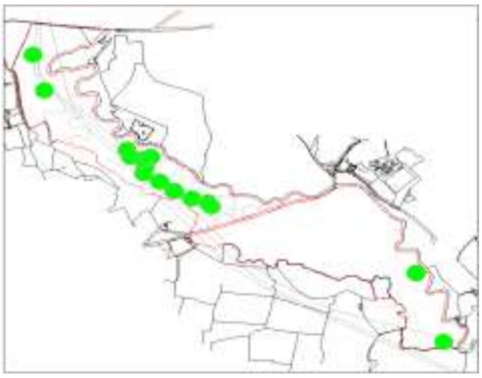
4.7 The LM6 group appears to represent a widely distributed canvas of similar vegetation upon which the localised variation represented by the other TWINSPAN groups is painted. It also appears to encompass the 'middle ground' of the spectrum of variation identified within the SSSI by Gibson (Gibson 2004) and mirrored elsewhere in Upper Lugg Meadow. As such it may represent the 'archetypal' Lugg Meadows community.

4.8 The distribution of the more diverse LM6a sub-group (dark blue) appears to correspond with certain darker tonal patterning on aerial photographs of the site, in particular in Compartments 11 and 23 where the community appears dominant. Much of the vegetation dominating the western portion of the SSSI (including Gibson's TWINSPAN 3, which within the SSSI is associated with *Fritillaria meleagris*) appears likely to fall either within the LM6 or LM5 groups.

4.9 The LM7 group would appear to include much of the vegetation in the riverward portion of the SSSI and extending south from here into other parts of Upper Lugg Meadow. It is also found in Compartment 15 of Lower Lugg Meadow and (perhaps extensively) in riverward portions of this part of the site also. It is possible that it represents a 'disturbed' or 'enriched' version of LM6, although its affinities are more intermediate between 'improved' and semi-natural grassland types than is suggested by Bingham's survey of 1990 which mapped the corresponding areas as 'poor MG7' or MG6. This may be indicative of a qualitative improvement in the botanical value of these areas.



4.10 LM8 is a species-poor community notable for the constancy of *Ranunculus repens*, abundance of *Lolium perenne* and *Poa trivialis* and the frequency of the nationally scarce *Oenanthe silaifolia*. It appears to be most frequent in Upper Lugg Meadow, and extends from the south of Upper Lugg Meadow into the SSSI via RPL3 and the Thistle Patch. It has clear affinities with Gibson's TWINSPAN 5 (Gibson 2004).



4.11 The various 'damp' and marshy communities represented by the 'lumped' set LMWG are strongly associated with the lowest-lying parts of the site, as confirmed by LiDAR data, with one outlier sample taken from a small topographical depression too subtle to be detected by the LiDAR information but noted on the corresponding field-sheet and detectable through vegetation patterning in aerial photographs. It is likely that vegetation falling within this broad 'wetland' grouping extends throughout the relict and active ditch and drain network, the full extent of which is highlighted in blue here to enable an appreciation of its extent. Many of these drainage channels are readily identified at range by a line of *Deschampsia* tussocks, or stands of *Phalaris arundinacea* and Carices. In the southernmost part of the site there are extensive stands of *Filipendula* and *Carex disticha*, occasional stands of *Thalictrum flavum* and lower-growing swards of *Eleocharis palustris, Alopecurus geniculatus and Agrostis stolonifera* with associated herb species including *Rorippa palustris, Myosotis scorpioides* and *Lysimachia nummularia*. This group of vegetation types is deserving of further targeted survey attention to enable detailed classification. This will extend the number of distinct communities recognisable within the site.

Conservation and management implications

4.12 Starting with the SSSI, the results confirm that there is no sudden change in the character or quality of the grassland communities associated with the designation boundary and indeed vegetation that is obviously equally rich in species lies just outside the SSSI. Similar observations, albeit on a more localised scale, were made by Bingham (1990) and Gibson (2004) who both identified vegetation beyond the north-western boundary of the SSSI that was high in species indicative of ‘quality’ in conservation terms. Gibson noted that the quality of this vegetation was in some instances higher than much of the riverward portion of the SSSI (Gibson 2004).

4.13 With the benefit now of data from the wider site, it can in fact be seen that the eastern (riverward) portion of the SSSI contains some of the most species-poor communities of the entire Lugg Meadows complex. These include, but are not restricted to, the ‘Thistle Patch’ which has been the subject of targeted management carried out by the HNT since 2004 to improve its conservation value, with monitoring showing evidence that some success has been achieved over a five year period (Woodfield 2010a).

4.14 It is also clear that the SSSI encompasses only a sample of the range of vegetation communities of conservation interest that occur at Lugg Meadows. In fact the parameters of variation within the SSSI that were first identified by Gibson (Gibson 2004) and are again observable from later data (Woodfield 2010a) are shown by the results to be encompassed within a much broader spectrum of variation across the wider site.

4.15 This broader spectrum appears to include grassland types that are more species-rich than those occurring within the SSSI (e.g. community LM1) as well as vegetation that is markedly different in character to anything that is represented within the designated area (e.g. the ‘wetland’ vegetation of the LMWG group).

4.16 Ordination analyses strongly suggest that soil moisture, as influenced by slight local topographical variations and their effect on flooding patterns, is the primary driver for this variation. Changes in mean or summer soil-moisture levels across the site are likely to be responsible for what is an evident gradation from ‘drier’ grasslands at one end of the spectrum, through to a group of ‘wetter’ communities with vegetation dominated by Carices or tall herbs to the detriment of grasses.

4.17 In the context of the NVC this spectrum would appear to occupy a zone between communities within, or close to, the compass of MG5 at the ‘drier’ end of the spectrum, through to vegetation transitional between grassland and marshy or inundation vegetation at the ‘wetter’ end. The expected ‘middle ground’ of this transition would be MG4, however the Lugg Meadows vegetation shows varying degrees of departure from this ‘node’ of the NVC, although emerging work by the Floodplain Meadows Partnership has identified sub-communities of MG4 not covered by the relatively limited formal dataset for that community, and these show a better match to the Lugg Meadows vegetation.

4.18 The reasons for this departure are as yet uncertain, but simple tests conducted in this study for any relationship between the sample data and derived scores for environmental variables suggest that fertility is probably implicated, and indeed that it may be only sub-ordinate to soil moisture in determining the composition and distribution of the grassland communities over much of the site.

4.19 The main source of nutrient input to the site is undoubtedly the floodwaters of the River Lugg. The replenishment, by floodwaters, of nutrients taken out of the system by hay cropping is of course an integral part of traditional hay meadow management. However the River Lugg currently drains a catchment upstream of the site that is characterised by intensive potato and dairy farming, and the river water quality is known to suffer as a consequence.

4.20 The sequence of flooding across various areas of the meadows, the patterns of floodwater retention after flood events, and the nutrient load deposited by floodwaters therefore remain crucial, but as yet poorly explored, lines of inquiry. If high nutrient loads in Lugg floodwaters are indeed a driver for vegetation change on the site, it might be expected that the most species-rich areas (e.g. Compartment 17 and nearby areas abutting the A438) should be amongst the last to flood. A simple survey of soil fertility in the wake of flooding events, using hand auger samples taken along a number of line transects, would do much to test this hypothesis.

4.21 However, whilst fertility may well be acting as a suppressant to species-diversity within the grasslands, at least in some parts of the site, this does not of itself support the case that the vegetation as a whole is substantially degraded from some historical zenith. This is particularly the case given the existence of idiosyncratic elements to the vegetation that do not necessarily fit any perceived patterns of enrichment. Prominent amongst these is *Oenanthe silaifolia*, which seems, if anything, to be as or more abundant in the more species-poor grasslands on the site as it is elsewhere.

4.22 Indeed comparing the 2010 results with those from previous surveys and past attempts at classifying the vegetation of the site, precipitates the suggestion that the effect of nutrient-enriched floodwaters may be at the very least complicated by management variations over time. It is particularly striking that areas at the northern edge of Lower Lugg Meadow identified as 'species-poor MG7' in 1990 now, some twenty years later, harbour some of the most diverse plant communities on the entire site. Given what is known about the management history of these areas, one hypothesis warranting further investigation is that a change to later cutting brought in by the current landowners (e.g. Plantlife), has had a positive effect on both the species-diversity and conservation value of these grasslands.

4.23 Such observations are important and relevant when it is considered that year-on-year variations in cutting time may be increasing. In 2010 hay cutting commenced in Upper Lugg Meadow in mid-June, and over the longer term it is possible that any trend towards earlier cutting could compromise the ability of later-flowering species to replenish their populations from seed. Amongst those species able to regenerate annually from a rootstock, the effect on populations might not be discernable for decades, but could be sudden and catastrophic if and when it occurs.

4.24 The possible effects of management trends on the Lugg Meadows grasslands therefore warrant further investigation, but it is equally important to emphasise that any change to site management needs to be made on a highly considered basis, and in the context that in general terms the site's management has remained unbroken for perhaps a thousand years. Even if later cutting were found to be a means to promote a developmental change in the vegetation (towards something closer to 'type' MG4 for example), this is not necessarily in itself an end to justify the means. Some previous authors and commentators could be accused of becoming rather fixated on the relative absence of *Sanguisorba officinalis* at Lugg Meadows as a sign that the grasslands are of reduced conservation importance. This ignores several important things, first amongst which is an absence of evidence to suggest *S. officinalis* has historically been any more abundant at Lugg Meadows than it is today (Purchas & Ley 1889). Indeed it remains possible that aspects of the traditional, low-intensity site management regime practiced at the site, which are near-unique in their length of continuity, have historically militated against local phenotypes of this species gaining prominence in vegetation where it otherwise might be expected to be abundant. Whether this devalues the site's conservation value is a question that must be considered in the light of other idiosyncratic elements of the vegetation that may have benefitted from the regime, prominent amongst which is probably one of the most important UK populations of the nationally scarce plant *Oenanthe silaifolia* as well as other scarce plants.

4.25 Future decisions about management must therefore be careful to ensure that the elements of interest that are peculiar to the site are not threatened by any attempt to see the Lugg Meadows become 'more like other MG4 grasslands'. The NVC is not comprehensive or definitive, particularly where the formal dataset is as restricted as that for MG4, and simplistic attempts at classification based on strength of association to the formal NVC dataset should not on their own be used as a basis for judgements about the conservation value of this site. This conclusion is, in fact, entirely consistent with the caveats offered by the architects of the NVC, who stress that the system should be regarded as “a set of pigeonholes providing a convenient summary of a very complex field of variation” and (of particular relevance when considering past surveys of the Lugg Meadows grasslands) that “it can therefore be hard to discriminate between alternative choices and with a computerised key, two possible vegetation types may have more or less identical similarity coefficients” (Rodwell 2006).

5 Conclusions

5.1 The putative Lugg Meadows grassland communities identified in this study are believed to represent more or less robust nodes of classification along a spectrum of variation ranging from ‘marshy’ and tall herb communities associated with high soil moisture levels, to communities closer to dry, unimproved permanent pasture in their character.

5.2 As such, soil moisture is considered to be the prime determinant of vegetation composition on the site, but there are strong indications that the effect of any such gradient is complicated, and in some parts of the site may even be subordinate to, fertility arising from Lugg floodwaters. Whilst deposition of fertile silts from river water is an integral part of traditional flood meadow systems, excess fertility will reduce species-diversity and denude the overall quality of the vegetation in conservation terms. Axes of ‘disturbance’ or enrichment have previously been recognised within the SSSI (Gibson 2004, Woodfield 2010a) and their possible physical manifestation as a reduction of both species-diversity and habitat quality as one moves towards the River Lugg does appear, from the 2010 data, to be replicated elsewhere within Upper Lugg Meadow.

5.3 A third factor that may be capable of driving relatively rapid vegetation change on the site is the timing of cutting. Although the site’s long continuity of ‘Lammas’ management remains unbroken, relatively subtle but sustained shifts in cutting time appear to have occurred in some parts of the site in recent decades and in certain of these, comparison of the current data with historic surveys suggests that there has been a comparatively rapid and (in conservation terms) positive shift in the nature of the vegetation. This applies particularly to the northern parts of Lower Lugg Meadow, much of which has, since the mid 1990’s, been under the control of Plantlife.

5.4 Notwithstanding that excess fertility may in places be suppressing the quality of the grasslands that would otherwise be expected to be maintained by the Lammas system, it is not the case that the vegetation has deteriorated to the point suggested by some previous commentators, and encapsulated by their classification of large areas of the site as the essentially ‘improved’ grassland types MG7 or MG6 of the NVC. Indeed the results of this study support and reinforce the conclusions reached by Gibson (2004) and Woodfield (2010a) that such departure from the NVC, and most particularly from ‘textbook’ MG4, as there is at Lugg Meadows appears to be in large part due to idiosyncrasies in the vegetation not picked up by the relatively limited sample size from which the formal NVC constancy tables were derived. Even in the context of an emerging expansion of this limited dataset, and recognition of a broader compass of MG4-related vegetation than presented in the NVC volumes, the Lugg Meadows vegetation continues to stand somewhat apart. Nevertheless, species that at Lugg Meadows and elsewhere can be highly characteristic of semi-natural hay meadow vegetation, but which do not figure prominently, if at all, in the formal MG4 dataset, occur prominently on the site. In particular, the population of the scarce *Oenanthe silaifolia* is possibly of national significance and arguably adds more to the conservation importance of the site than the scarcity of *Sanguisorba officinalis* detracts from it. The site is also known to support scarce and rare *Taraxacum* species.

5.5 The formal guidelines for SSSI selection do make extensive use of the NVC, but they also recognise that “there will always be a proportion of stands which are ‘intermediates’ in terms of the NVC communities, but these are not necessarily of lesser quality” (NCC 1989). The Lugg Meadows grasslands clearly fall within this description, indeed this study has shown that the wider site encompasses areas of equivalent, or even perhaps greater, nature conservation value than some of those within the current SSSI boundary and it is questionable whether the current delimitation of the statutory site encompasses an adequate range and representation of the scientific interest of the vegetation maintained under the ‘Lammas’ system.

5.6 Future appraisals of the site’s conservation interest, and indeed its habitat condition, therefore need to encompass additional considerations to strict classification to a national framework that is stated, by its own authors, to be no more than an "approximation". Such considerations include the site's size, historical ecology, cultural appeal in the continuity of traditional management and the intrinsic value of the rarer species present. By any such measures the intact Lammas system of the Lugg Meadows clearly remains of national importance to nature conservation and rather than there being any substantive doubt over the value of the botanical communities present, the delimitation of the SSSI, which was originally to conserve the still extant population of *Fritillaria meleagris*, appears too narrowly drawn.

6 References

BINGHAM, J. 1990. Lugg Meadows – Survey of Lammas Land. *Unpublished report for NCC dated 25th June 1990 and held on HNT files.*

BRIAN, A. 1990. Lammas meadows – a survey of their present day survival and distribution with particular reference to the Lugg Meadows near Hereford; together with an account of their origins and characteristics. *Unpublished paper held on HNT files.*

BRIAN, A. 2001. A Tenurial History of Lugg Meadow near Hereford. *Unpublished paper held on HNT files.*

CURRALL, J. E. P., 1987. A transformation of the Domin scale. *Vegetatio* 72: 81-87.

ELLENBERG, H. 1988. *Vegetation ecology of Central Europe, 4th edition*. Cambridge University Press. Cambridge.

FAULKS, PERRY, CULLEY & RECH and DHV (UK) LTD. 1994. Botanical monitoring of the Lugg Meadows, Hereford. Results and Analysis of Surveys Undertaken in 1992, 1993 and 1994 (Revision A). *Report for the Highways Agency*.

FAULKS, PERRY, CULLEY & RECH and DHV (UK) LTD. 1996. Botanical monitoring programme for the Lugg Meadows, Hereford. Final Report (Revision C). *Report prepared for the Highways Agency.*

FRITH, J. 2003. Lugg Meadows, Herefordshire. Plantlife Reserve. NVC Survey June 2003. *Report produced for Plantlife by James Frith, Ecological Consultant.*

GOWING, D., WALLACE, H., & DODD, M,. 2010. *Hydrology and vegetation of floodplain meadows in the UK*. Presentation at 'Floodplain Meadows: A Threatened Habitat'. 21st April 2010.

GRIME, J. P., HODGSON, J. G., HUNT, R. 1988. *Comparative Plant Ecology*. Unwin Hyman Ltd. London.

GIBSON, C. W. D., 2003. Lugg Meadows SSSI Study. *Unpublished Research Report for English Nature*. Peterborough. (also Bioscan Report E1230R0. Bioscan UK Limited. Oxford).

GIBSON, C. W. D., 2004. Lugg Meadows SSSI Study – Baseline for Monitoring. *Unpublished Research Report for English Nature*. Peterborough. (also Bioscan Report E1230M0. Bioscan UK Limited. Oxford).

HILL, M. O., MOUNTFORD, J. O., ROY, D. B. & BUNCE, R. G. H. (1999). *Ellenberg's indicator values for British plants. Ecofact Volume 2. Technical Annex*. Natural Environment Research Council.

HILL, M. O., ROY, D. B., MOUNTFORD, J. O. & BUNCE, R. G. H. (2000). Extending Ellenberg's indicator values to a new area: an algorithmic approach. *Journal of Applied Ecology* 37: 3–15.

HODGSON, J.G., COLOSANTI, R., SUTTON, F., 1995. Monitoring grasslands. Volume 1. *English Nature Research Report No. 156*. English Nature. Peterborough.

JEFFERSON, R.G., PINCHES, C.E., WALLACE, H.L. & GOWING, D.J.G. 2009 Monitoring of British Floodplain meadows: approaches to guide management. In: Sapegin, L.M. ed *Flood-Plain systems as the objects with high phytodiversity, their study and mapping.* Proceedings of an International Research Seminar, 11-12 June 2009, F. Skoryna State University, Gomel, Belarus pp 257-291.

NATURE CONSERVANCY COUNCIL. 1989. *Guidelines for selection of biological SSSIs*. Nature Conservancy Council. Peterborough.

PURCHAS, W. H. & LEY, A. (1889) *A Flora of Herefordshire*. Jakeman and Carver, Hereford.

RODWELL, J.S., (ed) 1992. *British Plant Communities: volume 3 – grasslands and montane communities.* Cambridge University Press. Cambridge.

RODWELL, J.S., 2006. *NVC Users' Handbook*. JNCC ISBN – 13 978 1 86107 574 1

ROWELL, T.A., ROBERTSON, H.J. 1994. The grassland database: VEGAN version 4.0. Supplement to the version 3.0 manual. *English Nature Research Reports No. 113*. English Nature. Peterborough.

SEABY, R. M. H. & HENDERSON, P. A. (2007). *Community Analysis Package 4 (Version 4.1.3).* Pisces Conservation Limited.

STEWART, K.E.J., BOURN, N, A, D, & THOMAS, J. A. 2001. An evaluation of three quick methods commonly used to assess sward height in ecology. *Journal of Applied Ecology* 38: 1148-1154.

WALLACE, H., PROSSER, M., GOWING, D. 2009. The vegetation of the Severn/Avon Vale Floodplain Meadows. *Natural England Commissioned Report NECR052 –16th September 2010.*

WOODFIELD, D. M. G. (2010a). Lugg Meadows SSSI, Herefordshire: assessment of vegetation change and management efficacy following five years of monitoring. (Bioscan Report E1230bR1). *Unpublished Natural England Commissioned Report.*

Appendix 1 TWINSPAN outputs (2010 data)

QUADRAT DIVISION 1 Number of quadrates in cluster = 179
eigenvalue = 0.195337 number of iterations = 4
Indicators and their sign
RANUACR [-];
LOLPERR [-];
FESRUB [-];
The maximum indicator score for the negative group = -1
The minimum indicator score for the positive group = 0
Negative group: 2 Number of objects = 168 comprising:

18-1, 17-1, 17-2, 17-3, 17-4, 16-1, 16-2, 16-3, 16-4, 22-1, 22-3, 17-5, 22-4, 20a-1, 20a-2, 20a-3, 20a-4, 20b-5, 6a-1, 6a-2, 6a-3, 6a-4, 18-2, 20b-6, 20b-7, 20b-8, 21-1, 21-2, 21-3, 21-4, 29-2, 24-7, 24-8, 28-1, 26-1, 28-2, 27-1, 27-2, 27-3, 27-4, 27-5, 27-6, 26-2, 25-1, 25-2, 25-3, 25-4, 25-5, 25-6, 25-7, 25-8, 26-3, 17-6, 17-7, 17-8, 3b-1, 3b-2, 3a-2, 3a-3, 3a-6, 4-4, 3a-5, 10a-7, 10a-8, 3a-4, 1-5, 1-6, SSSI-1, SSSI-2, SSSI-3, SSSI-4, SSSI-5, SSSI-6, 9a-1, 9a-2, 9a-3, 9a-4, 9a-5, 9a-6, 9b-7, 9b-8, 10b-1, 10b-2, 10a-3, 10a-4, 10a-5, 10a-6, 4-1, 4-2, 4-3, SSSI-7, 7-2, 7-3, 7-1, 8-1, 8-2, 8-3, 7-5, 7-4, 5-4, 5-1, 5-2, 5-3, 3a-1, 1-1, 1-2, 1-3, 1-4, 2-7, 2-6, 2-5, 2-4, 2-3, 2-8, 2-2, 2-1, 11-1, 11-2, 11-3, 11-6, 11-4, 11-5, 11-7, 11-8, 12-1, 12-2, 12-3, 12-4, 12-5, 12-6, 12-7, 12-8, 13b-1, 13b-2, 13b-3, 13b-4, 14-1, 14-2, 14-3, 14-4, 14-5, 14-6, 14-7, 14-8, 15a-1, 15a-2, 15a-3, 15a-4, 15a-5, 15a-6, 15b-7, 15b-8, 31-4, 31-2, 31-3, 13a-1, 13a-2, 23b-1, 23a-2, 23a-3, 23a-4, 23a-5, 24-1, 24-2, 24-3, 24-4, 24-5, 24-6,

The borderline negative group: Number of objects = 3 comprising:

29-2, 31-4, 31-3,

The positive group: 3 Number of objects = 11 comprising:

22-2, 29-1, 29-5, 29-6, 29-7, 29-8, 30-1, 30-2, 29-3, 31-1, 29-4,

The borderline positive group: Number of objects = 2 comprising:

22-2, 30-2,

Variables preferring the negative group of quadrats

HOLCLAN 1 (107, 0) ANTHODO 1 (56, 0) BROCOMM 1 (103, 0) LOLPERR 1 (143, 0) HORDSEC 1 (98, 2) FESRUB 1 (136, 0) ALLIVIN 1 (56, 0) CENTNIG 1 (37, 0) CIRSARV 1 (67, 0) HERASPHO 1 (39, 0) LOTCORN 1 (34, 1) PLANLAN 1 (65, 0) RANUACR 1 (158, 2) TARAGG 1 (121, 0) TRIFPRAT 1 (34, 0) HOLCLAN 2 (107, 0) ANTHODO 2 (56, 0) BROCOMM 2 (99, 0) LOLPERR 2 (142, 0) HORDSEC 2 (97, 2) FESRUB 2 (135, 0) ALLIVIN 2 (42, 0) CIRSARV 2 (64, 0) HERASPHO 2 (37, 0) PLANLAN 2 (60, 0) RANUACR 2 (153, 0) TARAGG 2 (97, 0) HOLCLAN 3 (95, 0) ANTHODO 3 (52, 0) BROCOMM 3 (52, 0) LOLPERR 3 (138, 0) HORDSEC 3 (93, 1) FESRUB 3 (132, 0) LATHPRAT 3 (38, 0) RANUACR 3 (75, 0) HOLCLAN 4 (69, 0) LOLPERR 4 (101, 0) HORDSEC 4 (68, 1) FESRUB 4 (103, 0) RANUACR 4 (39, 0) POATRIV 5 (46, 1) ALOPRAT 6 (38, 1)

Variables biased towards the positive group of quadrats

DESCCES 1 (11, 4) ELYTREP 1 (7, 3) ALOPGEN 1 (0, 3) CARDIST 1 (0, 5) ELEOPAL 1 (0, 3) CARDPRAT 1 (29, 8) LEONAUT 1 (18, 5) OENASIL 1 (37, 7) RUMCRIS 1 (20, 4) ACHIPTA 1 (0, 3) DESCCES 2 (10, 4) ELYTREP 2 (6, 3) ALOPGEN 2 (0, 3) CARDIST 2 (0, 5) ELEOPAL 2 (0, 3) CARDPRAT 2 (20, 6) LEONAUT 2 (15, 4) OENASIL 2 (25, 6) RUMCRIS 2 (13, 3) ACHIPTA 2 (0, 3) DESCCES 3 (7, 3) CARDIST 3 (0, 5) ELEOPAL 3 (0, 3) CARHIRT 4 (23, 5) CARDIST 4 (0, 4) ELEOPAL 4 (0, 3) RANUREP 4 (22, 4) AGROCAP 6 (44, 6) AGROCAP 7 (3, 3)

Variables with no quadrat preference

ALOPRAT 1 (162, 8) PHLEPRA 1 (91, 3) POATRIV 1 (154, 9) AGROCAP 1 (163, 11) CARHIRT 1 (49, 6) LATHPRAT 1 (144, 8) RANUREP 1 (61, 6) RUMACET 1 (153, 8) ALOPRAT 2 (162, 8) PHLEPRA 2 (87, 3) POATRIV 2 (153, 9) AGROCAP 2 (163, 11) CARHIRT 2 (49, 6) LATHPRAT 2 (138, 7) RANUREP 2 (58, 6) RUMACET 2 (142, 7) ALOPRAT 3 (160, 8) PHLEPRA 3 (79, 3) POATRIV 3 (148, 7) AGROCAP 3 (161, 11) CARHIRT 3 (39, 5) RANUREP 3 (34, 4) ALOPRAT 4 (147, 7) PHLEPRA 4 (43, 2) POATRIV 4 (126, 5) AGROCAP 4 (157, 10) ALOPRAT 5 (84, 4) AGROCAP 5 (120, 10)

END OF LEVEL 1

TWINSPAN QUADRAT CLASSIFICATION LEVEL 1

QUADRAT DIVISION 2 Number of quadrates in cluster = 168
eigenvalue = 0.178558 number of iterations = 4
Indicators and their sign
HOLCLAN [-];
CIRSARV [-];
ANTHODO [-];
HERASPHO [-];
DACTGLO [-];
The maximum indicator score for the negative group = -3
The minimum indicator score for the positive group = -2
Negative group: 4 Number of objects = 45 comprising:

18-1, 17-1, 17-2, 17-3, 17-4, 17-5, 22-4, 20a-1, 20a-2, 18-2, 26-1, 26-2, 17-6, 17-7, 17-8, 3b-1, 3b-2, 1-5, 1-6, SSSI-5, 9b-7, 9b-8, 10b-1, SSSI-7, 8-2, 1-1, 1-2, 1-3, 1-4, 2-7, 2-6, 2-3, 2-8, 14-1, 14-3, 14-4, 14-5, 14-6, 14-8, 15a-1, 15a-2, 15a-4, 15b-7, 15b-8, 13a-1,

The borderline negative group: Number of objects = 4 comprising:

26-2, 14-1, 15a-4, 15b-8,

The misclassified negatives: Number of objects = 1 comprising:

17-5,

The positive group: 5 Number of objects = 123 comprising:

16-1, 16-2, 16-3, 16-4, 22-1, 22-3, 20a-3, 20a-4, 20b-5, 6a-1, 6a-2, 6a-3, 6a-4, 20b-6, 20b-7, 20b-8, 21-1, 21-2, 21-3, 21-4, 29-2, 24-7, 24-8, 28-1, 28-2, 27-1, 27-2, 27-3, 27-4, 27-5, 27-6, 25-1, 25-2, 25-3, 25-4, 25-5, 25-6, 25-7, 25-8, 26-3, 3a-2, 3a-3, 3a-6, 4-4, 3a-5, 10a-7, 10a-8, 3a-4, SSSI-1, SSSI-2, SSSI-3, SSSI-4, SSSI-6, 9a-1, 9a-2, 9a-3, 9a-4, 9a-5, 9a-6, 10b-2, 10a-3, 10a-4, 10a-5, 10a-6, 4-1, 4-2, 4-3, 7-2, 7-3, 7-1, 8-1, 8-3, 7-5, 7-4, 5-4, 5-1, 5-2, 5-3, 3a-1, 2-5, 2-4, 2-2, 2-1, 11-1, 11-2, 11-3, 11-6, 11-4, 11-5, 11-7, 11-8, 12-1, 12-2, 12-3, 12-4, 12-5, 12-6, 12-7, 12-8, 13b-1, 13b-2, 13b-3, 13b-4, 14-2, 14-7, 15a-3, 15a-5, 15a-6, 31-4, 31-2, 31-3, 13a-2, 23b-1, 23a-2, 23a-3, 23a-4, 23a-5, 24-1, 24-2, 24-3, 24-4, 24-5, 24-6,

The borderline positive group: Number of objects = 5 comprising:

3a-5, 7-2, 7-1, 13b-3, 15a-6,

The misclassified positive:Number of objects = 5 comprising:

20b-6, 26-3, 2-2, 2-1, 15a-3,

Variables preferring the negative group of quadrats

DACTGLO 1 (27, 3) ANTHODO 1 (35, 21) CYNCRIS 1 (21, 11) TRISFLAV 1 (11, 4) FESPRAT 1 (14, 12) CENTNIG 1 (19, 18) CIRSARV 1 (40, 27) HERASPHO 1 (31, 8) TRIFPRAT 1 (22, 12) TRIFREP 1 (10, 3) DACTGLO 2 (25, 2) ANTHODO 2 (35, 21) CYNCRIS 2 (21, 11) TRISFLAV 2 (11, 4) FESPRAT 2 (14, 12) CENTNIG 2 (17, 14) CIRSARV 2 (38, 26) HERASPHO 2 (29, 8) TRIFPRAT 2 (22, 11) DACTGLO 3 (19, 2) HOLCLAN 3 (42, 53) ANTHODO 3 (34, 18) CYNCRIS 3 (20, 9) FESPRAT 3 (10, 9) HERASPHO 3 (10, 2) HOLCLAN 4 (41, 28) ANTHODO 4 (23, 7) CYNCRIS 4 (11, 4) RANUACR 4 (17, 22) HOLCLAN 5 (19, 8)

Variables biased towards the positive group of quadrats

PHLEPRA 1 (13, 78) HORDSEC 1 (12, 86) OENASIL 1 (1, 36) PHLEPRA 2 (11, 76) HORDSEC 2 (12, 85) PHLEPRA 3 (10, 69) HORDSEC 3 (11, 82) PHLEPRA 4 (3, 40) HORDSEC 4 (7, 61) ALOPRAT 5 (7, 77) HORDSEC 5 (2, 31) ALOPRAT 6 (3, 35) AGROCAP 6 (3, 41)

Variables with no quadrat preference

ALOPRAT 1 (39, 123) HOLCLAN 1 (43, 64) BROCOMM 1 (26, 77) POATRIV 1 (36, 118) LOLPERR 1 (39, 104) AGROCAP 1 (42, 121) FESRUB 1 (41, 95) CARHIRT 1 (9, 40) ALLIVIN 1 (12, 44) LATHPRAT 1 (38, 106) LOTCORN 1 (10, 24) PLANLAN 1 (22, 43) RANUACR 1 (44, 114) RANUREP 1 (11, 50) RUMACET 1 (40, 113) TARAGG 1 (35, 86) ALOPRAT 2 (39, 123) HOLCLAN 2 (43, 64) BROCOMM 2 (24, 75) POATRIV 2 (35, 118) LOLPERR 2 (39, 103) AGROCAP 2 (42, 121) FESRUB 2 (41, 94) CARHIRT 2 (9, 40) ALLIVIN 2 (11, 31) LATHPRAT 2 (37, 101) PLANLAN 2 (22, 38) RANUACR 2 (41, 112) RANUREP 2 (11, 47) RUMACET 2 (36, 106) TARAGG 2 (32, 65) ALOPRAT 3 (37, 123) BROCOMM 3 (16, 36) POATRIV 3 (32, 116) LOLPERR 3 (37, 101) AGROCAP 3 (40, 121) FESRUB 3 (41, 91) CARHIRT 3 (7, 32) LATHPRAT 3 (12, 26) RANUACR 3 (23, 52) RANUREP 3 (9, 25) ALOPRAT 4 (28, 119) POATRIV 4 (28, 98) LOLPERR 4 (27, 74) AGROCAP 4 (38, 119) FESRUB 4 (32, 71) POATRIV 5 (10, 36) LOLPERR 5 (8, 25) AGROCAP 5 (31, 89)

QUADRAT DIVISION 3 Number of quadrates in cluster = 11
eigenvalue = 0.515901 number of iterations = 2
Indicators and their sign
ALOPRAT [-];
The maximum indicator score for the negative group = -1
The minimum indicator score for the positive group = 0
Negative group: 6 Number of objects = 8 comprising:

22-2, 29-5, 29-6, 29-7, 30-1, 30-2, 29-3, 31-1,

The positive group: 7 Number of objects = 3 comprising:

29-1, 29-8, 29-4,

Variables preferring the negative group of quadrats

ALOPRAT 1 (8, 0) PHLEPRA 1 (3, 0) POATRIV 1 (8, 1) HORDSEC 1 (2, 0) DESCCES 1 (4, 0) FILIULM 1 (2, 0) LATHPRAT 1 (8, 0) LEONAUT 1 (5, 0) RANUACR 1 (2, 0) RANUREP 1 (6, 0) RUMACET 1 (8, 0) ALOPRAT 2 (8, 0) PHLEPRA 2 (3, 0) POATRIV 2 (8, 1) HORDSEC 2 (2, 0) DESCCES 2 (4, 0) FILIULM 2 (2, 0) LATHPRAT 2 (7, 0) LEONAUT 2 (4, 0) RANUREP 2 (6, 0) RUMACET 2 (7, 0) ALOPRAT 3 (8, 0) PHLEPRA 3 (3, 0) POATRIV 3 (6, 1) DESCCES 3 (3, 0) LEONAUT 3 (2, 0) RANUREP 3 (4, 0) ALOPRAT 4 (7, 0) PHLEPRA 4 (2, 0) POATRIV 4 (5, 0) LEONAUT 4 (2, 0) RANUREP 4 (4, 0) ALOPRAT 5 (4, 0) RANUREP 5 (2, 0)

Variables biased towards the positive group of quadrats

ELYTREP 1 (0, 3) ALOPGEN 1 (0, 3) ELEOPAL 1 (0, 3) OENASIL 1 (4, 3) RUMCRIS 1 (1, 3) POTEREP 1 (0, 2) LYSNUMM 1 (0, 1) ACHIPTA 1 (1, 2) ELYTREP 2 (0, 3) ALOPGEN 2 (0, 3) ELEOPAL 2 (0, 3) RUMCRIS 2 (1, 2) POTEREP 2 (0, 2) LYSNUMM 2 (0, 1) ACHIPTA 2 (1, 2) ELYTREP 3 (0, 1) ALOPGEN 3 (0, 2) ELEOPAL 3 (0, 3) ALOPGEN 4 (0, 2) ELEOPAL 4 (0, 3) ALOPGEN 5 (0, 1) CARHIRT 5 (1, 1) ELEOPAL 5 (0, 1) AGROCAP 7 (1, 2)

Variables with no quadrat preference

AGROCAP 1 (8, 3) CARHIRT 1 (5, 1) CARDIST 1 (3, 2) CARDPRAT 1 (5, 3) AGROCAP 2 (8, 3) CARHIRT 2 (5, 1) CARDIST 2 (3, 2) CARDPRAT 2 (4, 2) OENASIL 2 (4, 2) AGROCAP 3 (8, 3) CARHIRT 3 (4, 1) CARDIST 3 (3, 2) AGROCAP 4 (7, 3) CARHIRT 4 (4, 1) CARDIST 4 (3, 1) AGROCAP 5 (7, 3) AGROCAP 6 (4, 2)

END OF LEVEL 2

TWINSPAN QUADRAT CLASSIFICATION LEVEL 2

QUADRAT DIVISION 4 Number of quadrates in cluster = 45
eigenvalue = 0.202688 number of iterations = 3
Indicators and their sign
RANUACR [+];
CYNCRIS [-];
TRIFPRAT [-];
The maximum indicator score for the negative group = -1
The minimum indicator score for the positive group = 0
Negative group: 8 Number of objects = 21 comprising:

18-1, 17-1, 17-2, 17-3, 17-4, 17-5, 22-4, 20a-1, 20a-2, 18-2, 17-6, 17-7, 17-8, 9b-7, SSSI-7, 1-4, 14-1, 14-8, 15a-1, 15b-7, 13a-1,

The borderline negative group: Number of objects = 2 comprising:

SSSI-7, 1-4,

The misclassified negatives: Number of objects = 2 comprising:

14-1, 15b-7,

The positive group: 9 Number of objects = 24 comprising:

26-1, 26-2, 3b-1, 3b-2, 1-5, 1-6, SSSI-5, 9b-8, 10b-1, 8-2, 1-1, 1-2, 1-3, 2-7, 2-6, 2-3, 2-8, 14-3, 14-4, 14-5, 14-6, 15a-2, 15a-4, 15b-8,

The borderline positive group: Number of objects = 5 comprising:
8-2, 14-3, 14-6, 15a-4, 15b-8,

The misclassified positive:Number of objects = 1 comprising:

1-3,

Variables preferring the negative group of quadrats

CYNCRIS 1 (17, 4) HORDSEC 1 (10, 2) TRISFLAV 1 (10, 1) CARHIRT 1 (8, 1) ALLIVIN 1 (9, 3) LEONAUT 1 (6, 0) LOTCORN 1 (7, 3) RANBULB 1 (7, 2) TRIFPRAT 1 (18, 4) TRIFREP 1 (8, 2) TRAGPRAT 1 (5, 1) CYNCRIS 2 (17, 4) HORDSEC 2 (10, 2) TRISFLAV 2 (10, 1) CARHIRT 2 (8, 1) ALLIVIN 2 (8, 3) LEONAUT 2 (6, 0) LOTCORN 2 (7, 2) TRIFPRAT 2 (18, 4) TRIFREP 2 (5, 2) TRAGPRAT 2 (5, 0) CYNCRIS 3 (17, 3) HORDSEC 3 (9, 2) TRISFLAV 3 (8, 1) CARHIRT 3 (6, 1) LATHPRAT 3 (11, 1) ANTHODO 4 (15, 8) CYNCRIS 4 (11, 0) HORDSEC 4 (6, 1) TRISFLAV 4 (5, 0) LATHPRAT 4 (9, 0)

Variables biased towards the positive group of quadrats

BROHORD 1 (1, 7) FESPRAT 1 (4, 10) CERAFONT 1 (0, 6) RANUREP 1 (0, 11) BROHORD 2 (1, 7) FESPRAT 2 (4, 10) RANUREP 2 (0, 11) BROHORD 3 (1, 6) FESPRAT 3 (3, 7) HERASPHO 3 (3, 7) RANUACR 3 (3, 20) RANUREP 3 (0, 9) DACTGLO 4 (2, 6) POATRIV 4 (7, 21) FESPRAT 4 (2, 6) HERASPHO 4 (0, 5) RANUACR 4 (2, 15) RANUREP 4 (0, 6) ALOPRAT 5 (1, 6) POATRIV 5 (2, 8) RANUACR 5 (0, 6)

Variables with no quadrat preference

ALOPRAT 1 (17, 22) PHLEPRA 1 (7, 6) DACTGLO 1 (11, 16) HOLCLAN 1 (19, 24) ANTHODO 1 (21, 14) BROCOMM 1 (11, 15) POATRIV 1 (13, 23) LOLPERR 1 (19, 20) AGROCAP 1 (21, 21) FESRUB 1 (21, 20) CENTNIG 1 (10, 9) CIRSARV 1 (19, 21) HERASPHO 1 (13, 18) LATHPRAT 1 (19, 19) PLANLAN 1 (8, 14) RANUACR 1 (20, 24) RUMACET 1 (18, 22) TARAGG 1 (15, 20) ALOPRAT 2 (17, 22) PHLEPRA 2 (5, 6) DACTGLO 2 (9, 16) HOLCLAN 2 (19, 24) ANTHODO 2 (21, 14) BROCOMM 2 (11, 13) POATRIV 2 (12, 23) LOLPERR 2 (19, 20) AGROCAP 2 (21, 21) FESRUB 2 (21, 20) CENTNIG 2 (9, 8) CIRSARV 2 (18, 20) HERASPHO 2 (12, 17) LATHPRAT 2 (19, 18) PLANLAN 2 (8, 14) RANUACR 2 (17, 24) RUMACET 2 (16, 20) TARAGG 2 (14, 18) ALOPRAT 3 (15, 22) PHLEPRA 3 (4, 6) DACTGLO 3 (7, 12) HOLCLAN 3 (19, 23) ANTHODO 3 (21, 13) BROCOMM 3 (9, 7) POATRIV 3 (10, 22) LOLPERR 3 (17, 20) AGROCAP 3 (21, 19) FESRUB 3 (21, 20) ALOPRAT 4 (10, 18) HOLCLAN 4 (19, 22) LOLPERR 4 (11, 16) AGROCAP 4 (20, 18) FESRUB 4 (17, 15) HOLCLAN 5 (10, 9) LOLPERR 5 (3, 5) AGROCAP 5 (17, 14)

QUADRAT DIVISION 5 Number of quadrates in cluster = 123
eigenvalue = 0.113672 number of iterations = 5
Indicators and their sign
RANUREP [+];
CARHIRT [-];
FESRUB [-];
POATRIV [+];
The maximum indicator score for the negative group = 0
The minimum indicator score for the positive group = 1
Negative group: 10 Number of objects = 93 comprising:

16-1, 16-2, 16-3, 16-4, 22-1, 22-3, 20a-3, 20a-4, 20b-5, 20b-6, 20b-7, 20b-8, 21-1, 21-2, 21-3, 21-4, 29-2, 24-7, 24-8, 28-1, 28-2, 27-1, 27-2, 27-3, 27-4, 27-5, 25-1, 25-2, 25-3, 25-4, 25-5, 25-6, 25-7, 25-8, 3a-2, 3a-3, 3a-6, 3a-5, 10a-7, 10a-8, 3a-4, 9a-1, 9a-2, 10a-3, 10a-4, 10a-6, 4-1, 4-2, 4-3, 7-2, 7-3, 7-1, 8-1, 8-3, 7-5, 7-4, 5-4, 5-1, 5-2, 5-3, 3a-1, 2-5, 2-2, 2-1, 11-2, 11-3, 11-6, 11-4, 11-5, 11-7, 11-8, 12-2, 12-4, 12-7, 12-8, 13b-1, 13b-3, 13b-4, 14-2, 31-4, 31-2, 13a-2, 23b-1, 23a-2, 23a-3, 23a-4, 23a-5, 24-1, 24-2, 24-3, 24-4, 24-5, 24-6,

The borderline negative group: Number of objects = 7 comprising:

24-8, 27-1, 3a-2, 10a-3, 10a-4, 12-8, 13b-1,

The misclassified negatives: Number of objects = 3 comprising:

11-6, 11-5, 11-7,

The positive group: 11 Number of objects = 30 comprising:

6a-1, 6a-2, 6a-3, 6a-4, 27-6, 26-3, 4-4, SSSI-1, SSSI-2, SSSI-3, SSSI-4, SSSI-6, 9a-3, 9a-4, 9a-5, 9a-6, 10b-2, 10a-5, 2-4, 11-1, 12-1, 12-3, 12-5, 12-6, 13b-2, 14-7, 15a-3, 15a-5, 15a-6, 31-3,

The borderline positive group: Number of objects = 5 comprising:

27-6, 9a-3, 9a-5, 10a-5, 12-6,

The misclassified positive:Number of objects = 5 comprising:
26-3, 10b-2, 15a-3, 15a-5, 15a-6,

Variables preferring the negative group of quadrats

ANTHODO 1 (20, 1) FESRUB 1 (83, 12) CARHIRT 1 (40, 0) ALLIVIN 1 (42, 2) CARDPRAT 1 (23, 1) FILIULM 1 (22, 2) LOTCORN 1 (24, 0) ANTHODO 2 (20, 1) FESRUB 2 (82, 12) CARHIRT 2 (40, 0) ALLIVIN 2 (30, 1) LOTCORN 2 (24, 0) FESRUB 3 (80, 11) CARHIRT 3 (32, 0) LATHPRAT 3 (26, 0) PHLEPRA 4 (36, 4) FESRUB 4 (63, 8) CARHIRT 4 (22, 0) HORDSEC 5 (30, 1)

Variables biased towards the positive group of quadrats

CIRSARV 1 (16, 11) RANUREP 1 (27, 23) CIRSARV 2 (15, 11) RANUREP 2 (24, 23) BROCOMM 3 (21, 15) RANUREP 3 (13, 12) HOLCLAN 4 (10, 18) RANUREP 4 (8, 8) HOLCLAN 5 (1, 7) POATRIV 5 (15, 21) LOLPERR 5 (10, 15)

Variables with no quadrat preference

ALOPRAT 1 (93, 30) PHLEPRA 1 (63, 15) HOLCLAN 1 (45, 19) BROCOMM 1 (55, 22) POATRIV 1 (89, 29) LOLPERR 1 (75, 29) HORDSEC 1 (65, 21) AGROCAP 1 (92, 29) LATHPRAT 1 (87, 19) OENASIL 1 (26, 10) PLANLAN 1 (30, 13) RANUACR 1 (89, 25) RUMACET 1 (86, 27) TARAGG 1 (68, 18) ALOPRAT 2 (93, 30) PHLEPRA 2 (61, 15) HOLCLAN 2 (45, 19) BROCOMM 2 (53, 22) POATRIV 2 (89, 29) LOLPERR 2 (74, 29) HORDSEC 2 (64, 21) AGROCAP 2 (92, 29) LATHPRAT 2 (84, 17) PLANLAN 2 (27, 11) RANUACR 2 (87, 25) RUMACET 2 (82, 24) TARAGG 2 (52, 13) ALOPRAT 3 (93, 30) PHLEPRA 3 (57, 12) HOLCLAN 3 (35, 18) POATRIV 3 (87, 29) LOLPERR 3 (73, 28) HORDSEC 3 (63, 19) AGROCAP 3 (92, 29) RANUACR 3 (41, 11) ALOPRAT 4 (89, 30) POATRIV 4 (69, 29) LOLPERR 4 (48, 26) HORDSEC 4 (50, 11) AGROCAP 4 (90, 29) RANUACR 4 (15, 7) ALOPRAT 5 (55, 22) AGROCAP 5 (70, 19) ALOPRAT 6 (27, 8) AGROCAP 6 (35, 6)

QUADRAT DIVISION 6 Number of quadrates in cluster = 8
eigenvalue = 0.277949 number of iterations = 3
Indicators and their sign
ACHIPTA [+];
The maximum indicator score for the negative group = 0
The minimum indicator score for the positive group = 1
Negative group: 12 Number of objects = 7 comprising:

22-2, 29-5, 29-6, 29-7, 30-2, 29-3, 31-1,

The borderline negative group: Number of objects = 1 comprising:

30-2,

The positive group: 13 Number of objects = 1 comprising:

30-1,

Variables preferring the negative group of quadrats

PHLEPRA 1 (3, 0) HORDSEC 1 (2, 0) DESCCES 1 (4, 0) CARHIRT 1 (5, 0) CARDPRAT 1 (5, 0) LEONAUT 1 (5, 0) OENASIL 1 (4, 0) RANUACR 1 (2, 0) PHLEPRA 2 (3, 0) HORDSEC 2 (2, 0) DESCCES 2 (4, 0) CARHIRT 2 (5, 0) CARDPRAT 2 (4, 0) LEONAUT 2 (4, 0) OENASIL 2 (4, 0) PHLEPRA 3 (3, 0) POATRIV 3 (6, 0) DESCCES 3 (3, 0) CARHIRT 3 (4, 0) LEONAUT 3 (2, 0) PHLEPRA 4 (2, 0) POATRIV 4 (5, 0) AGROCAP 4 (7, 0) CARHIRT 4 (4, 0) LEONAUT 4 (2, 0) ALOPRAT 5 (4, 0) AGROCAP 5 (7, 0) RANUREP 5 (2, 0) AGROCAP 6 (4, 0)

Variables biased towards the positive group of quadrats

CARDIST 1 (2, 1) FILIULM 1 (1, 1) ACHIPTA 1 (0, 1) CARDIST 2 (2, 1) FILIULM 2 (1, 1) ACHIPTA 2 (0, 1) CARDIST 3 (2, 1) FILIULM 3 (0, 1) RANUREP 3 (3, 1) CARDIST 4 (2, 1) FILIULM 4 (0, 1) RANUREP 4 (3, 1) FILIULM 5 (0, 1) FILIULM 6 (0, 1) FILIULM 7 (0, 1)

Variables with no quadrat preference

ALOPRAT 1 (7, 1) POATRIV 1 (7, 1) AGROCAP 1 (7, 1) LATHPRAT 1 (7, 1) RANUREP 1 (5, 1) RUMACET 1 (7, 1) ALOPRAT 2 (7, 1) POATRIV 2 (7, 1) AGROCAP 2 (7, 1) LATHPRAT 2 (6, 1) RANUREP 2 (5, 1) RUMACET 2 (6, 1) ALOPRAT 3 (7, 1) AGROCAP 3 (7, 1) ALOPRAT 4 (6, 1)

QUADRAT DIVISION 7 Number of quadrates in cluster = 3
No division was undertaken as there are too few objects

END OF LEVEL 3

TWINSPAN QUADRAT CLASSIFICATION LEVEL 3

QUADRAT DIVISION 8 Number of quadrates in cluster = 21
eigenvalue = 0.147886 number of iterations = 3
Indicators and their sign
BROCOMM [+];
LOTCORN [-];
PLANLAN [+];
The maximum indicator score for the negative group = 0
The minimum indicator score for the positive group = 1
Negative group: 16 Number of objects = 8 comprising:

17-1, 17-2, 17-3, 17-4, 17-5, 17-6, 17-7, 17-8,

The positive group: 17 Number of objects = 13 comprising:

18-1, 22-4, 20a-1, 20a-2, 18-2, 9b-7, SSSI-7, 1-4, 14-1, 14-8, 15a-1, 15b-7, 13a-1,

The borderline positive group: Number of objects = 2 comprising:

22-4, 20a-1,

Variables preferring the negative group of quadrats

PHLEPRA 1 (5, 2) CARHIRT 1 (6, 2) LUZCAMP 1 (3, 0) LEONAUT 1 (4, 2) LEUCVULG 1 (3, 1) LOTCORN 1 (6, 1) SILASIL 1 (3, 0) QUERROB 1 (2, 0) PHLEPRA 2 (4, 1) CARHIRT 2 (6, 2) LUZCAMP 2 (2, 0) LEONAUT 2 (4, 2) LEUCVULG 2 (3, 1) LOTCORN 2 (6, 1) SILASIL 2 (3, 0) TRIFREP 2 (4, 1) PHLEPRA 3 (3, 1) CARHIRT 3 (4, 2) LATHPRAT 3 (7, 4) LATHPRAT 4 (6, 3) HOLCLAN 5 (6, 4) AGROCAP 6 (2, 0)

Variables biased towards the positive group of quadrats

BROCOMM 1 (0, 11) PLANLAN 1 (0, 8) TARAGG 1 (3, 12) TRAGPRAT 1 (1, 4) BROCOMM 2 (0, 11) CENTNIG 2 (2, 7) PLANLAN 2 (0, 8) TARAGG 2 (3, 11) TRAGPRAT 2 (1, 4) BROCOMM 3 (0, 9) POATRIV 3 (1, 9) HORDSEC 3 (2, 7) FESPRAT 3 (0, 3) HERASPHO 3 (0, 3) RANUACR 3 (0, 3) POATRIV 4 (0, 7) LOLPERR 5 (0, 3) FESRUB 5 (0, 3)

Variables with no quadrat preference

ALOPRAT 1 (6, 11) DACTGLO 1 (5, 6) HOLCLAN 1 (8, 11) ANTHODO 1 (8, 13) POATRIV 1 (4, 9) LOLPERR 1 (7, 12) CYNCRIS 1 (8, 9) HORDSEC 1 (3, 7) TRISFLAV 1 (4, 6) AGROCAP 1 (8, 13) FESRUB 1 (8, 13) FESPRAT 1 (1, 3) ALLIVIN 1 (4, 5) CENTNIG 1 (3, 7) CIRSARV 1 (6, 13) HERASPHO 1 (4, 9) LATHPRAT 1 (8, 11) RANUACR 1 (8, 12) RANBULB 1 (2, 5) RUMACET 1 (6, 12) TRIFPRAT 1 (7, 11) TRIFREP 1 (4, 4) ALOPRAT 2 (6, 11) DACTGLO 2 (3, 6) HOLCLAN 2 (8, 11) ANTHODO 2 (8, 13) POATRIV 2 (3, 9) LOLPERR 2 (7, 12) CYNCRIS 2 (8, 9) HORDSEC 2 (3, 7) TRISFLAV 2 (4, 6) AGROCAP 2 (8, 13) FESRUB 2 (8, 13) FESPRAT 2 (1, 3) ALLIVIN 2 (3, 5) CIRSARV 2 (6, 12) HERASPHO 2 (3, 9) LATHPRAT 2 (8, 11) RANUACR 2 (5, 12) RANBULB 2 (1, 3) RUMACET 2 (4, 12) TRIFPRAT 2 (7, 11) ALOPRAT 3 (5, 10) DACTGLO 3 (3, 4) HOLCLAN 3 (8, 11) ANTHODO 3 (8, 13) LOLPERR 3 (6, 11) CYNCRIS 3 (8, 9) TRISFLAV 3 (3, 5) AGROCAP 3 (8, 13) FESRUB 3 (8, 13) ALOPRAT 4 (3, 7) HOLCLAN 4 (8, 11) ANTHODO 4 (6, 9) LOLPERR 4 (3, 8) CYNCRIS 4 (4, 7) HORDSEC 4 (2, 4) TRISFLAV 4 (2, 3) AGROCAP 4 (8, 12) FESRUB 4 (5, 12) AGROCAP 5 (7, 10)

QUADRAT DIVISION 9 Number of quadrates in cluster = 24
eigenvalue = 0.164795 number of iterations = 3
Indicators and their sign
BROHORD [-];
HERASPHO [-];
The maximum indicator score for the negative group = -1
The minimum indicator score for the positive group = 0
Negative group: 18 Number of objects = 9 comprising:

26-1, 26-2, SSSI-5, 9b-8, 10b-1, 1-2, 1-3, 2-7, 2-6,

The positive group: 19 Number of objects = 15 comprising:

3b-1, 3b-2, 1-5, 1-6, 8-2, 1-1, 2-3, 2-8, 14-3, 14-4, 14-5, 14-6, 15a-2, 15a-4, 15b-8,

Variables preferring the negative group of quadrats

BROHORD 1 (7, 0) GERDISS 1 (4, 0) RANBULB 1 (2, 0) TRIFPRAT 1 (3, 1) CREPBIEN 1 (2, 0) ANTHSYL 1 (3, 0) BROHORD 2 (7, 0) CERAFONT 2 (2, 0) GERDISS 2 (4, 0) RANBULB 2 (2, 0) TRIFPRAT 2 (3, 1) CREPBIEN 2 (2, 0) ANTHSYL 2 (3, 0) DACTGLO 3 (7, 5) BROHORD 3 (6, 0) CIRSARV 3 (2, 1) HERASPHO 3 (7, 0) TARAGG 3 (2, 1) BROHORD 4 (2, 0) HERASPHO 4 (5, 0) HERASPHO 5 (2, 0)

Variables biased towards the positive group of quadrats

ANTHODO 1 (2, 12) CENTNIG 1 (1, 8) LATHPRAT 1 (4, 15) ANTHODO 2 (2, 12) CENTNIG 2 (1, 7) LATHPRAT 2 (4, 14) ANTHODO 3 (2, 11) BROCOMM 3 (1, 6) AGROCAP 3 (4, 15) FESPRAT 3 (1, 6) ANTHODO 4 (0, 8) AGROCAP 4 (3, 15) FESPRAT 4 (1, 5) HOLCLAN 5 (1, 8) AGROCAP 5 (2, 12) RANUACR 5 (1, 5)

Variables with no quadrat preference

ALOPRAT 1 (9, 13) PHLEPRA 1 (2, 4) DACTGLO 1 (7, 9) HOLCLAN 1 (9, 15) BROCOMM 1 (5, 10) POATRIV 1 (9, 14) LOLPERR 1 (7, 13) AGROCAP 1 (6, 15) FESRUB 1 (6, 14) FESPRAT 1 (3, 7) CERAFONT 1 (3, 3) CIRSARV 1 (9, 12) HERASPHO 1 (9, 9) PLANLAN 1 (5, 9) RANUACR 1 (9, 15) RANUREP 1 (5, 6) RUMACET 1 (8, 14) TARAGG 1 (8, 12) ALOPRAT 2 (9, 13) PHLEPRA 2 (2, 4) DACTGLO 2 (7, 9) HOLCLAN 2 (9, 15) BROCOMM 2 (4, 9) POATRIV 2 (9, 14) LOLPERR 2 (7, 13) AGROCAP 2 (6, 15) FESRUB 2 (6, 14) FESPRAT 2 (3, 7) CIRSARV 2 (9, 11) HERASPHO 2 (9, 8) PLANLAN 2 (5, 9) RANUACR 2 (9, 15) RANUREP 2 (5, 6) RUMACET 2 (7, 13) TARAGG 2 (6, 12) ALOPRAT 3 (9, 13) PHLEPRA 3 (2, 4) HOLCLAN 3 (9, 14) POATRIV 3 (9, 13) LOLPERR 3 (7, 13) FESRUB 3 (6, 14) RANUACR 3 (6, 14) RANUREP 3 (3, 6) ALOPRAT 4 (8, 10) DACTGLO 4 (3, 3) HOLCLAN 4 (8, 14) POATRIV 4 (8, 13) LOLPERR 4 (6, 10) FESRUB 4 (4, 11) RANUACR 4 (4, 11) RANUREP 4 (2, 4) ALOPRAT 5 (2, 4) POATRIV 5 (3, 5) LOLPERR 5 (2, 3)

QUADRAT DIVISION 10 Number of quadrates in cluster = 93
eigenvalue = 0.112494 number of iterations = 4
Indicators and their sign
HORDSEC [+];
ANTHODO [-];
HOLCLAN [-];
ALOPRAT [-];
The maximum indicator score for the negative group = -2
The minimum indicator score for the positive group = -1
Negative group: 20 Number of objects = 17 comprising:

3a-5, 9a-1, 4-3, 7-2, 7-3, 7-1, 8-1, 8-3, 7-5, 7-4, 5-4, 5-2, 5-3, 2-5, 2-2, 2-1, 14-2,

The borderline negative group: Number of objects = 3 comprising:

4-3, 5-2, 14-2,

The misclassified negatives: Number of objects = 2 comprising:

9a-1, 2-2,

The positive group: 21 Number of objects = 76 comprising:

16-1, 16-2, 16-3, 16-4, 22-1, 22-3, 20a-3, 20a-4, 20b-5, 20b-6, 20b-7, 20b-8, 21-1, 21-2, 21-3, 21-4, 29-2, 24-7, 24-8, 28-1, 28-2, 27-1, 27-2, 27-3, 27-4, 27-5, 25-1, 25-2, 25-3, 25-4, 25-5, 25-6, 25-7, 25-8, 3a-2, 3a-3, 3a-6, 10a-7, 10a-8, 3a-4, 9a-2, 10a-3, 10a-4, 10a-6, 4-1, 4-2, 5-1, 3a-1, 11-2, 11-3, 11-6, 11-4, 11-5, 11-7, 11-8, 12-2, 12-4, 12-7, 12-8, 13b-1, 13b-3, 13b-4, 31-4, 31-2, 13a-2, 23b-1, 23a-2, 23a-3, 23a-4, 23a-5, 24-1, 24-2, 24-3, 24-4, 24-5, 24-6,

The borderline positive group: Number of objects = 3 comprising:

3a-4, 4-1, 5-1,

Variables preferring the negative group of quadrats

HOLCLAN 1 (16, 29) ANTHODO 1 (14, 6) FESPRAT 1 (4, 7) CARDPRAT 1 (11, 12) HOLCLAN 2 (16, 29) ANTHODO 2 (14, 6) FESPRAT 2 (4, 7) CARDPRAT 2 (8, 8) HOLCLAN 3 (14, 21) ANTHODO 3 (12, 5) BROCOMM 3 (8, 13) FESPRAT 3 (4, 4) HOLCLAN 4 (7, 3) ANTHODO 4 (6, 1) CARHIRT 4 (7, 15) RANUACR 4 (6, 9) ALOPRAT 6 (12, 15) ALOPRAT 7 (5, 1)

Variables biased towards the positive group of quadrats

HORDSEC 1 (1, 64) ALLIVIN 1 (3, 39) FILIULM 1 (2, 20) LOTCORN 1 (1, 23) HORDSEC 2 (1, 63) ALLIVIN 2 (3, 27) LOTCORN 2 (1, 23) HORDSEC 3 (1, 62) LATHPRAT 3 (1, 25) LOLPERR 4 (3, 45) HORDSEC 4 (0, 50) HORDSEC 5 (0, 30) AGROCAP 5 (7, 63) AGROCAP 6 (3, 32)

Variables with no quadrat preference

ALOPRAT 1 (17, 76) PHLEPRA 1 (8, 55) BROCOMM 1 (11, 44) POATRIV 1 (14, 75) LOLPERR 1 (8, 67) AGROCAP 1 (17, 75) FESRUB 1 (14, 69) CARHIRT 1 (12, 28) CENTNIG 1 (4, 14) LATHPRAT 1 (17, 70) OENASIL 1 (5, 21) PLANLAN 1 (6, 24) RANUACR 1 (17, 72) RANUREP 1 (3, 24) RUMACET 1 (14, 72) TARAGG 1 (13, 55) ALOPRAT 2 (17, 76) PHLEPRA 2 (8, 53) BROCOMM 2 (11, 42) POATRIV 2 (14, 75) LOLPERR 2 (8, 66) AGROCAP 2 (17, 75) FESRUB 2 (14, 68) CARHIRT 2 (12, 28) LATHPRAT 2 (17, 67) OENASIL 2 (2, 16) PLANLAN 2 (6, 21) RANUACR 2 (17, 70) RANUREP 2 (3, 21) RUMACET 2 (13, 69) TARAGG 2 (10, 42) ALOPRAT 3 (17, 76) PHLEPRA 3 (8, 49) POATRIV 3 (13, 74) LOLPERR 3 (8, 65) AGROCAP 3 (17, 75) FESRUB 3 (14, 66) CARHIRT 3 (9, 23) RANUACR 3 (11, 30) ALOPRAT 4 (17, 72) PHLEPRA 4 (7, 29) POATRIV 4 (9, 60) AGROCAP 4 (17, 73) FESRUB 4 (11, 52) ALOPRAT 5 (16, 39)

QUADRAT DIVISION 11 Number of quadrates in cluster = 30
eigenvalue = 0.143159 number of iterations = 5
Indicators and their sign
FESRUB [-];
HOLCLAN [-];
CIRSARV [-];
The maximum indicator score for the negative group = -2
The minimum indicator score for the positive group = -1
Negative group: 22 Number of objects = 15 comprising:

6a-1, 6a-2, 6a-4, 26-3, SSSI-2, SSSI-3, SSSI-6, 10b-2, 2-4, 12-1, 13b-2, 14-7, 15a-3, 15a-5, 15a-6,

The misclassified negatives: Number of objects = 1 comprising:

2-4,

The positive group: 23 Number of objects = 15 comprising:

6a-3, 27-6, 4-4, SSSI-1, SSSI-4, 9a-3, 9a-4, 9a-5, 9a-6, 10a-5, 11-1, 12-3, 12-5, 12-6, 31-3,

The borderline positive group: Number of objects = 1 comprising:

SSSI-4,

Variables preferring the negative group of quadrats

HOLCLAN 1 (13, 6) FESRUB 1 (12, 0) CIRSARV 1 (10, 1) GERDISS 1 (5, 0) HERASPHO 1 (4, 0) POTEREP 1 (4, 0) HOLCLAN 2 (13, 6) FESRUB 2 (12, 0) CIRSARV 2 (10, 1) HERASPHO 2 (4, 0) POTEREP 2 (4, 0) HOLCLAN 3 (13, 5) FESRUB 3 (11, 0) CIRSARV 3 (4, 0) RANUACR 3 (8, 3) HOLCLAN 4 (13, 5) FESRUB 4 (8, 0) RANUACR 4 (6, 1) HOLCLAN 5 (6, 1)

Variables biased towards the positive group of quadrats

ELYTREP 1 (1, 4) OENASIL 1 (2, 8) RUMCRIS 1 (1, 5) ELYTREP 2 (1, 4) OENASIL 2 (1, 5) RUMCRIS 2 (1, 4) HORDSEC 4 (3, 8) AGROCAP 6 (0, 6)

Variables with no quadrat preference

ALOPRAT 1 (15, 15) PHLEPRA 1 (6, 9) BROCOMM 1 (13, 9) POATRIV 1 (14, 15) LOLPERR 1 (14, 15) HORDSEC 1 (9, 12) AGROCAP 1 (14, 15) LATHPRAT 1 (10, 9) PLANLAN 1 (8, 5) RANUACR 1 (11, 14) RANUREP 1 (9, 14) RUMACET 1 (14, 13) TARAGG 1 (9, 9) ALOPRAT 2 (15, 15) PHLEPRA 2 (6, 9) BROCOMM 2 (13, 9) POATRIV 2 (14, 15) LOLPERR 2 (14, 15) HORDSEC 2 (9, 12) AGROCAP 2 (14, 15) LATHPRAT 2 (9, 8) PLANLAN 2 (7, 4) RANUACR 2 (11, 14) RANUREP 2 (9, 14) RUMACET 2 (14, 10) TARAGG 2 (7, 6) ALOPRAT 3 (15, 15) PHLEPRA 3 (5, 7) BROCOMM 3 (9, 6) POATRIV 3 (14, 15) LOLPERR 3 (13, 15) HORDSEC 3 (8, 11) AGROCAP 3 (14, 15) RANUREP 3 (7, 5) ALOPRAT 4 (15, 15) POATRIV 4 (14, 15) LOLPERR 4 (12, 14) AGROCAP 4 (14, 15) RANUREP 4 (5, 3) ALOPRAT 5 (10, 12) POATRIV 5 (13, 8) LOLPERR 5 (9, 6) AGROCAP 5 (7, 12) ALOPRAT 6 (4, 4)

QUADRAT DIVISION 12 Number of quadrates in cluster = 7
eigenvalue = 0.210595 number of iterations = 4
Indicators and their sign
ALOPRAT [-];
The maximum indicator score for the negative group = -1
The minimum indicator score for the positive group = 0
Negative group: 24 Number of objects = 4 comprising:

22-2, 30-2, 29-3, 31-1,
The positive group: 25 Number of objects = 3 comprising:

29-5, 29-6, 29-7,

Variables preferring the negative group of quadrats

HORDSEC 1 (2, 0) PHALARU 1 (1, 0) RANUACR 1 (2, 0) RANUREP 1 (4, 1) RUMCRIS 1 (1, 0) HORDSEC 2 (2, 0) PHALARU 2 (1, 0) RANUREP 2 (4, 1) RUMCRIS 2 (1, 0) HORDSEC 3 (1, 0) CARHIRT 3 (3, 1) PHLEPRA 4 (2, 0) HORDSEC 4 (1, 0) DESCCES 4 (1, 0) CARHIRT 4 (3, 1) ALOPRAT 5 (4, 0) POATRIV 5 (1, 0) CARHIRT 5 (1, 0) RANUREP 5 (2, 0) ALOPRAT 6 (1, 0) AGROCAP 7 (1, 0)

Variables biased towards the positive group of quadrats

CARDPRAT 1 (2, 3) FILIULM 1 (0, 1) LEONAUT 1 (2, 3) LOTCORN 1 (0, 1) OENASIL 1 (1, 3) SILASIL 1 (0, 1) GALIPAL 1 (0, 1) CARDPRAT 2 (1, 3) FILIULM 2 (0, 1) LOTCORN 2 (0, 1) OENASIL 2 (1, 3) SILASIL 2 (0, 1) GALIPAL 2 (0, 1) LEONAUT 3 (0, 2) POATRIV 4 (2, 3) LEONAUT 4 (0, 2) AGROCAP 6 (1, 3)

Variables with no quadrat preference

ALOPRAT 1 (4, 3) PHLEPRA 1 (2, 1) POATRIV 1 (4, 3) AGROCAP 1 (4, 3) DESCCES 1 (2, 2) CARHIRT 1 (3, 2) CARDIST 1 (1, 1) LATHPRAT 1 (4, 3) RUMACET 1 (4, 3) ALOPRAT 2 (4, 3) PHLEPRA 2 (2, 1) POATRIV 2 (4, 3) AGROCAP 2 (4, 3) DESCCES 2 (2, 2) CARHIRT 2 (3, 2) CARDIST 2 (1, 1) LATHPRAT 2 (4, 2) LEONAUT 2 (2, 2) RUMACET 2 (3, 3) ALOPRAT 3 (4, 3) PHLEPRA 3 (2, 1) POATRIV 3 (3, 3) AGROCAP 3 (4, 3) DESCCES 3 (2, 1) CARDIST 3 (1, 1) RANUREP 3 (2, 1) ALOPRAT 4 (4, 2) AGROCAP 4 (4, 3) CARDIST 4 (1, 1) RANUREP 4 (2, 1) AGROCAP 5 (4, 3)

QUADRAT DIVISION 13 Number of quadrates in cluster = 1
No division was undertaken as there are too few objects

END OF LEVEL 4
THIS IS THE END OF THE DIVISIONS REQUESTED

TWINSPAN QUADRAT CLASSIFICATION LEVEL 4

VARIABLE DIVISION 1 Number of Variables in cluster = 69
eigenvalue = 0.429236 number of iterations = 3
Negative group: 2 Number of objects = 48 comprising:

ALOPRAT, DACTGLO, HOLCLAN, ANTHODO, BROHORD, BROCOMM, POATRIV, LOLPERR, CYNCRIS, TRISFLAV, AGROSTOL, FESRUB, FESPRAT, FESTULOL, POAPRAT, LUZCAMP, ALLIVIN, CENTNIG, CERAFONT, CIRSARV, GERDISS, HERASPHO, LATHPRAT, LEUCVULG, PLANLAN, RANUACR, RANBULB, RANUFIC, RUMACET, SILASIL, TARAGG, TRIFDUB, TRIFPRAT, TRIFREP, VICCRAC, TRAGPRAT, STEGRAM, LOTPED, RHINMIN, QUERROB, SANGOFF, EQUIARV, CREPBIEN, ACHIMILL, ANTHSYL, GALIAPA, VICSATI, KINPRA,

The positive group: 3 Number of objects = 21 comprising:

PHLEPRA, HORDSEC, AGROCAP, DESCCES, PHALARU, ELYTREP, ALOPGEN, CARHIRT, CARDIST, ELEOPAL, CARDPRAT, FILIULM, LEONAUT, LOTCORN, OENASIL, RANUREP, RUMCRIS, POTEREP, GALIPAL, LYSNUMM, ACHIPTA,

END OF LEVEL 1

TWINSPAN VARIABLE CLASSIFICATION LEVEL 1

VARIABLE DIVISION 2 Number of Variables in cluster = 48
eigenvalue = 0.308502 number of iterations = 2
Negative group: 4 Number of objects = 44 comprising:

DACTGLO, HOLCLAN, ANTHODO, BROHORD, BROCOMM, LOLPERR, CYNCRIS, TRISFLAV, AGROSTOL, FESRUB, FESPRAT, FESTULOL, POAPRAT, LUZCAMP, ALLIVIN, CENTNIG, CERAFONT, CIRSARV, GERDISS, HERASPHO, LEUCVULG, PLANLAN, RANUACR, RANBULB, RANUFIC, SILASIL, TARAGG, TRIFDUB, TRIFPRAT, TRIFREP, VICCRAC, TRAGPRAT, STEGRAM, LOTPED, RHINMIN, QUERROB, SANGOFF, EQUIARV, CREPBIEN, ACHIMILL, ANTHSYL, GALIAPA, VICSATI, KINPRA,

The positive group: 5 Number of objects = 4 comprising:

ALOPRAT, POATRIV, LATHPRAT, RUMACET,

VARIABLE DIVISION 3 Number of Variables in cluster = 21
eigenvalue = 0.494928 number of iterations = 3
Negative group: 6 Number of objects = 6 comprising:

PHLEPRA, HORDSEC, CARHIRT, FILIULM, LOTCORN, OENASIL,

The positive group: 7 Number of objects = 15 comprising:

AGROCAP, DESCCES, PHALARU, ELYTREP, ALOPGEN, CARDIST, ELEOPAL, CARDPRAT, LEONAUT, RANUREP, RUMCRIS, POTEREP, GALIPAL, LYSNUMM, ACHIPTA,

END OF LEVEL 2

TWINSPAN VARIABLE CLASSIFICATION LEVEL 2

VARIABLE DIVISION 4 Number of Variables in cluster = 44
eigenvalue = 0.138963 number of iterations = 2
Negative group: 8 Number of objects = 1 comprising:

SILASIL,

The positive group: 9 Number of objects = 43 comprising:

DACTGLO, HOLCLAN, ANTHODO, BROHORD, BROCOMM, LOLPERR, CYNCRIS, TRISFLAV, AGROSTOL, FESRUB, FESPRAT, FESTULOL, POAPRAT, LUZCAMP, ALLIVIN, CENTNIG, CERAFONT, CIRSARV, GERDISS, HERASPHO, LEUCVULG, PLANLAN, RANUACR, RANBULB, RANUFIC, TARAGG, TRIFDUB, TRIFPRAT, TRIFREP, VICCRAC, TRAGPRAT, STEGRAM, LOTPED, RHINMIN, QUERROB, SANGOFF, EQUIARV, CREPBIEN, ACHIMILL, ANTHSYL, GALIAPA, VICSATI, KINPRA,

---

VARIABLE DIVISION 5 Number of Variables in cluster = 4
No division was undertaken as there are too few objects

VARIABLE DIVISION 6 Number of Variables in cluster = 6
eigenvalue = 0.302738 number of iterations = 2
Negative group: 12 Number of objects = 2 comprising:

PHLEPRA, HORDSEC,

The positive group: 13 Number of objects = 4 comprising:

CARHIRT, FILIULM, LOTCORN, OENASIL,

VARIABLE DIVISION 7 Number of Variables in cluster = 15
eigenvalue = 0.437632 number of iterations = 3
Negative group: 14 Number of objects = 7 comprising:

AGROCAP, DESCCES, ELYTREP, CARDPRAT, RANUREP, RUMCRIS, POTEREP,

The positive group: 15 Number of objects = 8 comprising:

PHALARU, ALOPGEN, CARDIST, ELEOPAL, LEONAUT, GALIPAL, LYSNUMM, ACHIPTA,

END OF LEVEL 3

TWINSPAN VARIABLE CLASSIFICATION LEVEL 3

VARIABLE DIVISION 8 Number of Variables in cluster = 1
No division was undertaken as there are too few objects

VARIABLE DIVISION 9 Number of Variables in cluster = 43
eigenvalue = 0.134759 number of iterations = 2
Negative group: 18 Number of objects = 24 comprising:

DACTGLO, HOLCLAN, ANTHODO, BROHORD, CYNCRIS, TRISFLAV, FESPRAT, LUZCAMP, CENTNIG, CERAFONT, CIRSARV, HERASPHO, LEUCVULG, RANBULB, TRIFPRAT, TRIFREP, TRAGPRAT, LOTPED, RHINMIN, QUERROB, EQUIARV, CREPBIEN, ACHIMILL, ANTHSYL,

The positive group: 19 Number of objects = 19 comprising:

BROCOMM, LOLPERR, AGROSTOL, FESRUB, FESTULOL, POAPRAT, ALLIVIN, GERDISS, PLANLAN, RANUACR, RANUFIC, TARAGG, TRIFDUB, VICCRAC, STEGRAM, SANGOFF, GALIAPA, VICSATI, KINPRA,

VARIABLE DIVISION 12 Number of Variables in cluster = 2
No division was undertaken as there are too few objects

VARIABLE DIVISION 13 Number of Variables in cluster = 4
No division was undertaken as there are too few objects

VARIABLE DIVISION 14 Number of Variables in cluster = 7
eigenvalue = 0.319618 number of iterations = 2
Negative group: 28 Number of objects = 3 comprising:

AGROCAP, DESCCES, CARDPRAT,

The positive group: 29 Number of objects = 4 comprising:

ELYTREP, RANUREP, RUMCRIS, POTEREP,

VARIABLE DIVISION 15 Number of Variables in cluster = 8
eigenvalue = 0.300106 number of iterations = 2
Negative group: 30 Number of objects = 7 comprising:

PHALARU, ALOPGEN, CARDIST, ELEOPAL, GALIPAL, LYSNUMM, ACHIPTA,

The positive group: 31 Number of objects = 1 comprising:

LEONAUT,

END OF LEVEL 4
THIS IS THE END OF THE DIVISIONS REQUESTED

TWINSPAN VARIABLE CLASSIFICATION LEVEL 4

ORDER OF VARIABLES INCLUDING RARER ONES

47, 3, 4, 5, 6, 10, 12, 16, 24, 29, 30, 31, 34, 37, 42, 50, 51, 53, 56, 57, 58, 63, 64, 65, 66, 7, 9, 13, 15, 19, 22, 27, 33, 40, 41, 44, 48, 49, 52, 55, 59, 67, 68, 69, 1, 8, 35, 45, 2, 11, 23, 32, 38, 39, 14, 17, 28, 20, 43, 46, 54, 18, 21, 25, 26, 60, 61, 62, 36,

ORDER OF SAMPLES

2, 3, 4, 5, 13, 61, 62, 63, 1, 14, 15, 16, 24, 88, 99, 116, 145, 152, 153, 159, 167, 43, 51, 80, 89, 90, 114, 115, 117, 118, 64, 65, 74, 75, 104, 113, 121, 122, 147, 148, 149, 150, 154, 156, 160, 70, 82, 98, 100, 101, 102, 103, 105, 106, 107, 108, 110, 111, 119, 123, 124, 146, 6, 7, 8, 9, 10, 12, 17, 18, 19, 25, 26, 27, 28, 29, 30, 31, 33, 34, 35, 42, 44, 45, 46, 47, 48, 49, 52, 53, 54, 55, 56, 57, 58, 59, 66, 67, 68, 71, 72, 73, 83, 92, 93, 95, 96, 97, 109, 112, 126, 127, 128, 129, 130, 131, 132, 134, 136, 139, 140, 141, 143, 144, 162, 164, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 20, 21, 23, 60, 77, 78, 81, 91, 120, 133, 142, 151, 155, 157, 158, 22, 50, 69, 76, 79, 84, 85, 86, 87, 94, 125, 135, 137, 138, 165, 11, 41, 161, 163, 36, 37, 38, 40, 32, 39, 166,

10000000000

47	SILASIL		0	0	2	0	2	0	5	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0

	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	3	0	0
	0	0	0	3	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	3	0	0	0	0	0	0	
10010000000														
3	DACTGLO		5	1	5	0	0	0	1	5	7	0	3	0
	25	0	0	5	0	3	35	0	0	7	7	0	0	7
	10	10	7	15	2	0	8	0	0	10	2	0	2	0
	25	3	15	5	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1	0	0	5	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	15	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	
10010000000														
4	HOLCLAN		25	45	20	25	35	30	25	10	30	15	10	15
	0	15	0	15	10	25	35	55	15	20	15	15	20	30
	10	10	10	8	17	20	25	10	10	15	4	15	25	30
	40	35	40	25	55	15	15	7	5	10	7	7	15	15
	5	7	0	4	3	10	15	7	0	15	0	0	0	0
	0	5	5	25	5	0	0	7	0	0	0	0	0	5
	0	5	0	0	0	2	0	0	0	0	7	0	0	0
	0	0	0	0	0	3	7	0	0	0	0	5	0	0
	0	7	5	4	5	0	7	0	7	2	0	0	5	0
	0	0	5	7	4	3	4	5	10	0	0	0	2	0
	20	25	10	35	15	15	10	20	0	15	0	30	25	50
	50	10	0	0	15	40	0	20	0	15	0	0	3	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	
10010000000														
5	ANTHODO		20	15	20	20	10	15	7	7	7	15	15	10
	15	10	5	15	5	10	10	20	5	0	0	0	0	0
	5	5	0	0	2	5	10	5	7	0	25	20	10	10
	0	15	10	0	20	5	0	0	10	10	7	7	5	10
	4	5	4	0	10	10	10	7	0	0	0	0	0	0
	0	10	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	5	0	0
	0	0	0	0	0	0	5	0	0	0	0	0	0	0
	0	4	0	0	0	0	7	0	0	0	0	0	0	5
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	5	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	
10010000000														
6	BROHORD		0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	5	0	0	0	0	0	0	3	10	8	10
	5	5	5	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	5	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	
10010000000														
10	CYNCRIS		10	10	10	7	10	7	7	7	25	10	7	0
	10	10	0	10	5	10	0	20	0	0	0	0	0	0

	0	5	0	0	0	0	0	0	3	5	0	0	0	0
	0	5	0	0	0	0	0	0	3	0	0	0	0	0
	0	5	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	5	0	0	0	5	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	5	0	0	0	0	0	0	0
	10	0	0	0	0	0	15	0	10	0	0	0	0	0
	0	0	0	0	0	0	4	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	7	0	0	0	0	0	0
	15	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	
10010000000														
12	TRISFLAV		15	5	10	2	0	0	0	0	5	15	7	0
	15	0	0	0	0	4	0	15	0	0	0	0	5	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	3	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	4	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	3	0
	7	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	
10010000000														
16	FESPRAT		0	0	0	0	0	0	0	2	5	0	0	10
	0	10	0	0	0	0	0	0	0	3	0	0	0	0
	3	10	0	0	20	15	10	8	3	0	15	10	0	0
	0	0	0	0	0	8	0	0	0	5	5	0	0	0
	0	0	0	0	0	5	0	0	0	0	0	0	0	4
	0	0	10	0	2	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	10	0	0	5	0	8	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	4	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	5	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	
10010000000														
24	LUZCAMP		0	2	3	0	0	0	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	
10010000000														
29	CENTNIG		1	12	0	0	0	0	3	0	0	0	2	2
	0	4	2	0	2	10	0	2	0	0	0	0	3	0
	0	0	0	0	0	3	0	0	3	0	1	3	4	4
	3	4	0	0	0	0	3	0	0	0	0	3	4	0
	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	3	0	0	0	0	0	0	0	0	0	1	0	0
	10	0	0	0	0	0	0	0	0	0	0	0	1	0
	0	0	0	0	0	0	2	0	0	0	0	1	0	0
	0	0	2	0	2	2	3	0	3	0	0	0	4	0
	0	0	0	0	0	0	0	0	0	0	0	3	3	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	

10010000000														
30	CERAFONT		0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	3	0	1
	0	2	0	0	0	0	1	1	0	0	0	0	1	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	2	0	0	0	0
	0	0	0	0	0	2	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	
10010000000														
31	CIRSARV		5	2	0	2	0	3	3	4	4	4	1	10
	3	3	2	3	2	2	3	4	10	3	3	5	5	4
	3	3	3	2	3	1	3	2	4	3	2	2	0	15
	4	0	2	2	0	0	0	0	0	0	2	0	0	0
	0	0	0	0	0	2	1	0	0	0	0	0	0	0
	20	0	0	4	0	0	3	3	0	2	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	3	0	0	2
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	2	0	0	0	0	0	0	0	0	0	0	10	0	5
	0	0	4	0	0	0	0	0	0	0	2	0	0	7
	3	0	3	7	8	4	0	0	0	0	25	4	2	3
	5	0	2	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	
10010000000														
34	HERASPHO		3	0	4	0	0	1	0	3	5	7	2	0
	3	2	5	4	0	0	3	0	2	25	30	4	3	7
	10	10	7	15	3	0	2	3	0	0	2	3	2	0
	0	3	0	3	1	0	0	0	2	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	12	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	4	0
	0	0	2	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	7	0	0	0	0	0	2	4	0	3	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	
10010000000														
37	LEUCVULG		0	3	3	0	0	0	0	15	0	0	0	0
	0	2	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	
10010000000														
42	RANBULB		0	0	1	2	0	0	0	0	1	0	2	0
	0	0	2	3	0	0	1	0	0	0	0	0	0	0
	3	3	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	1	0

	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	
10010000000														
50	TRIFPRAT		3	2	2	3	0	5	4	4	2	3	2	2
	2	2	3	3	0	4	2	0	4	0	0	0	3	0
	3	3	0	0	0	0	0	0	0	0	0	0	3	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	3	0	0	0	0	0	0
	0	0	0	0	0	0	4	2	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	2	0	0	0	0	0	0	0
	2	3	0	0	0	0	0	0	2	0	0	0	0	1
	0	0	3	0	0	0	2	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	2	0	0	0	2	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	
10010000000														
51	TRIFREP		4	3	0	0	2	0	0	2	0	1	0	0
	1	0	0	1	0	0	0	0	2	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	3	3	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	2	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	3	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	
10010000000														
53	TRAGPRAT		0	0	0	0	0	0	0	2	2	0	3	0
	0	0	0	0	0	0	2	0	3	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	2	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	
10010000000														
56	LOTPED		0	0	0	0	0	0	0	0	0	0	0	0
	0	0	3	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	1	0	0	0	0	3	3	0	0
	0	0	0	0	0	3	0	0	0	0	0	0	0	0
	0	0	0	0	0	2	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	3	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	
10010000000														
57	RHINMIN		0	0	0	0	0	0	0	0	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0

	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	
10010000000														
58	QUERROB		0	1	0	0	0	0	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	
10010000000														
63	EQUIARV		0	0	0	2	0	0	0	0	0	0	0	0
	0	0	0	0	2	0	0	0	0	0	0	0	3	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	
10010000000														
64	CREPBIEN		0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	0	0	0	0	0	0	0	0	0	0
	2	2	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	
10010000000														
65	ACHIMILL		0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	2	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	
10010000000														
66	ANTHSYL		0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	4	0	3	0	0
	0	0	0	3	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0

	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	
10011000000														
7	BROCOMM		0	0	0	0	0	0	0	0	5	5	0	5
	5	7	3	0	5	7	5	5	3	2	0	1	8	3
	3	0	0	0	2	0	0	0	0	0	10	10	5	7
	1	5	3	3	7	10	5	3	3	0	5	0	0	7
	0	0	4	0	5	5	5	5	0	0	0	0	0	0
	0	0	4	2	1	5	5	5	5	0	0	2	2	2
	3	3	0	5	7	3	0	0	0	0	0	0	0	0
	0	0	0	4	5	10	5	7	7	5	0	0	2	0
	5	4	3	4	2	2	3	2	3	2	3	0	0	0
	0	1	2	3	2	4	3	4	0	2	0	2	0	2
	5	3	3	0	10	10	5	10	8	3	0	7	3	7
	5	0	3	0	12	8	5	10	3	5	5	0	3	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	
10011000000														
9	LOLPERR		10	15	0	2	15	5	5	5	30	5	5	0
	10	50	3	15	20	20	20	30	5	5	15	45	20	30
	0	15	10	0	15	20	8	8	5	15	0	10	25	20
	35	20	35	0	15	5	20	0	0	0	0	5	15	7
	7	0	0	0	0	5	0	15	10	7	10	10	5	0
	5	10	7	5	5	5	7	7	20	5	10	5	15	15
	10	10	15	7	10	7	7	10	10	5	7	15	5	4
	15	0	0	20	35	0	20	20	20	15	0	0	0	0
	15	20	25	35	35	30	20	40	45	40	25	10	20	25
	5	1	15	15	15	15	20	10	0	15	5	10	15	5
	7	10	50	15	35	40	40	35	3	30	0	35	15	40
	35	10	15	15	40	60	10	25	10	30	20	20	35	25
	20	5	0	0	0	0	0	0	0	0	0	0	0	
10011000000														
13	AGROSTOL		0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	5	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	10	0	0	3	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	
10011000000														
15	FESRUB		15	5	15	10	7	7	10	15	15	10	50	50
	25	10	7	15	10	15	15	20	15	7	5	0	15	0
	10	30	0	10	15	10	0	5	7	5	15	20	10	10
	15	10	15	15	20	10	0	5	10	0	20	10	0	15
	10	10	20	7	15	5	15	10	10	10	15	10	10	10
	45	35	45	20	15	25	25	30	5	5	0	10	10	0
	20	10	15	25	20	20	20	20	20	25	7	15	15	5
	15	10	15	0	0	10	5	0	0	5	10	7	10	5
	10	3	5	3	1	7	7	5	10	5	5	15	25	15
	0	10	15	15	10	20	10	15	10	40	10	15	25	15
	30	15	5	5	0	0	15	10	0	4	5	10	15	10
	10	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	
10011000000														
19	FESTULOL		0	0	0	2	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	7	0	0	0	0	0	0	0	0

	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	
10011000000														
22	POAPRAT		0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	3	0	0	0	0
	0	0	0	0	0	0	0	0	3	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	3	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	5	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	
10011000000														
27	ALLIVIN		3	0	0	1	0	0	2	2	0	0	3	0
	0	0	3	0	3	0	0	2	2	0	0	0	0	0
	0	0	0	0	0	0	0	0	3	0	0	0	0	0
	0	0	0	2	2	0	0	0	0	0	2	3	0	0
	3	0	0	0	0	0	0	0	0	0	2	0	0	0
	0	2	0	0	0	0	0	3	2	0	0	0	0	3
	2	2	0	2	3	4	2	2	1	1	2	3	2	2
	0	0	0	0	0	0	2	0	0	0	0	0	0	0
	2	3	2	0	1	1	1	2	2	0	0	1	1	3
	0	0	1	0	0	2	2	2	0	1	1	1	3	1
	0	0	0	0	0	0	0	0	0	1	0	0	0	0
	0	0	3	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	
10011000000														
33	GERDISS		0	0	0	0	0	0	0	0	2	0	1	0
	0	0	0	0	0	0	0	0	0	2	0	3	2	2
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	3
	0	2	0	0	0	1	1	0	0	0	0	2	1	1
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	2	0	0	0
	0	0	0	1	3	3	0	0	0	1	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	
10011000000														
40	PLANLAN		0	0	0	0	0	0	0	0	3	3	3	0
	0	2	3	7	4	4	0	0	0	3	0	0	2	0
	3	0	3	3	0	0	3	3	3	3	2	0	3	4
	3	4	0	0	0	3	0	0	0	0	0	3	3	0
	0	0	0	0	3	0	3	3	0	0	0	0	0	0
	0	3	0	0	1	0	0	3	0	1	0	3	4	0
	3	3	0	0	2	0	0	0	0	0	0	0	0	1
	0	0	0	0	0	0	3	0	0	2	0	0	0	0
	4	5	2	2	3	3	0	0	2	0	2	0	0	0
	0	0	0	0	0	0	0	2	0	0	3	0	4	3
	2	2	0	1	0	2	0	3	3	2	0	4	0	0
	0	0	0	0	0	2	3	0	0	3	0	1	4	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	
10011000000														
41	RANUACR		4	1	1	2	1	3	2	2	3	2	4	2
	4	3	4	5	15	0	4	10	2	4	3	12	8	3
	7	10	10	25	15	30	20	30	5	30	30	8	7	15
	4	25	15	10	10	25	4	4	15	3	7	5	7	10
	3	6	4	4	15	5	10	15	4	4	3	0	3	2

	3	4	3	2	4	0	3	2	0	3	1	5	7	10
	10	7	2	5	4	4	5	7	7	10	7	7	5	7
	4	4	5	2	5	15	7	7	5	4	30	3	5	4
	4	4	4	4	5	4	4	15	10	10	15	4	4	5
	3	1	2	0	3	4	3	3	5	4	4	3	7	4
	5	0	0	3	0	0	12	10	15	10	2	10	10	7
	4	2	2	3	0	40	4	3	3	7	4	5	4	4
	3	3	1	0	1	0	0	0	0	0	0	0	0	
10011000000														
44	RANUFIC		0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	
10011000000														
48	TARAGG		2	0	2	0	0	0	0	2	3	3	2	2
	2	2	4	5	0	3	3	1	2	1	2	1	2	0
	4	4	5	15	3	3	3	3	3	3	3	5	0	2
	2	0	3	3	0	3	1	3	3	0	3	3	3	3
	2	0	0	0	3	2	1	1	3	2	2	0	0	2
	5	3	3	2	2	2	0	3	2	1	1	1	1	2
	2	2	0	2	2	1	2	3	3	2	2	2	2	2
	0	0	0	0	1	0	1	3	0	0	0	2	0	3
	2	3	2	2	3	1	0	1	2	2	1	2	0	0
	0	0	2	1	4	4	2	3	1	0	1	2	0	0
	0	0	2	2	2	0	1	0	0	1	0	2	3	2
	3	0	1	0	0	0	2	0	1	2	1	2	2	2
	2	0	0	0	0	0	0	0	0	0	0	0	0	
10011000000														
49	TRIFDUB		0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	
10011000000														
52	VICCRAC		0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	3	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	5	0
	3	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	2	0	0	0	0	0	7	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	5	0	0	0	0	0	0	0	0	0	0	0	
10011000000														
55	STEGRAM		0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0

	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	3	0	0	0	0	0
	0	0	0	1	0	0	0	0	0	0	2	0	0	0
	0	0	0	0	0	0	0	0	2	4	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	3	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	
10011000000														
59	SANGOFF		0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	15	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	
10011000000														
67	GALIAPA		0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	
10011000000														
68	VICSATI		0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	3	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	
10011000000														
69	KINPRA		0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	
10100000000														
1	ALOPRAT		0	3	15	15	0	10	7	5	5	5	5	4
	0	15	60	10	20	10	15	0	20	10	10	20	10	10

	60	5	15	40	40	15	0	8	65	10	25	20	20	25
	5	0	15	10	5	15	35	75	70	80	65	65	60	75
	80	65	70	85	60	30	30	45	25	15	10	45	25	40
	5	15	15	20	30	45	60	10	30	60	50	20	15	45
	20	35	25	30	65	15	20	15	15	7	25	6	35	35
	10	15	25	55	45	10	15	60	70	40	70	70	75	65
	10	10	30	15	10	10	15	35	10	20	15	70	45	60
	35	40	15	10	10	10	10	20	35	25	50	55	15	5
	60	60	65	25	30	15	35	15	35	30	60	25	10	15
	15	65	35	40	45	30	30	40	70	65	45	15	25	60
	20	15	45	45	35	60	7	20	20	20	0	0	0	
10100000000														
8	POATRIV		0	0	0	2	0	5	3	1	25	0	0	7
	15	60	10	0	19	10	15	0	7	10	20	60	35	35
	5	15	10	15	20	20	20	25	10	25	10	4	20	15
	30	10	35	25	0	15	25	7	10	15	0	7	0	10
	10	0	2	5	5	25	30	15	10	10	15	15	25	10
	7	7	7	15	25	20	10	20	20	10	15	7	10	15
	0	7	15	7	10	10	10	7	10	7	7	15	7	10
	20	15	15	20	35	20	25	15	15	20	10	5	4	10
	15	20	40	40	40	35	35	45	34	25	20	5	20	20
	10	5	10	15	10	10	15	10	10	10	15	10	10	7
	30	30	30	20	60	60	40	25	0	35	35	30	25	45
	45	15	15	25	20	40	10	20	20	45	40	30	40	35
	35	15	30	5	2	15	10	20	15	4	0	7	0	
10100000000														
35	LATHPRAT		12	10	4	17	5	10	10	12	10	25	15	5
	4	3	3	0	4	3	0	2	3	3	0	0	2	0
	0	3	0	2	4	2	3	3	3	3	3	3	4	4
	1	3	7	3	2	3	3	3	3	3	3	3	2	3
	3	3	3	3	2	3	3	7	3	5	3	7	5	4
	7	5	10	4	5	10	7	10	10	1	2	4	3	4
	3	4	5	4	3	15	3	12	7	4	4	5	12	7
	1	0	0	2	0	3	3	0	0	0	3	3	3	3
	3	3	1	3	3	3	2	2	3	4	2	2	7	4
	2	2	3	10	3	3	10	5	10	10	4	5	4	3
	4	4	4	0	0	0	0	0	3	2	3	3	3	4
	1	3	3	3	3	3	0	0	0	2	0	4	0	0
	1	3	3	2	2	2	2	2	1	2	0	0	0	
10100000000														
45	RUMACET		1	2	3	3	0	0	1	3	2	2	2	2
	2	2	3	3	2	3	3	0	2	0	1	3	3	2
	3	3	3	3	1	2	3	3	3	3	6	4	3	3
	2	7	3	2	0	3	3	3	3	3	3	0	3	3
	2	3	0	0	3	3	1	4	2	1	1	2	0	2
	0	3	3	2	2	4	3	2	3	0	2	3	3	3
	4	3	2	3	2	3	4	4	2	4	3	0	3	3
	3	3	2	2	2	3	1	3	3	2	2	2	3	3
	2	4	3	2	3	2	3	2	2	3	3	2	2	4
	3	2	4	4	2	2	3	2	2	2	2	3	4	3
	2	3	0	2	3	3	2	3	3	3	2	2	2	3
	3	1	2	2	4	3	2	3	2	0	1	2	1	4
	0	2	1	3	3	2	3	3	3	2	0	0	0	
11000000000														
2	PHLEPRA		3	0	1	0	0	5	5	5	0	0	1	0
	0	0	0	0	0	0	7	0	0	7	10	0	0	0
	0	0	0	0	5	0	0	0	0	0	10	0	0	0
	0	0	10	0	5	0	10	15	0	0	0	5	0	0
	0	0	20	30	10	10	10	0	5	10	10	10	3	10
	0	5	0	5	1	0	0	0	10	10	0	3	5	5
	5	0	10	10	15	0	10	5	1	10	15	15	5	7
	5	10	10	10	0	0	5	4	0	0	15	15	15	15
	7	0	0	0	10	7	0	0	15	10	15	10	0	0
	5	10	5	0	7	0	5	4	7	5	15	15	7	10
	0	0	5	35	0	0	2	0	0	0	0	0	7	5
	7	0	20	10	0	0	7	7	0	5	3	5	3	0
	10	0	10	0	0	15	0	5	0	0	0	0	0	

11000000000														
11	HORDSEC		0	0	0	3	15	0	0	45	10	0	5	65
	0	12	0	0	5	0	10	0	7	0	5	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	15	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	5	0	0	40	50	60	40	65	60
	60	45	45	12	20	10	15	30	50	15	0	7	20	0
	0	0	10	10	5	0	5	0	5	10	15	45	10	7
	2	7	15	25	40	8	60	7	15	10	0	5	0	5
	20	25	40	30	25	65	35	15	30	13	10	7	0	20
	0	15	0	45	65	55	50	55	50	25	5	0	1	25
	0	10	5	5	8	0	0	7	0	10	0	2	10	5
	0	20	7	0	0	10	35	20	0	10	15	15	10	7
	7	2	10	0	2	0	0	0	0	0	0	0	0	
11010000000														
23	CARHIRT		0	4	5	4	7	7	5	0	0	0	0	0
	10	0	7	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	7	0	0	0	0	0
	0	0	0	0	0	0	3	0	7	15	15	10	10	20
	10	10	4	7	0	0	0	4	3	10	10	5	0	10
	3	0	5	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	10	15	0	7	7	10	10
	0	0	0	0	5	0	4	0	0	15	15	7	0	0
	0	0	0	4	0	0	0	0	4	20	0	0	0	0
	0	5	0	0	0	5	10	10	15	15	10	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	25	0	20	10	3	0	10	0	25	0	0	
11010000000														
32	FILIULM		0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	7	0	0	0	0	4	0	0	4	0	2	1	0	1
	0	0	0	2	0	0	0	0	0	0	15	3	0	3
	0	0	0	0	0	20	1	0	0	0	1	3	1	0
	0	0	0	0	0	0	0	0	0	2	0	0	0	0
	0	0	0	0	0	3	0	0	0	0	0	0	0	0
	4	17	0	0	3	0	0	1	2	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	2	1	0	0	0	0
	0	0	0	0	0	0	0	2	0	75	0	0	0	
11010000000														
38	LOTCORN		4	2	0	3	0	7	2	3	0	0	0	0
	0	0	0	0	3	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	2	0
	1	3	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	3	0	0	0	0	0	0
	3	2	0	0	0	0	0	4	0	2	3	3	3	0
	0	0	3	0	0	2	0	2	2	0	0	0	0	2
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	3	2	0	0	0	0	0	0	0
	0	0	0	0	10	0	4	7	4	4	3	3	7	3
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	2	0	0	0	0	0	
11010000000														
39	OENASIL		0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	2	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	1	0	3	0	0	0	0	0	0
	0	0	0	1	3	0	0	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	1	0	1	3	0	0	3	3	2	2	3	1	4
	0	0	3	1	3	3	2	3	2	3	3	0	0	0
	0	0	0	0	0	0	0	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	1	0	2	0	0	0	0

	0	0	0	0	1	1	1	3	0	0	0	0	2	2
	2	3	0	0	3	0	3	3	3	0	1	3	3	
11100000000														
14	AGROCAP		65	50	40	45	45	35	45	20	30	35	30	5
	20	20	35	30	45	25	45	45	45	5	25	0	0	0
	3	15	3	25	25	35	15	50	10	20	30	30	30	30
	25	30	45	45	40	55	20	50	15	10	15	25	10	15
	20	35	10	25	20	25	10	50	40	45	40	30	40	45
	5	5	30	50	30	10	10	15	0	50	65	75	65	55
	65	45	45	40	65	70	60	55	50	45	45	45	65	55
	60	65	65	40	40	60	20	35	20	45	17	30	25	30
	50	50	45	40	50	45	30	50	60	50	55	20	20	20
	70	50	55	10	45	40	45	25	60	40	25	60	60	75
	35	10	20	15	0	15	40	20	15	35	10	35	45	45
	40	35	50	55	40	15	15	25	15	45	50	45	70	40
	75	65	35	30	90	45	60	70	50	5	40	90	80	
11100000000														
17	DESCCES		0	0	0	0	0	10	0	0	0	0	1	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	15	0	0	0	0	0	0	0	0	0	0	3
	10	0	7	0	2	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	20	0	0	0	0	0	4	7	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	5	10	0	0	5	7	2	0	0	0	0	0	
11100000000														
28	CARDPRAT		0	0	0	0	0	0	0	0	0	0	0	0
	0	0	2	0	2	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	1	0	3	3	0	0
	0	0	0	0	0	0	2	3	0	3	0	1	2	1
	0	0	3	3	3	3	0	1	0	0	0	0	1	0
	0	0	0	0	0	0	0	0	0	0	3	3	0	0
	0	0	2	0	0	0	0	0	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	3	0	3	3
	0	0	0	0	2	0	0	0	0	0	1	0	0	0
	0	1	0	0	0	0	0	0	0	0	0	2	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	1	0	0	0
	0	0	3	0	1	0	2	4	3	0	1	3	3	
11101000000														
20	ELYTREP		0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	5	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	7	0	0	0	0	0	0
	0	5	0	5	0	0	0	5	0	0	0	0	0	4
	0	0	0	0	0	0	0	0	0	0	5	3	3	
11101000000														
43	RANUREP		0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	3	5	0	4
	0	0	20	30	0	0	20	10	0	25	0	0	0	7
	5	20	0	0	0	0	0	7	20	0	0	0	0	0
	0	0	3	0	0	0	0	0	0	0	0	7	1	4
	0	3	0	0	0	0	0	0	0	0	0	0	10	0
	0	3	35	0	0	7	0	0	0	3	10	3	0	0
	10	5	4	1	0	0	0	0	0	0	30	0	3	5
	0	0	4	1	0	2	0	0	0	0	3	15	0	0

	0	0	0	0	0	0	0	0	0	0	0	0	0	10
	7	10	20	0	8	55	4	0	60	0	3	20	0	0
	0	4	12	4	7	25	3	4	3	5	2	4	3	0
	3	50	25	40	4	4	15	0	0	20	0	0	0	
11101000000														
46	RUMCRIS		0	0	0	0	0	0	0	0	0	0	0	1
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	2	0	0	0	0
	2	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	2	0	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	1	0	0	0	0	0	0	0	0	0	0	2	0
	0	0	1	0	0	0	0	0	0	1	0	0	0	3
	0	1	0	0	2	0	0	0	0	2	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	2	0	0	0	0	0	0	0	0	0
	0	3	0	0	0	3	0	0	0	0	0	2	2	0
	1	0	0	0	2	0	0	0	0	0	1	2	2	
11101000000														
54	POTEREP		0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	1	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	2	0	0	0	1	0	0
	0	3	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	1	0	0	0	0	0	0
	0	0	0	1	0	0	0	0	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	4	0	0	0	0	0	0	0	0	0
	2	0	0	0	0	0	0	0	3	0	0	0	3	0
	2	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	3	3	
11110000000														
18	PHALARU		0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	3	0	0	0	0	0	0	0	
11110000000														
21	ALOPGEN		0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	40	3	20	
11110000000														
25	CARDIST		0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0

	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	15	0	0	20	10	0	15	5	
11110000000														
26	ELEOPAL		0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	15	30	20	
11110000000														
60	GALIPAL		0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	4	0	0	0	0	0	0	
11110000000														
61	LYSNUMM		0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	4	0	
11110000000														
62	ACHIPTA		0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	3	0	3	3	
11111000000														
36	LEONAUT		0	4	3	0	0	0	3	3	0	2	3	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	3	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	4	2	0	0

1	0	0	0	0	0	0	1	1	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	3	0	0	0	4	0	0	0
4	2	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	2	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	2	0	0	4	2	10	12	1	0	0	0	0	

Appendix 2 TWINSPAN outputs (2010 plus 2009 data)

QUADRAT DIVISION 1 Number of quadrates in cluster = 235
eigenvalue = 0.181331 number of iterations = 4
Indicators and their sign
RANUACR [-];
LOLPERR [-];
CARDPRAT [+];
The maximum indicator score for the negative group = 0
The minimum indicator score for the positive group = 1
Negative group: 2 Number of objects = 229 comprising:

18-1, 17-1, 17-2, 17-3, 17-4, 16-1, 16-2, 16-3, 16-4, 22-1, 22-2, 22-3, 17-5, 22-4, 20a-1, 20a-2, 20a-3, 20a-4, 20b-5, 6a-1, 6a-2, 6a-3, 6a-4, 18-2, 20b-6, 20b-7, 20b-8, 21-1, 21-2, 21-3, 21-4, 29-2, 24-7, 24-8, 30-1, 30-2, 28-1, 26-1, 28-2, 27-1, 27-2, 27-3, 27-4, 27-5, 27-6, 26-2, 25-1, 25-2, 25-3, 25-4, 25-5, 25-6, 25-7, 25-8, 26-3, 17-6, 17-7, 17-8, 3b-1, 3b-2, 3a-2, 3a-3, 3a-6, 4-4, 3a-5, 10a-7, 10a-8, 3a-4, 1-5, 1-6, SSSI-1, SSSI-2, SSSI-3, SSSI-4, SSSI-5, SSSI-6, 9a-1, 9a-2, 9a-3, 9a-4, 9a-5, 9a-6, 9b-7, 9b-8, 10b-1, 10b-2, 10a-3, 10a-4, 10a-5, 10a-6, 4-1, 4-2, 4-3, SSSI-7, 7-2, 7-3, 7-1, 8-1, 8-2, 8-3, 7-5, 7-4, 5-4, 5-1, 5-2, 5-3, 3a-1, 1-1, 1-2, 1-3, 1-4, 2-7, 2-6, 2-5, 2-4, 2-3, 2-8, 2-2, 2-1, 11-1, 11-2, 11-3, 11-6, 11-4, 11-5, 11-7, 11-8, 12-1, 12-2, 12-3, 12-4, 12-5, 12-6, 12-7, 12-8, 13b-1, 13b-2, 13b-3, 13b-4, 14-1, 14-2, 14-3, 14-4, 14-5, 14-6, 14-7, 14-8, 15a-1, 15a-2, 15a-3, 15a-4, 15a-5, 15a-6, 15b-7, 15b-8, 29-3, 31-4, 31-1, 31-2, 31-3, 13a-1, 13a-2, 23b-1, 23a-2, 23a-3, 23a-4, 23a-5, 24-1, 24-2, 24-3, 24-4, 24-5, 24-6, LR31-08, LR32-08, LR33-08, LR34-08, LR35-08, LR36-08, LR37-08, LR38-08, LR21-08, LR22-08, LR23-08, LR24-08, LR25-08, LR26-08, LR27-08, LR28-08, RPL31-08, RPL32-08, RPL33-08, RPL34-08, RPL35-08, RPL36-08, RPL37-08, RPL38-08, TP1-08, TP2-08, TP3-08, TP4-08, TP5-08, TP6-08, TP7-08, TP8-08, RPL21-08, RPL22-08, RPL23-08, RPL24-08, RPL25-08, RPL26-08, RPL27-08, RPL28-08, RPL11-08, RPL12-08, RPL13-08, RPL14-08, RPL15-08, RPL16-08, RPL17-08, RPL18-08, LR11-08, LR12-08, LR13-08, LR14-08, LR15-08, LR16-08, LR17-08, LR18-08,

The borderline negative group: Number of objects = 4 comprising:

30-1, 5-3, 29-3, 31-1,

The positive group: 3 Number of objects = 6 comprising:

29-1, 29-5, 29-6, 29-7, 29-8, 29-4,

The borderline positive group: Number of objects = 1 comprising:

29-6,

Variables preferring the negative group of quadrats

PHLEPRA 1 (108, 1) HOLCLAN 1 (158, 0) ANTHODO 1 (60, 0) BROCOMM 1 (147, 0) LOLPERR 1 (198, 0) HORDSEC 1 (107, 0) FESRUB 1 (161, 0) ALLIVIN 1 (57, 0) CIRSARV 1 (81, 0) HERASPHO 1 (53, 0) PLANLAN 1 (91, 0) RANUACR 1 (212, 0) RANUREP 1 (94, 1) TARAGG 1 (169, 0)

Variables biased towards the positive group of quadrats

DESCCES 1 (14, 2) ELYTREP 1 (7, 3) ALOPGEN 1 (0, 3) CARDIST 1 (2, 3) ELEOPAL 1 (0, 3) CARDPRAT 1 (42, 6) LEONAUT 1 (20, 3) OENASIL 1 (73, 6) RUMCRIS 1 (28, 3) POTEREP 1 (13, 2) ACHIPTA 1 (1, 2)

Variables with no quadrat preference

ALOPRAT 1 (219, 3) POATRIV 1 (215, 4) AGROCAP 1 (213, 6) CARHIRT 1 (67, 3) LATHPRAT 1 (189, 3) RUMACET 1 (211, 3)

END OF LEVEL 1

TWINSPAN QUADRAT CLASSIFICATION LEVEL 1

QUADRAT DIVISION 2 Number of quadrates in cluster = 229
eigenvalue = 0.166968 number of iterations = 4
Indicators and their sign

ANTHODO [-];
HERASPHO [-];
CIRSARV [-];
DACTGLO [-];
TRIFPRAT [-];
The maximum indicator score for the negative group = -3
The minimum indicator score for the positive group = -2
Negative group: 4 Number of objects = 42 comprising:

18-1, 17-1, 17-2, 17-3, 17-4, 22-4, 20a-1, 20a-2, 18-2, 26-1, 17-6, 17-7, 17-8, 3b-1, 3b-2, 1-5, 1-6, 9b-7, 9b-8, 10b-1, SSSI-7, 8-2, 1-2, 1-3, 1-4, 2-7, 2-6, 2-3, 2-8, 13b-3, 13b-4, 14-3, 14-6, 14-8, 15a-1, 15a-2, 15a-4, 15b-7, 13a-1, 13a-2, RPL26-08, RPL11-08,

The borderline negative group: Number of objects = 8 comprising:

20a-2, 2-7, 2-6, 13b-4, 15a-2, 15a-4, 13a-2, RPL26-08,

The misclassified negatives: Number of objects = 4 comprising:

3b-2, 8-2, 13b-3, 15b-7,

The positive group: 5 Number of objects = 187 comprising:

16-1, 16-2, 16-3, 16-4, 22-1, 22-2, 22-3, 17-5, 20a-3, 20a-4, 20b-5, 6a-1, 6a-2, 6a-3, 6a-4, 20b-6, 20b-7, 20b-8, 21-1, 21-2, 21-3, 21-4, 29-2, 24-7, 24-8, 30-1, 30-2, 28-1, 28-2, 27-1, 27-2, 27-3, 27-4, 27-5, 27-6, 26-2, 25-1, 25-2, 25-3, 25-4, 25-5, 25-6, 25-7, 25-8, 26-3, 3a-2, 3a-3, 3a-6, 4-4, 3a-5, 10a-7, 10a-8, 3a-4, SSSI-1, SSSI-2, SSSI-3, SSSI-4, SSSI-5, SSSI-6, 9a-1, 9a-2, 9a-3, 9a-4, 9a-5, 9a-6, 10b-2, 10a-3, 10a-4, 10a-5, 10a-6, 4-1, 4-2, 4-3, 7-2, 7-3, 7-1, 8-1, 8-3, 7-5, 7-4, 5-4, 5-1, 5-2, 5-3, 3a-1, 1-1, 2-5, 2-4, 2-2, 2-1, 11-1, 11-2, 11-3, 11-6, 11-4, 11-5, 11-7, 11-8, 12-1, 12-2, 12-3, 12-4, 12-5, 12-6, 12-7, 12-8, 13b-1, 13b-2, 14-1, 14-2, 14-4, 14-5, 14-7, 15a-3, 15a-5, 15a-6, 15b-8, 29-3, 31-4, 31-1, 31-2, 31-3, 23b-1, 23a-2, 23a-3, 23a-4, 23a-5, 24-1, 24-2, 24-3, 24-4, 24-5, 24-6, LR31-08, LR32-08, LR33-08, LR34-08, LR35-08, LR36-08, LR37-08, LR38-08, LR21-08, LR22-08, LR23-08, LR24-08, LR25-08, LR26-08, LR27-08, LR28-08, RPL31-08, RPL32-08, RPL33-08, RPL34-08, RPL35-08, RPL36-08, RPL37-08, RPL38-08, TP1-08, TP2-08, TP3-08, TP4-08, TP5-08, TP6-08, TP7-08, TP8-08, RPL21-08, RPL22-08, RPL23-08, RPL24-08, RPL25-08, RPL27-08, RPL28-08, RPL12-08, RPL13-08, RPL14-08, RPL15-08, RPL16-08, RPL17-08, RPL18-08, LR11-08, LR12-08, LR13-08, LR14-08, LR15-08, LR16-08, LR17-08, LR18-08,

The borderline positive group: Number of objects = 9 comprising:

17-5, 21-2, SSSI-5, 9a-2, 7-1, 5-4, 2-2, 15a-3, TP6-08,

The misclassified positive:Number of objects = 1 comprising:

26-2,

Variables preferring the negative group of quadrats

DACTGLO 1 (26, 7) ANTHODO 1 (33, 27) CYNCRIS 1 (18, 17) TRISFLAV 1 (11, 5) FESPRAT 1 (14, 12) CENTNIG 1 (18, 26) CIRSARV 1 (37, 44) HERASPHO 1 (32, 21) RANBULB 1 (9, 1) TRIFPRAT 1 (25, 16)

Variables biased towards the positive group of quadrats

HORDSEC 1 (10, 97) CARDPRAT 1 (4, 38) FILIULM 1 (0, 40) OENASIL 1 (0, 73) RANUREP 1 (7, 87)

Variables with no quadrat preference

ALOPRAT 1 (35, 184) PHLEPRA 1 (13, 95) HOLCLAN 1 (39, 119) BROCOMM 1 (24, 123) POATRIV 1 (35, 180) LOLPERR 1 (36, 162) AGROCAP 1 (39, 174) FESRUB 1 (38, 123) CARHIRT 1 (8, 59) ALLIVIN 1 (13, 44) LATHPRAT 1 (37, 152) PLANLAN 1 (20, 71) RANUACR 1 (41, 171) RUMACET 1 (38, 173) TARAGG 1 (33, 136)

QUADRAT DIVISION 3 Number of quadrates in cluster = 6
eigenvalue = 0.602649 number of iterations = 2
Indicators and their sign
ALOPRAT [-];
The maximum indicator score for the negative group = -1
The minimum indicator score for the positive group = 0
Negative group: 6 Number of objects = 3 comprising:

29-5, 29-6, 29-7,

The positive group: 7 Number of objects = 3 comprising:

29-1, 29-8, 29-4,

Variables preferring the negative group of quadrats

ALOPRAT 1 (3, 0) PHLEPRA 1 (1, 0) POATRIV 1 (3, 1) DESCCES 1 (2, 0) CARHIRT 1 (2, 1) FILIULM 1 (1, 0) LATHPRAT 1 (3, 0) LEONAUT 1 (3, 0) LOTCORN 1 (1, 0) RANUREP 1 (1, 0) RUMACET 1 (3, 0) SILASIL 1 (1, 0) GALIPAL 1 (1, 0)

Variables biased towards the positive group of quadrats

ELYTREP 1 (0, 3) ALOPGEN 1 (0, 3) CARDIST 1 (1, 2) ELEOPAL 1 (0, 3) RUMCRIS 1 (0, 3) POTEREP 1 (0, 2) LYSNUMM 1 (0, 1) ACHIPTA 1 (0, 2)

Variables with no quadrat preference

AGROCAP 1 (3, 3) CARDPRAT 1 (3, 3) OENASIL 1 (3, 3)

END OF LEVEL 2

TWINSPAN QUADRAT CLASSIFICATION LEVEL 2

QUADRAT DIVISION 4 Number of quadrates in cluster = 42
eigenvalue = 0.168599 number of iterations = 3
Indicators and their sign
CYNCRIS [-];
PLANLAN [+];
TRISFLAV [-];
TRIFPRAT [-];
ALLIVIN [-];
The maximum indicator score for the negative group = -2
The minimum indicator score for the positive group = -1
Negative group: 8 Number of objects = 15 comprising:

18-1, 17-1, 17-2, 17-3, 17-4, 22-4, 20a-1, 18-2, 17-6, 17-7, 17-8, 13b-4, 15b-7, 13a-1, 13a-2,

The borderline negative group: Number of objects = 2 comprising:

18-1, 13a-2,

The positive group: 9 Number of objects = 27 comprising:

20a-2, 26-1, 3b-1, 3b-2, 1-5, 1-6, 9b-7, 9b-8, 10b-1, SSSI-7, 8-2, 1-2, 1-3, 1-4, 2-7, 2-6, 2-3, 2-8, 13b-3, 14-3, 14-6, 14-8, 15a-1, 15a-2, 15a-4, RPL26-08, RPL11-08,

The borderline positive group: Number of objects = 2 comprising:

15a-1, 15a-4,

The misclassified positive:Number of objects = 2 comprising:

1-3, 14-8,

Variables preferring the negative group of quadrats

PHLEPRA 1 (7, 6) CYNCRIS 1 (12, 6) HORDSEC 1 (6, 4) TRISFLAV 1 (9, 2) CARHIRT 1 (6, 2) ALLIVIN 1 (9, 4) LEONAUT 1 (6, 0) LOTCORN 1 (6, 2) TRIFPRAT 1 (14, 11) TRIFREP 1 (6, 2) TRAGPRAT 1 (4, 2)

Variables biased towards the positive group of quadrats

BROHORD 1 (0, 6) FESPRAT 1 (2, 12) PLANLAN 1 (3, 17) RANUREP 1 (0, 7)

Variables with no quadrat preference

ALOPRAT 1 (12, 23) DACTGLO 1 (8, 18) HOLCLAN 1 (13, 26) ANTHODO 1 (14, 19) BROCOMM 1 (6, 18) POATRIV 1 (9, 26) LOLPERR 1 (14, 22) AGROCAP 1 (15, 24) FESRUB 1 (15, 23) CENTNIG 1 (5, 13) CIRSARV 1 (14, 23) HERASPHO 1 (10, 22) LATHPRAT 1 (15, 22) RANUACR 1 (15, 26) RANBULB 1 (4, 5) RUMACET 1 (13, 25) TARAGG 1 (10, 23)

QUADRAT DIVISION 5 Number of quadrates in cluster = 187
eigenvalue = 0.149242 number of iterations = 3
Indicators and their sign
FESRUB [-];
RANUREP [+];
HORDSEC [-];
CARHIRT [-];
PHLEPRA [-];
The maximum indicator score for the negative group = -1
The minimum indicator score for the positive group = 0
Negative group: 10 Number of objects = 137 comprising:

16-1, 16-2, 16-3, 16-4, 22-1, 22-2, 22-3, 17-5, 20a-3, 20a-4, 20b-5, 6a-2, 6a-4, 20b-6, 20b-7, 20b-8, 21-1, 21-2, 21-3, 21-4, 29-2, 24-7, 24-8, 30-1, 28-1, 28-2, 27-2, 27-3, 27-4, 27-5, 27-6, 25-1, 25-2, 25-3, 25-4, 25-5, 25-6, 25-7, 25-8, 3a-2, 3a-3, 3a-6, 3a-5, 10a-7, 10a-8, 3a-4, SSSI-6, 9a-1, 9a-2, 9a-3, 9a-4, 9a-6, 10b-2, 10a-3, 10a-4, 10a-5, 10a-6, 4-1, 4-2, 4-3, 7-2, 7-3, 7-1, 8-1, 8-3, 7-5, 7-4, 5-4, 5-1, 5-2, 5-3, 3a-1, 2-5, 2-2, 2-1, 11-1, 11-2, 11-3, 11-6, 11-4, 11-5, 11-7, 11-8, 12-1, 12-2, 12-4, 12-5, 12-6, 12-7, 12-8, 13b-1, 14-1, 14-2, 14-7, 15a-3, 15a-5, 15a-6, 15b-8, 29-3, 31-4, 31-1, 31-2, 31-3, 23b-1, 23a-2, 23a-3, 23a-4, 23a-5, 24-1, 24-2, 24-3, 24-4, 24-5, 24-6, LR31-08, LR32-08, LR33-08, LR34-08, LR35-08, LR36-08, LR37-08, LR38-08, LR21-08, LR25-08, LR26-08, LR27-08, LR28-08, RPL15-08, RPL18-08, LR11-08, LR12-08, LR13-08, LR14-08, LR15-08, LR16-08, LR17-08, LR18-08,

The borderline negative group: Number of objects = 12 comprising:

6a-4, 27-6, SSSI-6, 9a-3, 9a-4, 10a-4, 11-1, 12-1, 12-6, 14-7, LR21-08, RPL15-08,

The misclassified negatives: Number of objects = 4 comprising:

29-2, 30-1, 27-5, 31-3,

The positive group: 11 Number of objects = 50 comprising:

6a-1, 6a-3, 30-2, 27-1, 26-2, 26-3, 4-4, SSSI-1, SSSI-2, SSSI-3, SSSI-4, SSSI-5, 9a-5, 1-1, 2-4, 12-3, 13b-2, 14-4, 14-5, LR22-08, LR23-08, LR24-08, RPL31-08, RPL32-08, RPL33-08, RPL34-08, RPL35-08, RPL36-08, RPL37-08, RPL38-08, TP1-08, TP2-08, TP3-08, TP4-08, TP5-08, TP6-08, TP7-08, TP8-08, RPL21-08, RPL22-08, RPL23-08, RPL24-08, RPL25-08, RPL27-08, RPL28-08, RPL12-08, RPL13-08, RPL14-08, RPL16-08, RPL17-08,

The borderline positive group: Number of objects = 10 comprising:

6a-1, 6a-3, 4-4, 9a-5, 2-4, 14-4, 14-5, LR22-08, LR23-08, LR24-08,

The misclassified positive:Number of objects = 6 comprising:

26-2, 26-3, 12-3, TP2-08, RPL21-08, RPL12-08,

Variables preferring the negative group of quadrats

PHLEPRA 1 (84, 11) HORDSEC 1 (91, 6) FESRUB 1 (111, 12) CARHIRT 1 (59, 0) ALLIVIN 1 (43, 1) CARDPRAT 1 (35, 3) FILIULM 1 (37, 3) LOTCORN 1 (29, 1)

Variables biased towards the positive group of quadrats

BROHORD 1 (1, 13) AGROSTOL 1 (2, 14) CIRSARV 1 (21, 23) HERASPHO 1 (5, 16) RANUREP 1 (44, 43) RUMCRIS 1 (14, 13)

Variables with no quadrat preference

ALOPRAT 1 (136, 48) HOLCLAN 1 (78, 41) BROCOMM 1 (91, 32) POATRIV 1 (131, 49) LOLPERR 1 (115, 47) AGROCAP 1 (135, 39) LATHPRAT 1 (122, 30) OENASIL 1 (49, 24) PLANLAN 1 (45, 26) RANUACR 1 (129, 42) RUMACET 1 (125, 48) TARAGG 1 (97, 39)

QUADRAT DIVISION 6 Number of quadrates in cluster = 3
No division was undertaken as there are too few objects

QUADRAT DIVISION 7 Number of quadrates in cluster = 3
No division was undertaken as there are too few objects

END OF LEVEL 3

TWINSPAN QUADRAT CLASSIFICATION LEVEL 3

QUADRAT DIVISION 8 Number of quadrates in cluster = 15
eigenvalue = 0.158191 number of iterations = 4
Indicators and their sign
LOTCORN [-];
BROCOMM [+];
PHLEPRA [-];
DACTGLO [-];
The maximum indicator score for the negative group = -2
The minimum indicator score for the positive group = -1
Negative group: 16 Number of objects = 6 comprising:

17-1, 17-2, 17-3, 17-6, 17-7, 17-8,

The positive group: 17 Number of objects = 9 comprising:

18-1, 17-4, 22-4, 20a-1, 18-2, 13b-4, 15b-7, 13a-1, 13a-2,

The borderline positive group: Number of objects = 1 comprising:

18-2,

The misclassified positive:Number of objects = 1 comprising:

20a-1,

Variables preferring the negative group of quadrats

PHLEPRA 1 (5, 2) DACTGLO 1 (5, 3) CARHIRT 1 (4, 2) LUZCAMP 1 (3, 0) CENTNIG 1 (3, 2) LEONAUT 1 (4, 2) LEUCVULG 1 (3, 0) LOTCORN 1 (5, 1) SILASIL 1 (2, 0) QUERROB 1 (2, 0)

Variables biased towards the positive group of quadrats

BROCOMM 1 (0, 6) HORDSEC 1 (1, 5) GERDISS 1 (0, 2) PLANLAN 1 (0, 3) RANBULB 1 (1, 3) TRAGPRAT 1 (1, 3)

Variables with no quadrat preference

ALOPRAT 1 (5, 7) HOLCLAN 1 (6, 7) ANTHODO 1 (6, 8) POATRIV 1 (3, 6) LOLPERR 1 (5, 9) CYNCRIS 1 (6, 6) TRISFLAV 1 (3, 6) AGROCAP 1 (6, 9) FESRUB 1 (6, 9) ALLIVIN 1 (3, 6) CIRSARV 1 (5, 9) HERASPHO 1 (4, 6) LATHPRAT 1 (6, 9) RANUACR 1 (6, 9) RUMACET 1 (5, 8) TARAGG 1 (3, 7) TRIFPRAT 1 (6, 8) TRIFREP 1 (3, 3)

QUADRAT DIVISION 9 Number of quadrates in cluster = 27
eigenvalue = 0.144321 number of iterations = 6
Indicators and their sign
CENTNIG [+];
RANUREP [-];
BROHORD [-];
The maximum indicator score for the negative group = -1
The minimum indicator score for the positive group = 0
Negative group: 18 Number of objects = 10 comprising:

26-1, 1-5, 1-6, 10b-1, 1-2, 1-3, 1-4, 2-7, 2-6, RPL26-08,

The misclassified negatives: Number of objects = 1 comprising:

26-1,

The positive group: 19 Number of objects = 17 comprising:

20a-2, 3b-1, 3b-2, 9b-7, 9b-8, SSSI-7, 8-2, 2-3, 2-8, 13b-3, 14-3, 14-6, 14-8, 15a-1, 15a-2, 15a-4, RPL11-08,

The borderline positive group: Number of objects = 5 comprising:

3b-1, 9b-8, 13b-3, 14-6, 15a-2,

Variables preferring the negative group of quadrats

BROHORD 1 (5, 1) CERAFONT 1 (4, 1) RANBULB 1 (3, 2) RANUREP 1 (6, 1) CREPBIEN 1 (3, 0) ANTHSYL 1 (3, 1)

Variables biased towards the positive group of quadrats

BROCOMM 1 (4, 14) HORDSEC 1 (0, 4) ALLIVIN 1 (0, 4) CARDPRAT 1 (0, 4) CENTNIG 1 (0, 13) LOTPED 1 (0, 4)

Variables with no quadrat preference

ALOPRAT 1 (8, 15) PHLEPRA 1 (2, 4) DACTGLO 1 (9, 9) HOLCLAN 1 (10, 16) ANTHODO 1 (5, 14) POATRIV 1 (9, 17) LOLPERR 1 (8, 14) CYNCRIS 1 (2, 4) AGROCAP 1 (8, 16) FESRUB 1 (6, 17) FESPRAT 1 (5, 7) CIRSARV 1 (10, 13) HERASPHO 1 (10, 12) LATHPRAT 1 (6, 16) PLANLAN 1 (8, 9) RANUACR 1 (10, 16) RUMACET 1 (9, 16) TARAGG 1 (9, 14) TRIFPRAT 1 (3, 8)

QUADRAT DIVISION 10 Number of quadrates in cluster = 137
eigenvalue = 0.11093 number of iterations = 5
Indicators and their sign
HOLCLAN [-];
RANUREP [+];
PLANLAN [-];
ANTHODO [-];
ALLIVIN [-];
The maximum indicator score for the negative group = -1
The minimum indicator score for the positive group = 0
Negative group: 20 Number of objects = 87 comprising:

16-2, 16-3, 17-5, 20a-4, 6a-2, 20b-6, 21-1, 21-2, 21-3, 21-4, 24-7, 28-1, 28-2, 27-3, 27-4, 27-5, 25-1, 25-2, 25-3, 25-5, 25-6, 25-7, 25-8, 3a-5, 3a-4, 9a-1, 9a-2, 9a-6, 10b-2, 4-2, 7-2, 7-3, 7-1, 8-1, 8-3, 7-5, 7-4, 5-4, 2-5, 2-2, 2-1, 11-2, 11-3, 11-6, 11-4, 11-5, 11-7, 11-8, 12-1, 12-2, 12-4, 14-1, 14-2, 14-7, 15a-3, 15a-5, 15a-6, 15b-8, 23b-1, 23a-2, 23a-3, 23a-4, 23a-5, 24-1, 24-2, 24-3, 24-4, 24-5, 24-6, LR33-08, LR35-08, LR36-08, LR37-08, LR38-08, LR25-08, LR26-08, LR27-08, LR28-08, RPL15-08, RPL18-08, LR11-08, LR12-08, LR13-08, LR14-08, LR15-08, LR16-08, LR17-08,

The borderline negative group: Number of objects = 21 comprising:

16-2, 16-3, 6a-2, 21-3, 27-3, 25-1, 25-3, 25-5, 25-7, 3a-4, 9a-6, 4-2, 7-3, 11-4, 12-2, 23b-1, 23a-3, LR35-08, LR28-08, LR11-08, LR15-08,

The misclassified negatives: Number of objects = 1 comprising:

21-1,

The positive group: 21 Number of objects = 50 comprising:

16-1, 16-4, 22-1, 22-2, 22-3, 20a-3, 20b-5, 6a-4, 20b-7, 20b-8, 29-2, 24-8, 30-1, 27-2, 27-6, 25-4, 3a-2, 3a-3, 3a-6, 10a-7, 10a-8, SSSI-6, 9a-3, 9a-4, 10a-3, 10a-4, 10a-5, 10a-6, 4-1, 4-3, 5-1, 5-2, 5-3, 3a-1, 11-1, 12-5, 12-6, 12-7, 12-8, 13b-1, 29-3, 31-4, 31-1, 31-2, 31-3, LR31-08, LR32-08, LR34-08, LR21-08, LR18-08,

The borderline positive group: Number of objects = 4 comprising:

20a-3, 6a-4, 24-8, 27-6,

The misclassified positive:Number of objects = 8 comprising:

20b-5, 20b-7, 10a-6, 5-3, 12-7, LR31-08, LR32-08, LR21-08,

Variables preferring the negative group of quadrats

HOLCLAN 1 (66, 12) ANTHODO 1 (24, 1) ALLIVIN 1 (40, 3) CENTNIG 1 (24, 0) LOTCORN 1 (25, 4) PLANLAN 1 (38, 7)

Variables biased towards the positive group of quadrats

RANUREP 1 (12, 32)

Variables with no quadrat preference

ALOPRAT 1 (86, 50) PHLEPRA 1 (48, 36) BROCOMM 1 (65, 26) POATRIV 1 (81, 50) LOLPERR 1 (78, 37) HORDSEC 1 (53, 38) AGROCAP 1 (85, 50) FESRUB 1 (80, 31) CARHIRT 1 (42, 17) CARDPRAT 1 (17, 18) FILIULM 1 (27, 10) LATHPRAT 1 (84, 38) OENASIL 1 (25, 24) RANUACR 1 (84, 45) RUMACET 1 (81, 44) TARAGG 1 (68, 29)

QUADRAT DIVISION 11 Number of quadrates in cluster = 50
eigenvalue = 0.159311 number of iterations = 4
Indicators and their sign
LATHPRAT [-];
ANTHSYL [+];
HERASPHO [+];
GERDISS [+];
The maximum indicator score for the negative group = 0
The minimum indicator score for the positive group = 1
Negative group: 22 Number of objects = 36 comprising:

6a-1, 6a-3, 30-2, 27-1, 4-4, SSSI-1, SSSI-4, 9a-5, 1-1, 2-4, 12-3, 13b-2, 14-4, 14-5, LR22-08, LR23-08, LR24-08, RPL31-08, RPL32-08, RPL33-08, RPL34-08, RPL35-08, RPL36-08, RPL37-08, RPL38-08, RPL21-08, RPL22-08, RPL23-08, RPL24-08, RPL25-08, RPL27-08, RPL28-08, RPL12-08, RPL13-08, RPL14-08, RPL16-08,

The borderline negative group: Number of objects = 2 comprising:

RPL32-08, RPL28-08,

The misclassified negatives: Number of objects = 1 comprising:

27-1,

The positive group: 23 Number of objects = 14 comprising:

26-2, 26-3, SSSI-2, SSSI-3, SSSI-5, TP1-08, TP2-08, TP3-08, TP4-08, TP5-08, TP6-08, TP7-08, TP8-08, RPL17-08,

The borderline positive group: Number of objects = 1 comprising:

SSSI-3,

Variables preferring the negative group of quadrats

LATHPRAT 1 (29, 1) PLANLAN 1 (22, 4)

Variables biased towards the positive group of quadrats

BROHORD 1 (4, 9) HORDSEC 1 (3, 3) AGROSTOL 1 (7, 7) CERAFONT 1 (2, 4) CIRSARV 1 (12, 11) GERDISS 1 (1, 9) HERASPHO 1 (6, 10) ANTHSYL 1 (0, 8)

Variables with no quadrat preference

ALOPRAT 1 (35, 13) PHLEPRA 1 (7, 4) HOLCLAN 1 (28, 13) BROCOMM 1 (24, 8) POATRIV 1 (35, 14) LOLPERR 1 (33, 14) AGROCAP 1 (31, 8) FESRUB 1 (10, 2) OENASIL 1 (19, 5) RANUACR 1 (33, 9) RANUREP 1 (33, 10) RUMACET 1 (35, 13) RUMCRIS 1 (9, 4) TARAGG 1 (27, 12)

END OF LEVEL 4
THIS IS THE END OF THE DIVISIONS REQUESTED

TWINSPAN QUADRAT CLASSIFICATION LEVEL 4

VARIABLE DIVISION 1 Number of Variables in cluster = 70
eigenvalue = 0.376376 number of iterations = 3
Negative group: 2 Number of objects = 51 comprising:

ALOPRAT, PHLEPRA, DACTGLO, HOLCLAN, ANTHODO, BROHORD, BROCOMM, POATRIV, LOLPERR, CYNCRIS, HORDSEC, TRISFLAV, AGROSTOL, FESRUB, FESPRAT, PHALARU, FESTULOL, POAPRAT, LUZCAMP, ALLIVIN, CENTNIG, CERAFONT, CIRSARV, GERDISS, HERASPHO, LATHPRAT, LEUCVULG, PLANLAN, RANUACR, RANBULB, RANUFIC, RUMACET, TARAGG, TRIFDUB, TRIFPRAT, TRIFREP, VICCRAC, TRAGPRAT, STEGRAM, LOTPED, RHINMIN, QUERROB, SANGOFF, EQUIARV, CREPBIEN, ACHIMILL, ANTHSYL, GALIAPA, VICSATI, KINPRA, FRITMEL,

The positive group: 3 Number of objects = 19 comprising:

AGROCAP, DESCCES, ELYTREP, ALOPGEN, CARHIRT, CARDIST, ELEOPAL, CARDPRAT, FILIULM, LEONAUT, LOTCORN, OENASIL, RANUREP, RUMCRIS, SILASIL, POTEREP, GALIPAL, LYSNUMM, ACHIPTA,

END OF LEVEL 1

TWINSPAN VARIABLE CLASSIFICATION LEVEL 1

VARIABLE DIVISION 2 Number of Variables in cluster = 51
eigenvalue = 0.256601 number of iterations = 2
Negative group: 4 Number of objects = 47 comprising:

PHLEPRA, DACTGLO, HOLCLAN, ANTHODO, BROHORD, BROCOMM, LOLPERR, CYNCRIS, HORDSEC, TRISFLAV, AGROSTOL, FESRUB, FESPRAT, PHALARU, FESTULOL, POAPRAT, LUZCAMP, ALLIVIN, CENTNIG, CERAFONT, CIRSARV, GERDISS, HERASPHO, LEUCVULG, PLANLAN, RANUACR, RANBULB, RANUFIC, TARAGG, TRIFDUB, TRIFPRAT, TRIFREP, VICCRAC, TRAGPRAT, STEGRAM, LOTPED, RHINMIN, QUERROB, SANGOFF, EQUIARV, CREPBIEN, ACHIMILL, ANTHSYL, GALIAPA, VICSATI, KINPRA, FRITMEL,

The positive group: 5 Number of objects = 4 comprising:

ALOPRAT, POATRIV, LATHPRAT, RUMACET,

VARIABLE DIVISION 3 Number of Variables in cluster = 19
eigenvalue = 0.522216 number of iterations = 3
Negative group: 6 Number of objects = 6 comprising:

CARDIST, OENASIL, RANUREP, RUMCRIS, POTEREP, ACHIPTA,

The positive group: 7 Number of objects = 13 comprising:

AGROCAP, DESCCES, ELYTREP, ALOPGEN, CARHIRT, ELEOPAL, CARDPRAT, FILIULM, LEONAUT, LOTCORN, SILASIL, GALIPAL, LYSNUMM,

END OF LEVEL 2

TWINSPAN VARIABLE CLASSIFICATION LEVEL 2

VARIABLE DIVISION 4 Number of Variables in cluster = 47
eigenvalue = 0.190598 number of iterations = 2
Negative group: 8 Number of objects = 35 comprising:

DACTGLO, HOLCLAN, ANTHODO, BROHORD, BROCOMM, LOLPERR, CYNCRIS, TRISFLAV, FESRUB, FESPRAT, FESTULOL, LUZCAMP, ALLIVIN, CENTNIG, CERAFONT, CIRSARV, GERDISS, HERASPHO, LEUCVULG, PLANLAN, RANUACR, RANBULB, TARAGG, TRIFPRAT, TRIFREP, VICCRAC, TRAGPRAT, LOTPED, RHINMIN, QUERROB, EQUIARV, CREPBIEN, ACHIMILL, ANTHSYL, VICSATI,

The positive group: 9 Number of objects = 12 comprising:

PHLEPRA, HORDSEC, AGROSTOL, PHALARU, POAPRAT, RANUFIC, TRIFDUB, STEGRAM, SANGOFF, GALIAPA, KINPRA, FRITMEL,

---

VARIABLE DIVISION 5 Number of Variables in cluster = 4
No division was undertaken as there are too few objects

VARIABLE DIVISION 6 Number of Variables in cluster = 6
eigenvalue = 0.267638 number of iterations = 2
Negative group: 12 Number of objects = 1 comprising:

RANUREP,

The positive group: 13 Number of objects = 5 comprising:

CARDIST, OENASIL, RUMCRIS, POTEREP, ACHIPTA,

VARIABLE DIVISION 7 Number of Variables in cluster = 13
eigenvalue = 0.408318 number of iterations = 3
Negative group: 14 Number of objects = 10 comprising:

AGROCAP, DESCCES, ELYTREP, ALOPGEN, ELEOPAL, CARDPRAT, LEONAUT, SILASIL, GALIPAL, LYSNUMM,

The positive group: 15 Number of objects = 3 comprising:

CARHIRT, FILIULM, LOTCORN,

END OF LEVEL 3

TWINSPAN VARIABLE CLASSIFICATION LEVEL 3

VARIABLE DIVISION 8 Number of Variables in cluster = 35
eigenvalue = 0.111412 number of iterations = 2
Negative group: 16 Number of objects = 25 comprising:

DACTGLO, ANTHODO, BROHORD, CYNCRIS, TRISFLAV, FESPRAT, FESTULOL, LUZCAMP, CENTNIG, CERAFONT, CIRSARV, HERASPHO, LEUCVULG, RANBULB, TRIFPRAT, TRIFREP, TRAGPRAT, LOTPED, RHINMIN, QUERROB, EQUIARV, CREPBIEN, ACHIMILL, ANTHSYL, VICSATI,

The positive group: 17 Number of objects = 10 comprising:

HOLCLAN, BROCOMM, LOLPERR, FESRUB, ALLIVIN, GERDISS, PLANLAN, RANUACR, TARAGG, VICCRAC,

VARIABLE DIVISION 9 Number of Variables in cluster = 12
eigenvalue = 0.154351 number of iterations = 2
Negative group: 18 Number of objects = 10 comprising:

AGROSTOL, PHALARU, POAPRAT, RANUFIC, TRIFDUB, STEGRAM, SANGOFF, GALIAPA, KINPRA, FRITMEL,

The positive group: 19 Number of objects = 2 comprising:

PHLEPRA, HORDSEC,

VARIABLE DIVISION 12 Number of Variables in cluster = 1
No division was undertaken as there are too few objects

VARIABLE DIVISION 13 Number of Variables in cluster = 5
eigenvalue = 0.193435 number of iterations = 1
Negative group: 26 Number of objects = 2 comprising:

CARDIST, ACHIPTA,

The positive group: 27 Number of objects = 3 comprising:

OENASIL, RUMCRIS, POTEREP,

VARIABLE DIVISION 14 Number of Variables in cluster = 10
eigenvalue = 0.321857 number of iterations = 4
Negative group: 28 Number of objects = 7 comprising:

ELYTREP, ALOPGEN, ELEOPAL, LEONAUT, SILASIL, GALIPAL, LYSNUMM,

The positive group: 29 Number of objects = 3 comprising:

AGROCAP, DESCCES, CARDPRAT,

VARIABLE DIVISION 15 Number of Variables in cluster = 3
No division was undertaken as there are too few objects

END OF LEVEL 4
THIS IS THE END OF THE DIVISIONS REQUESTED

TWINSPAN VARIABLE CLASSIFICATION LEVEL 4

ORDER OF VARIABLES INCLUDING RARER ONES

3, 5, 6, 10, 12, 16, 19, 24, 29, 30, 31, 34, 37, 42, 50, 51, 53, 56, 57, 58, 63, 64, 65, 66, 68, 4, 7, 9, 15, 27, 33, 40, 41, 48, 52, 13, 18, 22, 44, 49, 55, 59, 67, 69, 70, 2, 11, 1, 8, 35, 45, 43, 25, 62, 39, 46, 54, 20, 21, 26, 36, 47, 60, 61, 14, 17, 28, 23, 32, 38,

ORDER OF SAMPLES

2, 3, 4, 61, 62, 63, 1, 5, 14, 15, 24, 144, 159, 167, 168, 43, 74, 75, 90, 114, 115, 116, 117, 118, 217, 16, 64, 65, 88, 89, 99, 104, 121, 122, 143, 147, 150, 152, 153, 154, 156, 220, 7, 8, 13, 18, 21, 25, 28, 29, 30, 31, 34, 42, 44, 47, 48, 49, 52, 53, 54, 56, 57, 58, 59, 70, 73, 82, 83, 87, 91, 97, 100, 101, 102, 103, 105, 106, 107, 108, 119, 123, 124, 126, 127, 128, 129, 130, 131, 132, 133, 134, 136, 145, 146, 151, 155, 157, 158, 160, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 182, 184, 185, 186, 187, 192, 193, 194, 195, 224, 227, 228, 229, 230, 231, 232, 233, 234, 6, 9, 10, 11, 12, 17, 19, 23, 26, 27, 33, 35, 40, 46, 50, 55, 66, 67, 68, 71, 72, 81, 84, 85, 92, 93, 94, 95, 96, 98, 109, 110, 111, 112, 125, 137, 138, 139, 140, 141, 161, 162, 163, 164, 165, 180, 181, 183, 188, 235, 20, 22, 41, 45, 69, 76, 79, 86, 113, 120, 135, 142, 148, 149, 189, 190, 191, 196, 197, 198, 199, 200, 201, 202, 203, 212, 213, 214, 215, 216, 218, 219, 221, 222, 223, 225, 51, 60, 77, 78, 80, 204, 205, 206, 207, 208, 209, 210, 211, 226, 36, 37, 38, 32, 39, 166,

10000000000

3	DACTGLO		5	1	5	0	1	5	7	0	0	3	25	0
	0	0	0	7	8	0	7	10	10	5	7	15	1	0
	2	0	0	0	0	0	2	0	15	2	3	3	35	15
	5	0	0	0	0	0	0	5	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	10	0	0	0	0	25	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	3	0	0	0	0	7	0	0	0	0	0	0
	0	0	0	0	0	0	1	0	0	0	0	0	0	

10000000000

5	ANTHODO		20	15	20	15	7	7	7	20	15	15	15	5
	20	5	0	0	10	5	0	5	5	15	0	0	0	10
	2	5	10	0	5	7	25	20	0	10	15	10	10	10
	0	3	0	0	10	10	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	5	0	0	5	0	0
	5	0	0	0	10	10	7	7	5	10	4	5	10	10
	10	0	4	0	0	0	0	7	0	0	0	5	7	0
	0	0	0	20	0	0	0	0	0	0	0	0	0	0
	0	1	0	0	3	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	4	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	5	0	0	10	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	

10000000000

6	BROHORD		0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	10	5	5	5	5	0	0	0
	0	0	0	8	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0

	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	1	0	0
	6	0	0	6	0	0	1	3	0	5	0	10	0	0
	6	6	10	1	1	0	10	0	0	0	0	0	0	
10000000000														
10	CYNCRIS		10	10	10	7	7	7	25	7	10	7	10	0
	20	0	0	0	0	0	0	0	5	10	0	0	0	0
	0	0	10	0	0	3	0	0	0	0	5	10	0	0
	0	0	0	0	10	0	0	5	0	5	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	5	0	7	0	3	0	0	0	0	0	0	5	0	0
	0	10	0	0	0	0	0	15	0	0	10	5	0	0
	0	0	15	0	0	0	0	4	0	0	0	0	0	0
	0	3	0	0	6	10	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	5	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	
10000000000														
12	TRISFLAV		15	5	10	0	0	0	5	2	15	7	15	0
	15	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	5	0	0	0	0	0	0	0	4	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	4	0	0	0	0	0	0	0	0	0	0	0
	3	0	7	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	3	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	3	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	
10000000000														
16	FESPRAT		0	0	0	0	0	2	5	0	0	0	0	0
	0	0	0	3	10	8	0	3	10	0	0	0	0	10
	20	15	10	0	0	3	15	10	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	8	8	0
	0	0	0	0	0	5	5	0	0	0	0	0	0	5
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	4	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	4	0	10	0	2
	0	0	0	0	0	0	0	10	0	0	5	0	5	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	
10000000000														
19	FESTULOL		0	0	0	0	0	0	0	2	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0

	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	7	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	
10000000000														
24	LUZCAMP		0	2	3	0	0	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	
10000000000														
29	CENTNIG		1	12	0	0	3	0	0	0	0	2	0	0
	2	0	0	0	0	0	0	0	0	0	0	0	0	2
	0	3	4	3	2	3	1	3	4	4	4	10	0	0
	0	3	0	0	0	3	0	0	0	0	0	0	1	0
	10	0	0	0	0	0	0	0	0	1	0	0	0	3
	2	0	0	1	0	0	0	3	4	0	1	0	0	0
	0	0	0	2	0	2	2	3	0	0	3	2	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	3	3
	0	3	0	1	0	0	0	1	6	0	0	3	0	0
	0	0	0	0	1	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	4	3	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	
10000000000														
30	CERAFONT		0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	1	1	1	0	2	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	2	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	2	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	3	3	1
	0	0	6	0	0	0	0	0	0	0	0	3	0	
10000000000														
31	CIRSARV		5	2	0	3	3	4	4	2	4	1	3	5
	4	10	4	3	3	2	4	3	3	3	3	2	1	10

	3	1	3	5	2	4	2	2	0	0	0	2	3	2
	2	0	0	0	0	0	0	4	3	3	0	2	0	0
	0	0	0	0	0	0	0	3	0	0	2	0	0	0
	0	0	0	0	0	0	2	0	0	0	0	0	0	2
	1	2	0	0	0	0	0	0	0	0	0	2	0	4
	2	3	5	0	0	0	0	0	0	0	0	2	0	0
	7	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	20	0	3	0
	0	0	0	0	0	2	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	10	0	0	0	0	0	0	0	0	0	0	3
	0	0	0	0	0	0	0	3	0	0	25	15	4	0
	0	0	0	0	0	0	0	0	1	0	3	0	3	6
	16	3	10	0	0	0	0	3	7	8	4	5	1	1
	1	6	0	0	10	3	0	0	0	0	0	0	0	
10000000000														
34	HERASPHO		3	0	4	1	0	3	5	0	7	2	3	0
	0	2	2	25	2	3	7	10	10	4	7	15	1	0
	3	0	2	3	5	0	2	3	4	2	3	0	3	0
	3	3	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	2	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	2	0	0	0	0	0
	3	0	0	1	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	12	0	0	0	0	0	0	0	4	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	1	6	0
	0	0	0	10	3	0	0	30	7	0	0	4	6	0
	10	3	3	10	1	0	1	0	0	0	0	0	0	
10000000000														
37	LEUCVULG		0	3	3	0	0	15	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	2	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	
10000000000														
42	RANBULB		0	0	1	0	0	0	1	2	0	2	0	0
	0	0	0	0	0	0	0	3	3	3	0	0	0	0
	0	0	0	0	2	0	0	0	0	0	0	0	1	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0

	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	
10000000000														
50	TRIFPRAT		3	2	2	5	4	4	2	3	3	2	2	1
	0	4	3	0	0	0	0	3	3	3	0	0	0	2
	0	0	2	3	3	0	0	0	0	3	0	4	2	0
	0	1	0	0	0	0	0	0	4	2	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	2	0	2	0	0	0	0	0	0	0	0	0	0	0
	0	2	3	0	0	0	0	0	0	0	2	0	3	2
	0	0	0	0	0	0	0	2	0	0	0	0	0	0
	0	1	0	0	1	10	0	0	6	0	3	3	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	
10000000000														
51	TRIFREP		4	3	0	0	0	2	0	0	1	0	1	0
	0	2	0	0	0	0	0	0	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	3	0	0	0
	0	0	0	0	2	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	3	0	0	0	0	0	0	0	0	0	0	2
	0	0	0	0	0	0	0	0	0	0	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	3	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	
10000000000														
53	TRAGPRAT		0	0	0	0	0	2	2	0	0	3	0	0
	0	3	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	2	0
	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	2	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	
10000000000														
56	LOTPED		0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	1	0	0	3	0	3	3	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	3	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	2
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	3	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0

	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	
10000000000														
57	RHINMIN		0	0	0	0	0	0	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	
10000000000														
58	QUERROB		0	1	0	0	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	
10000000000														
63	EQUIARV		0	0	0	0	0	0	0	2	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	3	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	2	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	
10000000000														
64	CREPBIEN		0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	2	2	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0

	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	
10000000000														
65	ACHIMILL		0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	2	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	
10000000000														
66	ANTHSYL		0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	4	0	0	0	0	0	0	0	3	1	0
	0	0	0	0	0	0	0	0	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	1	0	0	3	1	0
	3	1	1	10	0	3	0	0	0	0	0	0	0	
10000000000														
68	VICSATI		0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	1	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	3
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	
10001000000														
4	HOLCLAN		25	45	20	30	25	10	30	25	15	10	0	0
	55	15	5	20	25	10	30	10	10	15	10	8	6	15
	17	20	15	20	0	10	4	15	5	25	35	25	35	40
	25	23	15	0	35	5	25	25	0	7	0	0	0	5
	0	0	0	2	0	0	0	7	0	0	0	15	3	15

	7	15	20	5	5	10	7	7	15	15	5	7	3	10
	15	0	7	5	4	5	0	7	15	0	7	10	7	30
	25	50	50	55	7	4	3	4	5	10	0	0	0	2
	0	6	6	6	10	6	6	6	6	10	6	10	6	3
	3	3	6	3	3	0	0	0	0	0	0	5	10	5
	0	0	0	0	0	0	0	0	0	0	0	0	10	0
	20	0	0	0	0	0	7	0	0	4	0	0	0	0
	2	0	0	0	0	0	0	0	3	6	0	10	1	20
	10	0	5	0	15	40	0	15	0	3	0	30	40	0
	3	0	10	10	16	16	10	10	10	6	0	3	6	10
	6	10	10	10	16	16	3	15	35	15	15	15	6	10
	10	10	10	16	16	10	0	0	0	0	0	0	0	
10001000000														
7	BROCOMM		0	0	0	0	0	0	5	0	5	0	5	0
	5	3	2	2	0	0	3	3	0	0	0	0	10	5
	2	0	7	8	3	0	10	10	0	5	5	7	5	3
	3	1	0	0	0	0	3	2	5	5	5	0	2	2
	3	5	7	3	0	0	0	0	0	0	0	10	10	5
	5	5	10	0	3	0	5	0	0	7	0	0	5	5
	5	5	4	3	4	2	2	3	3	2	3	5	5	7
	3	7	5	7	3	2	4	3	4	0	2	0	2	0
	2	3	6	10	6	10	1	6	6	10	3	3	1	3
	3	0	3	1	1	0	0	0	0	0	0	4	3	1
	5	0	2	0	0	3	0	0	0	0	4	5	5	5
	10	7	7	5	5	0	3	2	4	0	0	0	0	0
	2	3	0	0	0	0	1	0	10	3	3	3	1	5
	0	0	3	0	12	8	3	0	8	3	0	7	1	0
	1	3	1	3	6	3	6	10	6	6	10	0	6	0
	0	6	10	0	0	0	3	0	0	10	10	1	6	0
	6	6	0	0	6	3	0	0	0	0	0	0	0	
10001000000														
9	LOLPERR		10	15	0	5	5	5	30	2	5	5	10	25
	30	5	15	5	8	8	30	0	15	15	10	0	16	0
	15	20	50	20	3	5	0	10	20	25	20	20	20	35
	0	16	7	10	15	10	10	5	7	7	20	5	5	15
	10	7	10	7	7	10	10	7	15	5	4	5	0	20
	20	30	35	0	0	0	0	5	15	7	7	0	0	5
	0	15	20	25	35	35	30	20	30	40	45	20	15	35
	15	40	35	15	15	15	15	20	10	0	15	5	10	15
	5	16	16	16	10	16	23	16	23	16	23	23	16	10
	6	16	16	10	10	10	10	5	0	0	5	7	50	5
	5	10	15	0	15	15	5	15	0	0	20	35	40	10
	25	20	20	20	15	0	0	0	0	0	0	20	25	20
	40	25	10	0	5	0	1	5	16	16	16	32	6	7
	10	0	10	15	40	60	10	15	3	35	0	20	35	0
	10	16	16	16	16	23	16	16	16	23	23	23	23	23
	10	10	10	23	23	16	23	15	15	35	40	45	16	16
	16	10	16	10	16	16	23	0	0	0	0	0	0	
10001000000														
15	FESRUB		15	5	15	7	10	15	15	10	10	50	25	15
	20	15	15	7	0	5	0	10	30	15	0	10	0	50
	15	10	10	15	7	7	15	20	25	10	10	15	15	15
	15	10	10	15	7	35	15	20	25	30	5	5	10	0
	20	25	20	20	20	20	20	7	15	15	5	10	10	0
	5	0	10	7	10	0	20	10	0	15	10	10	15	5
	15	10	3	5	3	1	7	7	4	5	10	10	10	10
	15	10	10	20	15	10	20	10	15	10	40	10	15	25
	15	6	0	1	1	10	10	3	0	3	6	10	3	10
	3	10	10	3	10	10	10	10	0	10	45	45	5	15
	25	0	10	0	15	0	25	15	10	15	0	0	15	0
	0	0	0	0	5	10	5	10	20	7	5	0	0	0
	5	5	15	0	0	0	10	0	0	3	1	3	6	30
	0	0	10	0	0	0	0	5	0	0	5	10	15	0
	6	0	0	0	0	0	0	0	0	0	0	1	0	0
	0	0	0	16	10	0	0	5	5	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	

10001000000														
27	ALLIVIN		3	0	0	0	2	2	0	1	0	3	0	3
	2	2	1	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	3	3	0	0	1	0	0	0	0	0
	2	0	0	2	0	2	0	0	0	3	2	0	0	3
	2	2	3	4	2	2	1	2	3	2	2	0	0	0
	2	0	0	0	0	0	2	3	0	0	3	0	0	0
	0	2	3	2	0	1	1	1	1	2	2	3	0	0
	0	0	0	2	0	0	2	2	2	0	1	1	1	3
	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	3	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	0	0	2	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	
10001000000														
33	GERDISS		0	0	0	0	0	0	2	0	0	1	0	0
	0	0	0	2	0	0	2	0	0	0	0	0	0	0
	0	0	0	2	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	3
	0	0	0	1	1	0	0	0	2	1	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	1	0	0	0	0	1
	0	0	0	0	0	0	0	0	0	0	0	2	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	2	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	1	3	3	3	1	1
	1	0	6	0	0	1	0	0	0	0	0	0	0	
10001000000														
40	PLANLAN		0	0	0	0	0	0	3	0	3	3	0	0
	0	0	0	3	3	3	0	3	0	7	3	3	6	0
	0	0	2	2	3	3	2	0	0	3	4	4	0	0
	0	6	0	0	0	3	2	0	0	3	0	1	3	0
	3	0	2	0	0	0	0	0	0	0	1	3	0	0
	3	3	3	0	0	0	0	3	3	0	0	0	3	0
	3	4	5	2	2	3	3	0	2	0	2	4	3	4
	0	0	0	0	0	0	0	0	2	0	0	3	0	4
	3	1	6	0	0	1	1	0	0	0	6	6	0	0
	0	1	0	0	0	0	0	0	0	0	0	0	0	1
	0	0	4	0	0	0	0	0	0	0	0	0	0	3
	0	0	0	0	2	0	0	0	0	0	0	1	0	0
	0	2	0	0	0	0	0	0	0	0	0	3	0	2
	0	0	3	0	0	2	0	3	3	4	0	4	3	3
	6	0	0	0	0	0	0	6	0	3	3	6	6	6
	1	6	0	6	6	6	6	0	1	0	2	0	0	0
	1	0	0	0	0	0	3	0	0	0	0	0	0	
10001000000														
41	RANUACR		4	1	1	3	2	2	3	2	2	4	4	5
	10	2	2	4	20	30	3	7	10	5	10	25	3	2
	15	30	3	8	4	5	30	8	4	7	25	0	4	15
	10	10	4	3	1	4	0	2	3	2	0	3	5	10
	10	5	4	4	5	7	7	7	7	5	7	25	15	4
	7	7	10	3	15	3	7	5	7	10	3	6	15	5
	10	4	4	4	4	5	4	4	10	15	10	15	15	10
	10	7	4	10	0	3	4	3	3	5	4	4	3	7
	4	10	10	10	16	16	16	23	16	16	16	16	10	10
	10	10	10	23	10	4	0	3	1	2	3	3	0	4
	0	1	7	0	2	2	10	4	4	5	2	5	12	4
	3	7	5	4	4	30	4	5	4	4	4	5	4	3
	10	15	4	1	3	0	1	3	10	10	16	6	10	5
	2	0	7	3	0	40	3	30	15	4	2	15	4	6

	16	16	16	10	16	16	10	6	6	10	0	10	6	10
	1	23	23	16	10	23	10	3	3	0	0	12	16	16
	16	0	0	32	23	32	0	0	0	0	0	0	0	
10001000000														
48	TARAGG		2	0	2	0	0	2	3	0	3	2	2	0
	1	2	2	1	3	3	0	4	4	5	5	15	6	2
	3	3	2	2	4	3	3	5	0	0	0	3	3	3
	3	1	2	2	0	3	0	2	0	3	2	1	1	2
	2	2	2	1	2	3	3	2	2	2	2	3	0	1
	1	2	0	2	3	0	3	3	3	3	2	0	3	2
	1	2	3	2	2	3	1	0	1	1	2	0	1	2
	3	2	3	0	1	4	4	2	3	1	0	1	2	0
	0	3	1	1	1	6	1	1	1	1	6	3	0	0
	0	1	0	0	0	3	0	0	0	2	5	3	2	2
	2	1	1	0	0	1	2	0	0	0	0	1	1	2
	0	3	0	1	0	0	3	0	0	0	3	2	2	2
	2	1	2	0	0	0	0	0	3	1	1	1	1	0
	0	0	2	0	0	0	1	3	0	2	0	2	2	0
	6	3	1	3	3	3	3	3	3	3	6	6	6	6
	1	6	6	6	6	6	6	2	2	2	0	1	3	3
	6	3	6	0	3	3	1	0	0	0	0	0	0	
10001000000														
52	VICCRAC		0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	3	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	3	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	2	0	0	0	0	0	0	7	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	5	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	5	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	
10010000000														
13	AGROSTOL		0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	5	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	6	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	3	0	0	0	0	0
	0	0	6	16	10	0	6	6	6	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	10	0	6	10
	0	6	6	10	10	0	0	0	0	0	0	0		
10010000000														
18	PHALARU		0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0

	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	3	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	
10010000000														
22	POAPRAT		0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	3	0	0	0	0	0	0	0	0	0
	0	0	3	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	5	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	3	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	
10010000000														
44	RANUFIC		0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	1	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	
10010000000														
49	TRIFDUB		0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	
10010000000														
55	STEGRAM		0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	1	0	0	0	0	0	0
	0	0	0	0	0	0	2	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0

	0	0	0	0	0	0	3	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	3	0	0	0	0	0	0	0	0
	0	2	0	0	0	0	4	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	
10010000000														
59	SANGOFF		0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	15	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	
10010000000														
67	GALIAPA		0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	
10010000000														
69	KINPRA		0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	
10010000000														
70	FRITMEL		0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0

	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	
10011000000														
2	PHLEPRA		3	0	1	5	5	5	0	0	0	1	0	0
	0	0	5	7	0	0	0	0	0	0	0	0	3	0
	5	0	0	0	0	0	10	0	0	0	0	0	7	10
	0	0	10	10	0	5	0	5	0	0	10	10	3	5
	5	10	15	0	10	5	1	15	15	5	7	0	0	10
	5	5	0	15	0	0	0	5	0	0	0	0	10	10
	10	7	0	0	0	10	7	0	0	0	15	0	0	0
	7	5	7	5	0	7	0	5	4	7	5	15	15	7
	10	10	10	0	6	0	0	0	3	3	0	0	0	0
	0	0	0	0	0	5	10	3	10	10	0	0	5	1
	0	0	5	0	10	20	10	5	10	10	10	0	2	7
	7	4	0	3	0	15	15	15	20	30	15	5	0	10
	10	15	10	0	5	15	10	0	10	10	0	0	0	0
	0	0	0	10	0	0	0	0	0	3	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	6	0	0	3
	3	6	3	0	0	0	0	10	35	0	0	0	0	3
	0	0	3	0	0	0	0	0	5	0	0	0	0	
10011000000														
11	HORDSEC		0	0	0	0	0	45	10	3	0	5	0	20
	0	7	0	0	0	0	0	0	0	0	0	0	0	65
	0	0	12	0	0	0	0	0	0	0	0	0	10	0
	15	0	50	60	15	45	10	12	15	30	50	15	7	0
	0	10	5	0	5	0	5	15	45	10	7	0	8	0
	60	10	7	5	0	0	0	0	0	0	0	0	0	5
	0	20	25	40	30	25	65	35	10	15	30	5	0	2
	10	5	0	0	45	65	55	50	55	50	25	5	0	1
	25	10	1	0	1	6	0	0	0	0	0	0	0	0
	0	0	0	0	0	40	40	65	10	60	60	45	5	20
	10	0	20	0	10	7	10	2	7	15	25	40	0	35
	20	7	15	15	10	0	0	0	0	0	5	15	7	7
	13	10	7	2	0	0	15	2	6	10	0	6	0	0
	20	0	0	0	0	10	0	0	0	10	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	5	5	8	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	
10100000000														
1	ALOPRAT		0	3	15	10	7	5	5	15	5	5	0	60
	0	20	15	10	0	8	10	60	5	10	15	40	0	4
	40	15	15	10	60	65	25	20	45	20	0	10	15	15
	10	0	15	10	0	15	60	20	60	10	30	60	20	45
	20	30	65	15	20	15	15	25	6	35	35	15	10	35
	15	65	15	70	70	80	65	65	60	75	80	65	60	30
	30	10	10	30	15	10	10	15	30	35	10	20	45	25
	10	15	15	5	10	10	10	10	20	35	25	50	55	15
	5	10	10	6	6	3	10	10	10	10	6	6	10	10
	10	10	10	10	10	25	45	25	45	40	5	15	65	30
	45	50	15	20	25	35	7	10	15	25	55	45	35	30
	40	60	70	45	40	70	75	75	70	85	65	15	60	20
	20	15	70	35	35	60	40	15	10	6	10	6	10	60
	65	45	35	40	45	30	70	10	35	25	60	25	5	10
	16	10	1	1	10	6	6	6	3	1	10	6	6	10
	0	3	10	1	6	10	16	10	25	30	15	20	6	3
	3	3	3	0	6	6	6	7	20	20	0	0	0	

10100000000														
8	POATRIV		0	0	0	5	3	1	25	2	0	0	15	20
	0	7	10	10	20	25	35	5	15	0	10	15	23	7
	20	20	60	35	10	10	10	4	20	20	10	10	15	35
	25	10	10	15	0	7	30	15	10	20	20	10	7	15
	0	7	10	10	10	7	10	7	15	7	10	15	20	25
	25	45	25	5	10	15	0	7	0	10	10	0	5	25
	30	15	20	40	40	40	35	35	35	45	34	19	15	30
	25	45	45	0	15	10	10	15	10	10	10	15	10	10
	7	10	16	10	16	16	16	23	23	16	16	23	10	16
	10	16	16	23	23	10	15	25	30	10	7	7	30	25
	20	15	10	4	15	15	7	20	15	15	20	35	40	10
	20	15	15	40	20	10	7	4	2	5	10	30	35	35
	25	20	5	2	10	15	5	15	16	16	16	23	16	30
	15	5	7	25	20	40	20	25	0	40	35	15	30	10
	16	16	10	10	16	10	23	16	16	16	16	23	23	23
	23	23	16	23	23	23	16	20	20	60	60	60	16	16
	16	16	16	10	16	16	23	10	20	15	0	7	0	
10100000000														
35	LATHPRAT		12	10	4	10	10	12	10	17	25	15	4	4
	2	3	3	3	3	3	0	0	3	0	0	2	10	5
	4	2	3	2	3	3	3	3	7	4	3	3	0	7
	3	6	5	3	5	5	4	4	7	10	10	1	4	4
	3	4	3	15	3	12	7	4	5	12	7	3	3	3
	3	2	0	3	3	3	3	3	2	3	3	3	2	3
	3	3	3	1	3	3	3	2	2	2	3	4	7	3
	3	4	1	2	10	3	3	10	5	10	10	4	5	4
	3	6	6	0	6	6	6	3	6	3	0	6	10	1
	10	6	10	3	6	3	7	5	3	4	7	10	4	5
	10	2	3	2	5	3	4	1	0	0	2	0	0	0
	0	0	0	0	0	3	3	3	3	3	3	4	0	1
	4	2	2	2	2	2	2	3	3	10	0	6	6	4
	3	2	4	3	3	3	0	3	3	0	3	4	1	3
	6	0	0	0	1	3	6	6	6	3	1	6	6	3
	1	10	0	10	6	16	0	0	0	0	0	0	0	0
	0	1	0	0	0	0	0	2	2	1	0	0	0	
10100000000														
45	RUMACET		1	2	3	0	1	3	2	3	2	2	2	4
	0	2	4	0	3	3	2	3	3	3	3	3	10	2
	1	2	2	3	3	3	6	4	2	3	7	3	3	3
	2	0	1	1	0	3	3	2	3	2	3	0	3	3
	4	3	2	3	4	4	2	3	0	3	3	3	3	3
	1	0	3	2	3	3	3	0	3	3	2	3	3	3
	1	2	4	3	2	3	2	3	3	2	2	2	4	2
	2	3	3	0	4	2	2	3	2	2	2	2	3	4
	3	3	6	3	6	6	3	6	10	10	6	6	6	1
	6	6	6	6	6	2	2	0	1	2	0	3	0	2
	4	2	3	2	2	2	4	3	3	2	2	2	2	2
	3	3	3	1	2	2	3	3	0	0	3	2	4	0
	3	3	2	3	3	2	2	2	6	10	6	3	1	2
	1	3	3	2	4	3	2	3	3	1	2	3	2	6
	10	6	0	6	6	3	3	6	6	6	6	6	6	6
	6	10	6	6	6	10	3	1	2	3	3	3	6	1
	1	1	10	10	3	6	0	3	3	3	0	0	0	
11000000000														
43	RANUREP		0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	20	10	4	0	0	0	20	30	23	0
	0	0	0	0	0	0	0	0	0	0	20	0	0	0
	0	0	0	0	0	3	10	0	0	0	0	0	0	0
	0	0	0	7	0	0	0	10	3	0	0	0	0	0
	0	5	0	0	20	0	0	0	0	0	0	0	0	0
	0	0	0	4	1	0	2	0	0	0	0	0	0	20
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	10	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	7	1	25	4	0	0	20	0
	0	0	10	20	35	12	3	10	5	4	1	0	4	3
	4	0	0	2	0	30	7	3	3	0	5	4	0	3
	0	3	15	4	0	4	0	50	0	0	0	10	1	7

	4	40	3	4	7	25	3	25	60	3	3	7	5	16
	6	0	16	16	23	10	10	10	10	16	0	10	10	10
	32	6	6	0	10	6	10	3	0	8	55	5	3	0
	10	32	32	0	0	6	32	15	0	0	0	0	0	
11010000000														
25	CARDIST		0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	10	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	15	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	20	0	15	5	
11010000000														
62	ACHIPTA		0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	3	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	3	3	
11011000000														
39	OENASIL		0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	1	0	0
	0	0	1	3	0	0	0	0	0	0	0	0	3	0
	0	0	0	3	1	3	3	2	2	3	2	2	1	0
	0	0	0	0	0	0	0	0	1	0	0	0	0	0
	0	10	6	1	0	3	6	23	6	10	0	3	0	0
	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	0	2	0	0	0	0	0	0	1	0	1	3	0	1
	3	3	3	0	2	2	3	1	0	1	4	0	2	2
	3	3	0	3	0	0	0	3	6	6	10	6	0	0
	0	0	0	0	1	1	0	0	0	2	0	0	0	10
	16	6	3	1	1	3	3	10	6	6	0	3	1	1
	0	0	1	0	0	3	0	0	0	0	0	0	3	6
	3	1	0	0	1	0	0	3	3	3	1	3	3	
11011000000														
46	RUMCRIS		0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	2	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	1	0	0	2	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	2	1	0	0	0	0	0	0	0

	0	0	0	0	0	0	0	0	0	1	0	0	0	0
	0	0	0	0	1	0	0	0	0	0	3	2	0	1
	2	2	0	2	0	0	0	0	0	0	0	0	0	0
	3	0	1	0	0	3	0	2	0	2	0	0	2	0
	0	0	0	0	0	0	1	0	0	0	0	0	0	1
	0	0	0	0	0	0	1	0	0	2	0	0	0	0
	0	1	0	0	0	1	3	0	0	0	1	2	2	
11011000000														
54	POTEREP		0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	3	0	0	0	0	0	0	0	0
	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	1	2	0
	3	0	2	0	0	4	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	1	0	0	0
	0	0	0	0	1	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	2
	0	0	0	0	0	0	0	0	3	0	0	0	0	0
	0	0	0	0	1	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	3	3	
11100000000														
20	ELYTREP		0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	5	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	7	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	5	0	0	0	0	0	0	0	0	0	0	0	4	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	5	0	0	5	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	5	3	3	
11100000000														
21	ALOPGEN		0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	40	3	20	
11100000000														
26	ELEOPAL		0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0

	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	15	30	20	
11100000000														
36	LEONAUT		0	4	3	0	3	3	0	0	2	3	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	2	0
	1	0	0	0	0	1	1	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	3	0	0	0	0	0
	0	0	0	0	0	0	0	3	2	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	4	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	4	0	4	4	2	2	2	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	10	12	1	0	0	0	
11100000000														
47	SILASIL		0	0	2	0	5	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	2	0	0	0	0	0	0	0	3	0
	0	3	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	3	0	0	0	0	0	
11100000000														
60	GALIPAL		0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	4	0	0	0	0	0	
11100000000														
61	LYSNUMM		0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0

	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	4	0	
11101000000														
14	AGROCAP		65	50	40	35	45	20	30	45	35	30	20	20
	45	45	55	5	15	50	0	3	15	30	3	25	0	5
	25	35	20	0	35	10	30	30	20	30	30	25	45	45
	45	10	45	40	45	5	10	50	10	15	0	50	75	55
	65	40	65	70	60	55	50	45	45	65	55	55	60	20
	20	45	20	30	15	10	15	25	10	15	20	35	20	25
	10	50	50	45	40	50	45	30	35	50	60	45	50	35
	45	45	40	40	10	45	40	45	25	60	40	25	60	60
	75	10	10	16	16	16	10	10	16	10	3	0	32	16
	16	16	16	16	23	40	30	40	35	45	5	30	20	30
	10	65	65	5	45	50	45	60	65	65	40	40	40	15
	25	35	20	50	45	17	50	25	10	25	30	45	40	75
	50	55	20	90	70	45	50	65	10	16	16	23	23	35
	35	30	45	55	40	15	15	20	15	70	10	30	25	42
	16	16	10	6	6	10	10	10	10	10	10	3	0	6
	0	0	0	16	10	0	3	25	15	0	15	0	6	6
	10	6	0	0	0	10	0	60	70	50	40	90	80	
11101000000														
17	DESCCES		0	0	0	10	0	0	0	0	0	1	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	4	7	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	10	3	10	7	0	2
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	15	0	0	0	0	0
	0	0	0	0	20	5	0	5	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	10
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	7	2	0	0	0	0	
11101000000														
28	CARDPRAT		0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	2	1	3	3	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	3	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	2
	0	0	0	0	0	3	0	1	2	1	0	0	3	3
	0	0	0	0	0	2	0	0	0	0	0	2	1	0
	0	0	0	0	0	0	0	0	0	0	0	0	2	0
	0	0	0	0	1	3	0	1	0	0	0	1	0	0
	0	1	0	0	0	0	0	1	3	0	0	0	0	0
	0	3	0	0	2	0	1	0	0	0	0	0	0	0
	0	0	0	1	0	3	3	3	3	3	3	0	0	0
	0	1	0	1	0	0	1	0	1	1	1	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	3
	0	0	0	0	0	0	1	0	1	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	2	4	3	1	3	3	

11110000000														
23	CARHIRT		0	4	5	7	5	0	0	4	0	0	10	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	7	7	0	0	0	0	0	0	0	0
	0	0	10	10	7	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	10	15	7	7	10	10	0	0	3
	4	0	0	7	7	15	15	10	10	20	10	10	0	0
	0	0	0	0	4	0	0	0	0	0	4	0	4	0
	0	0	0	0	0	0	5	10	10	15	15	10	0	0
	0	3	0	0	3	6	3	3	0	3	0	0	6	6
	6	3	6	6	3	3	5	0	25	10	3	5	0	0
	0	0	0	0	0	0	0	0	0	0	0	5	0	0
	0	0	0	0	15	15	0	0	4	7	0	0	0	0
	20	0	0	20	0	10	5	0	10	0	0	0	1	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	3	0	10	25	0	0	
11110000000														
32	FILIULM		0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	2	0	0	0	2	0	0	0	0	3	3
	0	0	0	20	1	0	0	1	3	1	0	0	0	0
	0	1	0	0	0	0	0	0	0	0	7	0	0	4
	0	0	0	0	0	0	3	0	0	0	0	0	0	0
	0	0	0	0	0	3	0	0	1	2	0	0	0	0
	0	3	3	0	1	6	32	10	10	0	0	0	6	10
	42	0	1	0	0	4	1	0	0	1	0	0	0	0
	0	15	0	75	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	2	0	0	0	0	0	0	0	0	0
	0	0	0	0	4	0	17	0	1	0	6	0	0	0
	0	0	0	0	0	0	2	0	0	0	0	0	0	0
	0	10	10	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	2	0	0	0	0	
11110000000														
38	LOTCORN		4	2	0	7	2	3	0	3	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	2	3	0	0	0
	0	0	0	0	0	2	0	0	0	4	0	2	3	0
	0	0	0	2	0	2	2	0	0	0	2	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	3	2	0	0	0	3	3	0
	0	0	0	0	0	10	0	4	7	4	4	3	3	7
	3	0	0	0	3	0	0	0	0	0	0	0	0	3
	3	0	0	1	0	0	0	0	0	0	3	0	0	0
	0	3	3	0	3	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	2	0	0	0	0	

Appendix 3 Field observations of fauna and plant species outside quadrats

Flora

Taraxacum aggregate. One plant keying out as *Taraxacum tamesense* was noted in Compartment 4 in May 2010. A comprehensive survey of *Taraxacum* species in April/May could be profitable in identifying scarcer species with hay-meadow associations.

(Between 1999 and 2002 the following Taraxacum species were recorded on the site: *T. laciniosifrons, T. Lepidum, T. subundulatum, T. Incisum, T. Sundbergii, T. Lucidum, T. Laeticolor, T. broddessonii* – also a possible *T. tamesense* was sent to Denmark for verification – source P. Garner BSBI recorder for Herefordshire, identifications confirmed by AJ Richards)

Large patch of *Thalictrum flavum* at 55330, 39596 +/-6m in Compartment 30. Marsh yellow cress *Rorippa palustris* here also.

Galium verum. A locally prominent component of the vegetation in Compartments 13 and 27 (the latter has a 4x5m patch at 55147, 39844) although it does not fall within any of the samples taken from either compartment.

Sanguisorba officinalis only noted in southernmost part of Lower Lugg. Patch at 55039, 39919 (+/- 5m) is northernmost representation found. The *Sanguisorba* in Comp 29 was only just beginning to flower as at 23 June.

Track between compartments 3a/3b and 2 has abundant *Alopecurus geniculatus* and *Leontodon autumnalis* with *Oenanthe silaifolia* also more common here than in adj areas.

Comp 22: white swathe visible on some aerials is hogweed flowers. Ground appears slightly raised and compacted. Hogweed abundance and general ruderal aspect (e.g. *Rumex obtusifolius* common) is the defining character of northern part of comp 22.

Comp 30. Not a homogenous compartment. Stands of Filipendula interspersed with grassier areas. Both sampled. (30-1 is Filip sample)

Shallow drainage channels (e.g. between 20a/20b) discernable (even at range) by line of Desc cesp.

Carex acuta local in some drainage channels in southern part of Lower Lugg Meadow

Comps 13a and 13b. Much bulkier and with prominent ruderals as compared with adj comp 12. Tragopogon and Gal verum more distinctive components.

Large patch of Achill ptarm to north of quadrat 2(4)

NB: BSBI recorder holds records for additional species including *Colchicum autumnale*, *Ophioglossum vulgatum* and *Myosurus minimus*).

Fauna

Bat droppings consistent with those produced by Daubenton's bats noted beneath a brickwork crack in A438 culvert in Oct 2009 not relocated in 2010. Noctule, 55 pipistrelle and 45 pipistrelle recorded on evening of 24th June. River Lugg a key foraging resource, but also over open grasslands.

Abundant burnet moths in Comp 20a. Large skipper. Meadow brown super-abundant.

Platycnemis pennipes (white-legged damselfly) – Comp 11. *Enallagma cyathigerum*. *Calopteryx splendens* also.

Rumex crispus and *F ulmaria* heavily defoliated by larvae (pale green) by 23/6. Possibly bright-line brown eye/flame shoulder with former and powdered quaker for latter, but could be sawflies or leaf beetles rather than Lepid? Prevalent leaf miners of *Alopecurus pratensis* also noted.

Lesser whitethroat, whitethroat and garden warbler in boundary hedges. Reed bunting along Lugg and locally elsewhere. Cuckoo (Upp Lugg). Sedge warbler (comp 2, 30, river margins and 29), skylark, kingfisher, red-legged partridge and green sandpiper also recorded.

Up to 4no curlew in Lower Lugg (4 in Comp 22 on 23/6/10)

Large hirundine and swift flocks on 23/6 over Lower Lugg. Literally thousands of swifts and house martins feeding at c.8 feet above veg. Site likely to be a critical resource for Hereford city populations of swift and house martin. Sand martin regular.

Meadow grasshopper abundant. *Rhyngia campestris*.

Sawfly larva noted on *Oenanthe silaifolia*. Mass emergence of sawfly *Tenthraedo arcuata* on 19/5/10.

Moles (indicative of lower summer groundwater levels?): Comps 14, 2, 1.

Habitat notes

Comp 9a. Gradient of quality from Lugg Rhea towards river very noticeable.

Comps 11 and 12 much shorter and finer swards generally. Less Alopec – more Ag cap. Searching for basal sheaths (necessary in May) easier.

Where spindly grasses such as Hordeum predominate, the dropped-disc method biases towards lower sward heights as these less bulky grasses cannot take the weight and flatten proportionately more. A consistent source of bias though.

Quadrat 26-1 is representative of whole of the section of Swilley Swarth and Comp 26 therefore amalgamated with Comp 19.

Appendix 4 Comments and analysis from Floodplain Meadows Partnership

Lugg meadows vegetation revisited (notes from the Floodplain Meadows Partnership)

Hilary Wallace, 5/1/2011 revised 18/1/2011

Having looked through the Lugg Meadows Vegetation Survey report (Woodfield 2010) we can make the following comments.

Species richness appears low, compared to quadrats we recorded in part of the site in 1995, but following the summer floods of 2007/2008 many meadows over a wide range of sites are showing a reduced species richness.

If one takes the endgroups presented from the Twinspan analysis of Woodfield (2010) and runs them through MATCH the scores are quite respectable (Table A).

Table A The top 3 MATCH scores for endgroups derived from Twinspan analysis of Woodfield (2010) compared with the published NVC (Rodwell 1992)

Endgroup	Top 3 scores		
1	MG5a: 61.8	MG6b: 60.3	MG4: 52.4
2	MG5a: 59.4	MG6b: 59.1	MG4: 59.0
3	MG7C: 63.6	MG7D: 62.3	MG6b: 57.3
4	MG7C: 64.1	MG7D: 60.2	MG6b: 59.0
5	MG7C: 57.3	MG6b: 55.2	MG7D: 53.6
6a	MG7C: 56.7	MG7D: 54.6	MG6a: 52.0
6b	MG7C: 56.5	MG7D: 54.8	MG6a: 53.2
7	MG7C: 62.3	MG7D: 58.9	MG6a: 57.7
8	MG7C: 58.4	MG7D: 56.9	MG7B: 48.3

Endgroups 1 and 2 appear to represent the ‘dry end’ of the gradient with highest scores for MG5, MG6b and MG4 whilst most of the rest of the site would ‘fit’ fairly comfortably into MG7C as described in the NVC.

However, species-rich expressions of MG7C and species poor expressions of MG4 have been described in recent studies (Gowing et al. 2002) and it is probable that much of the vegetation on the Lugg could be accommodated within these revised descriptions of the two communities.

If all end groups of Woodfield (2010) are run through the SIN program (Prosser 1990, Wallace et al. 1992) against both the published NVC tables (Rodwell 1992) and the endgroups derived from both the revised BD1310 (Gowing *et al*. 2002) and the new MG4&8 Twinspans (Wallace in prep), then it appears that much of the meadow could be placed broadly within the *Alopecurus-Sanguisorba* floodplain meadow community. SIN Scores for all end groups are presented (Table B). It is interesting to note that

SIN scores for MG5 for Endgroups 1 and 2 are all <2.5 and thus, even these stands come closer to the driest expression of MG4.

A 'good' sin score is usually > 3.5 in this type of grassland vegetation.

Table B SIN scores for Lugg meadow endgroups. Scores of >3 (in bold)

LUGG Twinspan Endgroups			1	2	3	4	5	6a	6b	7	8
SIN file											
SMG4	1	MG4.Typical	2.81	**3.06**	2.5	2.54	2.06	1.97	2.01	1.86	1.85
Revised MG4 (Wallace in prep)	2	MG4. Dactylis	**3.24**	2.63	1.86	2.13	2.11	1.74	1.91	1.96	1.74
	3	MG4. Cx panicea	1.49	1.52	1.3	1.57	1.35	1.27	1.32	1.31	1.28
	4	MG4. Poa trivialis	1.54	1.76	1.99	2.37	2.7	**3.11**	2.98	2.69	2.72
	5	MG4 Pt (I) Cxa	2.28	2.02	2.45	2.89	2.37	2.58	2.4	2.56	2.6
	6	MG4 Pt (ii) A.stolonifera	1.34	1.5	1.8	1.73	1.97	2.28	2	2.28	1.79
	7	MG4 Pt (iii) Species poor	1.85	1.94	2.16	2.42	2.62	**3.18**	**3.24**	2.77	2.93
	8	MG4. NVC	2.55	2.32	2.06	1.89	1.64	1.6	1.81	1.45	1.48
Sextra	1	MG8 Cx (BD1310 revised)	1.25	1.36	1.32	1.4	1.37	1.27	1.05	1.08	1.14
Gowing et al 2002	2	MG7C (BD1310 revised)	1.51	1.78	2.04	2.04	1.87	**3.26**	2.34	2.14	**3.3**
	3	MG6 Cx (BD1310 revised)	2.62	2.07	1.29	1.67	2.06	1.81	1.84	1.31	1.53
	4	MG6b (BD1310 revised)	2.34	2.96	1.58	2.06	2.37	2.3	2.19	1.9	2.18
Rodwell 1992	5	MG7C (NVC)	1.34	1.99	2.29	2.4	2	2.18	2.28	2.6	2.96
	6	MG6b (NVC)	2.22	2.05	1.91	1.81	1.92	1.58	1.65	2.03	1.34
	7	SD17c (NVC)	0.71	0.81	1.15	0.98	1.08	1.11	1.12	1.01	1.37
	8	Ag-Cx Southlake (Cox & Leach)	1.15	0.94	1.21	1.17	1.46	1.29	1.35	1.09	1.37
SMG8E	1	Agrostis-Carex									
Revised MG8 Wallace in prep.	2	MG8. Cxa									
	3	MG8. A.pratensis									
	4	MG8. Agrostis canina									
	5	MG8. Lolium perenne									
	6	MG8. Typical									
	7	MG8. Sanguisorba	2.05								
	8	MG8. NVC									

Table continued...

LUGG Twinspan Endgroups			1	2	3	4	5	6a	6b	7	8
SIN file											
Dutch48c	1	A8			2.35						
	2	S8a			1.83						
	3	S8b			2.03						
	4	S8c			2.27						
	5	A9			1.77						
	6	A5			1.67						
	7	S5a			1.63						
	8	S5b			1.75						
Rodwell 1992		MG5a (NVC)	2.38	2.02							
		MG5b (NVC)	2.11	1.85							

Thus, our interpretation of the endgroups from the report is as follows:

LM1. Despite the lack of *Trisetum* this seems closest to the driest MG4, the MG4 *Dactylis*, it may be in transition to something akin to the MG6b variant of our revised BD1310.

LM2. An intergrade between MG4 Typical and the species-rich MG6b of BD1310 (revised) though it lacks *Filipendula*.

LM3. A type of species-poor MG4 – an impoverished form of MG4 *Dactylis.*

LM4. An MG4 species-poor / MG7C intergrade.

LM5. A fine example of MG4 *Poa trivialis,* the species-poor variant.

LM6a. Another MG4 *Poa trivialis (*species-poor variant)/ MG7C intergrade.

LM6b. Like endgroup 5; still just a MG4 *Poa trivialis (*species-poor variant) but probably going to (or possibly coming from if we are being upbeat) MG7C.

LM7. MG4 *Poa trivialis (*species-poor variant) but a less typical example than LM5.

LM8. No *Filipendula* but still closest to the revised BD1310 MG7C.

Groups 2, 4, and 6 provide poor scores for all units and represent stands intermediate between MG4 and MG7C. Similar vegetation has been recorded on the Severn/Avon (Wallace *et al.* 2009) where fertility levels appear to be high for MG4 community development.

Past history of agricultural improvement over parts of the meadow coupled with high fertility in the Lugg catchment are probably providing a strong secondary driver to vegetation development with close affinities to MG7C. Cutting time etc will also affect species richness. A community map linked to elevation, soil fertility and past management might be very informative for future site management.

References

Gowing, D.J.G., Lawson, C.S.,Youngs,.E.G., Barber, K.R., Rodwell, J.S., Prosser, M.V., Wallace, H.L., Mountford, J.O and Spoor, G. 2002. The water regime requirements and response to hydrological change of grassland plant communities. Final report to DEFRA, London. Project BD1310.

Prosser, M.V. 1990. *West Allendale Hay Meadow Survey.* England Field Unit Report 93, Nature Conservancy.

Rodwell, J.S. 1992. British plant communities. Volume 3. Grasslands and montane communities. Cambridge University Press, Cambridge.

Wallace, H.L., Good, J.E.G. and Williams, T.G. 1992. The effects of afforestation on upland plant communities: an application of the British National Vegetation Classification. *Journal of Applied Ecology.* 29, 180-194.

Wallace, H.L., Prosser, M.V. and Gowing, D.J.G. 2009. The vegetation of the Severn/Avon floodplain meadows. Report to NE, Cheltenham. Ecological Surveys (Bangor) and The Floodplain Meadows Partnership, hosted by the Open University, Milton Keynes.

Woodfield, D.M.G. 2011. Lugg meadows vegetation survey. Natural England Commissioned Report. No.071.