Contents

MAVIS (Ver 1.03) User Manual

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What does MAVIS do?

Plant species lists recorded within a fixed area (i.e. quadrats) constitute the basic information used by ecologists, vegetation scientists and nature reserve managers to answer a range of questions about spatial and temporal variation in plant species composition. These questions are often answered by locating field data within various classifications that attempt to provide an explanatory or descriptive framework for understanding and evaluating the distribution of plant species at different scales. This program enables links to be made between botanical field data and a number of widely used classifications of plant species and vegetation. The result is a standard description of the entered data in terms of each classification. Because the classifications remain static and only the field data changes clearly many different sorts of plant community can all be expressed in the same standard language allowing comparison from site to site, region to region, biogeographic zone to biogeographic zone.

The classification systems available are as follows:

- Ellenberg scores for Light, Fertility, Wetness and substrate pH.
- Preston and Hill's (1997) classification of the British Flora into biogeographic elements.
- Grime's (1979) triangular CSR model classifying British vegetation in terms of three established strategies; Competitors, Stress-tolerators and Ruderal species.
- The wider countryside classification of ITE Countryside Survey data for 1978 and 1990 known as the Countryside Vegetation System (CVS).
- The National Vegetation Classification (NVC) developed by John Rodwell and others at the Unit of Vegetation Science, Lancaster University.

The program accepts data in the form of species lists with or without abundance codes but also handles frequency (sometimes called constancy) tables which are species lists with each taxon coded in terms of its frequency of occurrence within a group of individual samples recorded in stands of usually floristically similar vegetation. The output depends upon the classification system. These are described below.

Biogeographic Elements

1481 native British and Irish vascular plants were classified based on their occurrence in one or more major biomes (Arctic, Boreal, Temperate, Southern) and their longitudinal distribution (Oceanic, Suboceanic, European, Eurosiberian, Eurasian, Circumpolar). A complete account is given in Preston and Hill (1997).

Output from MAVIS gives the percentage of the total species in each plot attributable to each biogeographic element.

Code	Element name
13	European Arctic-montane
14	Eurosiberian Arctic-montane
15	Eurasian Arctic-montane
16	Circumpolar Arctic-montane
21	Oceanic Boreo-arctic Montane
23	European Boreo-arctic Montane
24	Eurosiberian Boreo-arctic Montane
26	Circumpolar Boreo-arctic Montane
34	Eurosiberian Wide-boreal
35	Eurasian Wide-boreal
36	Circumpolar Wide-boreal
41	Oceanic Boreal-montane
42	Suboceanic Boreal-montane
43	European Boreal-montane
44	Eurosiberian Boreal-montane
45	Eurasian Boreal-montane
46	Circumpolar Boreal-montane
51	Oceanic Boreo-temperate
52	Suboceanic Boreo-temperate
53	European Boreo-temperate
54	Eurosiberian Boreo-temperate
61	Oceanic Wide-temperate
63	European Wide-temperate
64	Eurosiberian Wide-temperate
65	Eurasian Wide-temperate
66	Circumpolar Wide-temperate
71	Oceanic Temperate
72	Suboceanic Temperate
73	European Temperate
74	Eurosiberian Temperate
75	Eurasian Temperate
76	Circumpolar Temperate
81	Oceanic Southern-temperate
82	Suboceanic Southern-temperate
83	European Southern-temperate
84	Eurosiberian Southern-temperate
85	Eurasian Southern-temperate
86	Circumpolar Southern-temperate
91	Mediterranean-Atlantic
92	Submediterranean-Subatlantic
93	Mediterranean-montane
55	Eurasian Boreo-temperate

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Ellenberg Scores

Ellenberg et al (1991) attached indicator scores to a large proportion of species in the European flora. These scores estimate the optimal position of each species along a number of key abiotic gradients. The scores were based on a synthesis of experimental work, field observation and descriptive analyses. However, because Ellenberg focussed on central European populations his scores may not be appropriate as a robust summary of a species performance in Britain. To address this problem Hill et al (1999) and Hill (2000) recalculated scores for common species using weighted averaging applied to the Countryside Survey (CS) botanical dataset. This exercise has effectively re-calibrated a number of the original scores for the British situation.

Independent validation of the robustness and accuracy of the original Ellenberg scores in Britain and northern Europe has also come from work comparing mean Ellenberg values along environmental gradients with observed values of abiotic factors. See bibliography.

List of Ellenberg scores available in MAVIS:

Fertility (lowest value = lowest fertility)
pH (lowest value = lowest pH)
Wetness (lowest value = driest conditions)
Light (lowest scores = most shade tolerant)

All scores range from 1 to 9 except for Wetness that ranges from 1 to 12. Note that wetness values were originally called Ellenberg F values from the German for moisture (Feuchtigkeit).

Computation of scores

At present scores are only computed for individual plots, not for constancy tables. If cover values have been entered for each species the resulting score is cover-weighted, if not then the score is weighted by presence only as follows:

E = Ellenberg score for each species
c = cover value for each species
n = number of species having Ellenberg scores in the quadrat

Cover-weighted score = Sum (E. c)/ Sum (c)

Unweighted scores = Sum (E) /n

Thus all scores range from 1 to the maximum value of each type of Ellenberg score.

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CSR Plant Strategy Model

This model assumes that constraints on the accumulation of plant biomass are principally controlled by stress and disturbance. Stress refers to factors that limit production such as drought, shade, low temperature and nutrient limitation. The second constraint is disturbance associated with partial or total destruction of biomass resulting from phenomena such as fire, trampling, cultivation, flooding and herbivore activity. Thus three primary strategies are suggested to have evolved in response to stress (stress-tolerators) or disturbance (ruderals) or an absence of both (competitors). The three extremes define an ecological envelope within which the established as opposed to the regenerative phase of plant species can be located depending upon the importance of each constraint as it has impinged upon their evolutionary history.

A large number of British plant species have been placed within the CSR triangle (Grime et al, 1988, 1995). MAVIS uses this database to compute for each entered plot a mean Competitor, Stress-tolerator and Ruderal score based upon the proportion of each species attributable to different parts of the CSR triangle. See bibliography for further information.

CSR scores range from 1, indicating the least association with each strategy, to 5 indicating the strongest association with each strategy. For example *Acer pseudoplatanus* has C=4, S=2 and R=1, being a strong competitor with none of the established phase behaviours associated with ruderal species.

Computation of scores

At present scores are only computed for individual plots, not for constancy tables. If cover values have been entered for each species the resulting score is cover-weighted, if not then the score is weighted by presence only as follows:

CSR = C or S or R score for each species
c = cover value for each species
n = number of species having CSR scores in the quadrat

Cover-weighted score = Sum (CSR. c) / Sum (c)

Unweighted scores = Sum (CSR) /n

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The Countryside Vegetation System (CVS)

MAVIS allocates quadrat vegetation samples to the 100 vegetation classes that make up the CVS. Each vegetation class was defined based on joint similarity of species composition among Countryside Survey vegetation quadrats recorded in 1978 and 1990. The two major strengths of the CVS are firstly, that the vegetation classes provide an impartial classification of the wider countryside in which the vegetation of linear features such as hedgerows, streamsides and road verges has been included. Secondly, via MAVIS, links can be made between new field data, CVS class and a higher level grouping of CVS classes into eight Aggregate Vegetation Classes (AVC) that have been used to stratify Countryside Survey data for statistical analyses of stock and change in plant biodiversity and soil characteristics.

The CVS vegetation classes were created by a TWINSPAN classification of vegetation data for each individual sample plot in both 1978 and 1990 (11,557 in total). A further cluster analysis of DECORANA scores for each of the 100 vegetation classes was carried out to create the eight AVC. At the AVC level between-group differences in overall species composition are much more sharply expressed resulting in floristically well-defined units whose links to different parts of the GB landscape can be easily understood. Since the AVC encompass all recorded plots they also provide larger sample sizes than each of the 100 plot classes and so provided a convenient and meaningful way of stratifying vegetation data for the analyses of stock and change in vegetation in the British countryside reported in Bunce et al (1997). The descriptive information for each of the 100 CVS classes is downloadable as a published volume at http://nora.nerc.ac.uk/4311/ and provides the parent aggregate class for each vegetation class.

Allocation of plots and groups to CVS plot classes

The original TWINSPAN classification of plots generated a hierarchical grouping of CS quadrats, at the lowest level of which the 100 CVS plot classes were defined. The route taken by any quadrat as it passed through the original classification was determined by its species composition which may have varied from plot to plot. However, all quadrats classified on either side of a nodal point were identified by a binary code indicating membership of one of two mutually exclusive groups, membership being based upon the joint presence or absence of species. This binary decision tree is implemented in MAVIS as a rule set for allocation of new data to the original classification. The algorithm is deterministic in the sense that new plots are allocated to one plot class only without any estimation of the degree of fit to the destination class or probability of belonging to other classes. The classification procedure uses the presence and absence of species only. No cover or constancy information is required even though this may have been entered.

For further information see bibliography.

CVS Vegetation Class Names

1 Almost weed free wheat/other crops
2 Scattered weeds in various crops
3 Grassy weeds in cereal crops
4 Broadleaved weeds in mixed crops
5 Mixed weeds in cereal groups
6 Weedy leys/undersown cereal crops
7 Crop hedges/boundaries
8 Eutrophic hedges/boundaries
9 Boundaries/open crop hedges
10 Tall grass boundaries
11 Streamside banks within crops

12 Lowland eutrophic roadsides
13 Lowland mesotrophic roadsides
14 Lowland roadsides/crop boundaries
15 Lowland river banks
16 Shady eutrophic streamsides
17 Lowland wetlands/water edges
18 Eutrophic shaded ditches
19 Eutrophic riverside/wetland tall herb
20 Grassy roadside verges
21 Diverse lowland hedgerows
22 Nutrient rich riverbanks
23 Eutrophic mixed grassland
24 Dry base rich woodland
25 Shaded grassland/hedges
26 Tall grassland/scrub
27 Rye grass roadsides
28 Eutrophic tall herb/grassland
29 Rye grass swards
30 Mixed eutrophic grassland
31 Rye grass/clover grassland
32 Gravel reedbeds
33 Marshy grassland
34 Mixed grassland scrub
35 Diverse base rich woodland/hedgerows
36 Shaded moist stream banks
37 Diverse mesotrophic grassland/scrub
38 Enriched mesotrophic grassland
39 Eutrophic streamsides/woodlands
40 Ryegrass/Yorkshire fog grassland
41 Riverside silts/wetlands
42 Woodland on heavy soils
43 Rye grass/bent grass swards
44 Calcareous grassland
45 Shaded grassy streamsides
46 Shaded nutrient rich streamsides
47 Diverse mesotrophic pasture
48 Marshy riversides
49 Acidic woodland fragments
50 Acidic woodlands
51 Wet rushy grasslands
52 Mesotrophic grasslands
53 Diverse mesotrophic/acid grasslands
54 Marshes/wet tall herb
55 Rushy mesotrophic/acid grasslands
56 Mesotrophic diverse moist grasslands
57 Enriched moorland flushes
58 Rushy diverse streamside/flushes
59 Upland semi shaded acidic streamsides
60 Streamsides/flushes within acidic grasslands
61 Herb rich upland grassland
62 Acidic lowland woodland
63 Diverse upland streamsides/grasslands
64 Agrostis/Fescue/Bracken
65 Acidic herb rich grass/heath

66 Streamsides/flushes in moorland vegetation
67 Moorland grass
68 Acidic oak/birch woodland
69 Open acidic heathy birch woodland
70 Shady acidic streamside
71 Herb rich moorland grass/heath
72 Acid peaty streamsides/flushes
73 Moorland grass on wet peat
74 Streamsides/flushes in wet moorland grass
75 Upland coniferous plantations on moorland/upland grassland
76 Diverse streamsides/flushes in moorland vegetation
77 Dense Sitka spruce
78 Complex montane/moorland grass
79 Mountain streamsides and slightly enriched moorland grass
80 Moorland grass/heath on peaty gleys
81 Heath/montane acidic grasslands
82 Wet moorland heath vegetation
83 Heather moorland on peats
84 Heather moorland
85 Streamsides/flushes on peats
86 Moorland/streamside on peaty gleys
87 Moorland/bog on peats
88 Montane moorland/heath
89 Montane heather moorland
90 Wet heathland
91 Upland heather moor
92 Ombotrophic bog
93 Montane heath vegetation class
94 Sphagnum bogs
95 Species poor blanket bog
96 Wet bogs
97 Northern blanket bog vegetation class
98 Cotton grass bog
99 Saturated bog vegetation class
100 Inundated bog/wetland peat

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Smart, S.M., R.T. Clarke, H.M. van de Poll, E.J. Robertson, E.R. Shield, R.G.H. Bunce and L.C. Maskell (2003). National-scale vegetation change across Britain; an analysis of sample-based surveillance data from the Countryside Surveys of 1990 and 1998. *J.Env.Man.* **67,** 239-254.

The National Vegetation Classification

This widely used phytosociological classification of semi-natural vegetation in Britain fully documented in the volumes of British Plant Communities (Rodwell, 1991a,b, 1992).
For groups of plots entered into MAVIS as constancy tables or for groups created within the program, matching coefficients are computed between the published synoptic tables and the new field data. The top 10 coefficients are displayed. Matching follows the same application of the Czekanowski coefficient as MATCH (Malloch, 1996) with the same down-weighting to 0.1 of species not present in the input data but present at constancy I (1-20%) in the NVC tables.

Note that individual plots are not automatically classified to the NVC because NVC constancy data strictly only applies to between-stand or between-plot frequency. Users wishing to classify individual plots can however apply the arbitrary relationship between plot cover and constancy as defined in Dring (2000) as follows: Constancy 1 if cover <2%, 2 if cover 2-5%, 3 if cover 5-10%, 4 if cover 10-20% and 5 if cover>=20%.

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MAVIS User Instructions

Entering plots and groups of plots (constancy tables) from the keyboard

1. Start the application by double-clicking the MAVIS2015.exe file. Run it from C:/MAVIS or another directory that contains all the program files. Do not run from a shortcut. Once activated you are presented with a form-based screen (shown below) consisting of a plots list, a groups list and some corresponding buttons. Plots are lists of species with optional cover percentages, and groups are lists of species with compulsory constancy values in the range 1 to 5.
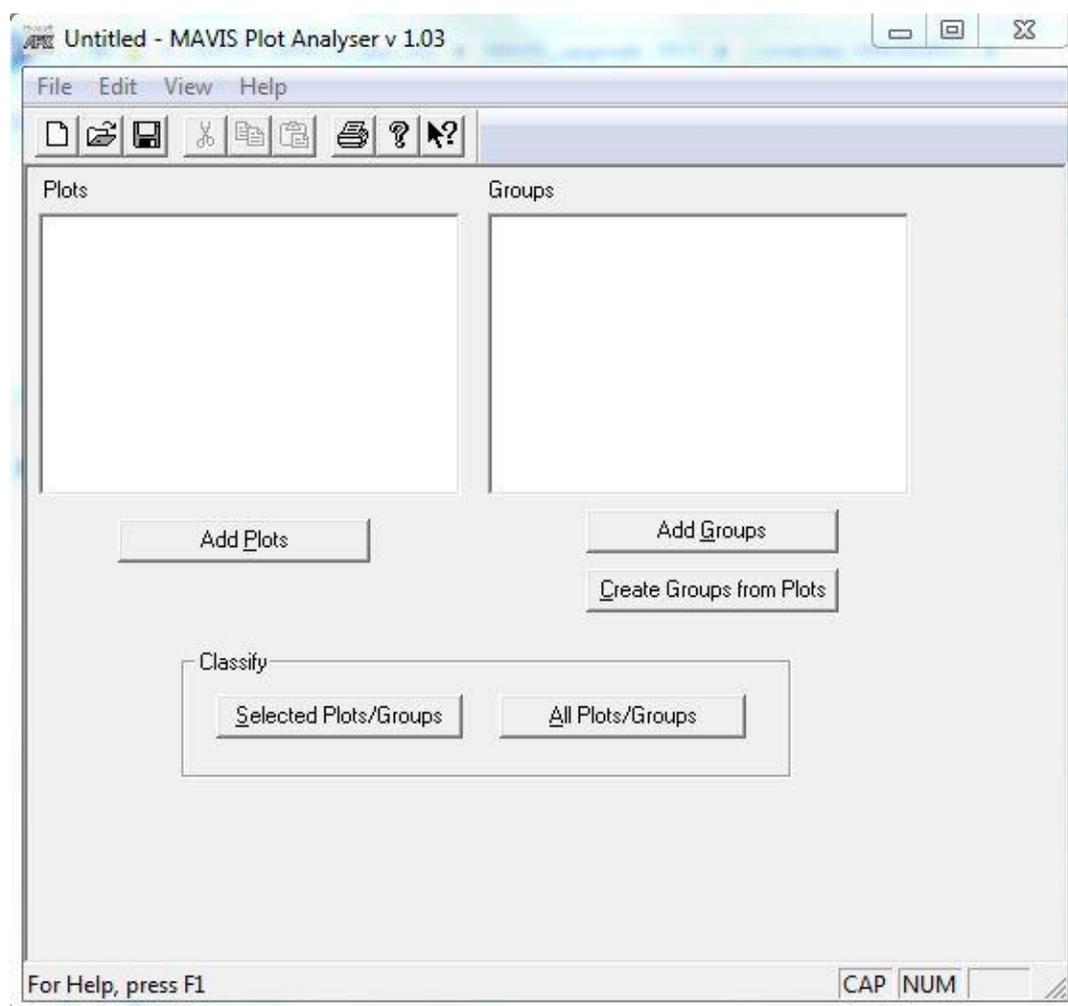
2. To add lists of species in quadrats manually, click the Add Plots button. The form shown below is presented which enables you to select species, optionally enter a percentage cover value and add the species to the growing quadrat list. The system will not accept cover values outside the range 0-100%. Species are easily and quickly entered by clicking inside the Genus box and typing the first few letters of the genus name. Once the correct genus has been clicked in the genus list all the species-level names that are associated with the genus appear in the Species box (see below). Click the species name and the complete binomial (genus + species) is added to the Target Species List box. Add a cover value if you wish to calculate cover-weighted mean Ellenberg and CSR scores. Cover values are not taken into account for CVS allocation or for calculating proportions of Biogeographic elements.

3. A plot number is automatically assigned to these manually-entered plots (the lowest unused number) and shown in the top right corner of the screen. You can also give a name to the plot by clicking and adding text in the Plot Name box. . When you have finished, click OK and the plot will be listed in the plots list box with its number and name.

4. To view or edit any plot or group, double click the desired plot or group. Choose OK to keep changes, CANCEL to reject them.

NVC matching in MAVIS

If you wish to assign your quadrat data to the NVC then you must analyse your dataset as a 'group' of quadrats, a minimum of 5 per stand is recommended, or as a constancy table consisting of a species list accompanied by codes indicating the frequency of each species in quadrats that represent the vegetation stand. The quadrats that are used to form a group could be sampled from a 'homogenous' stand of vegetation or from a number of species-compositionally similar stands as judged by the user or based on quadrats grouped together by a clustering program. The essential point is that MAVIS will not match individual plots to the NVC. This is because the NVC units were apparently defined on the basis of diagnostic differences in between-stand frequency of plant species. This is consistent with how the NVC units appear in their published form; as sets of tables showing the constancy (frequency) of a diagnostic set of species across a group of quadrats that define each NVC unit.
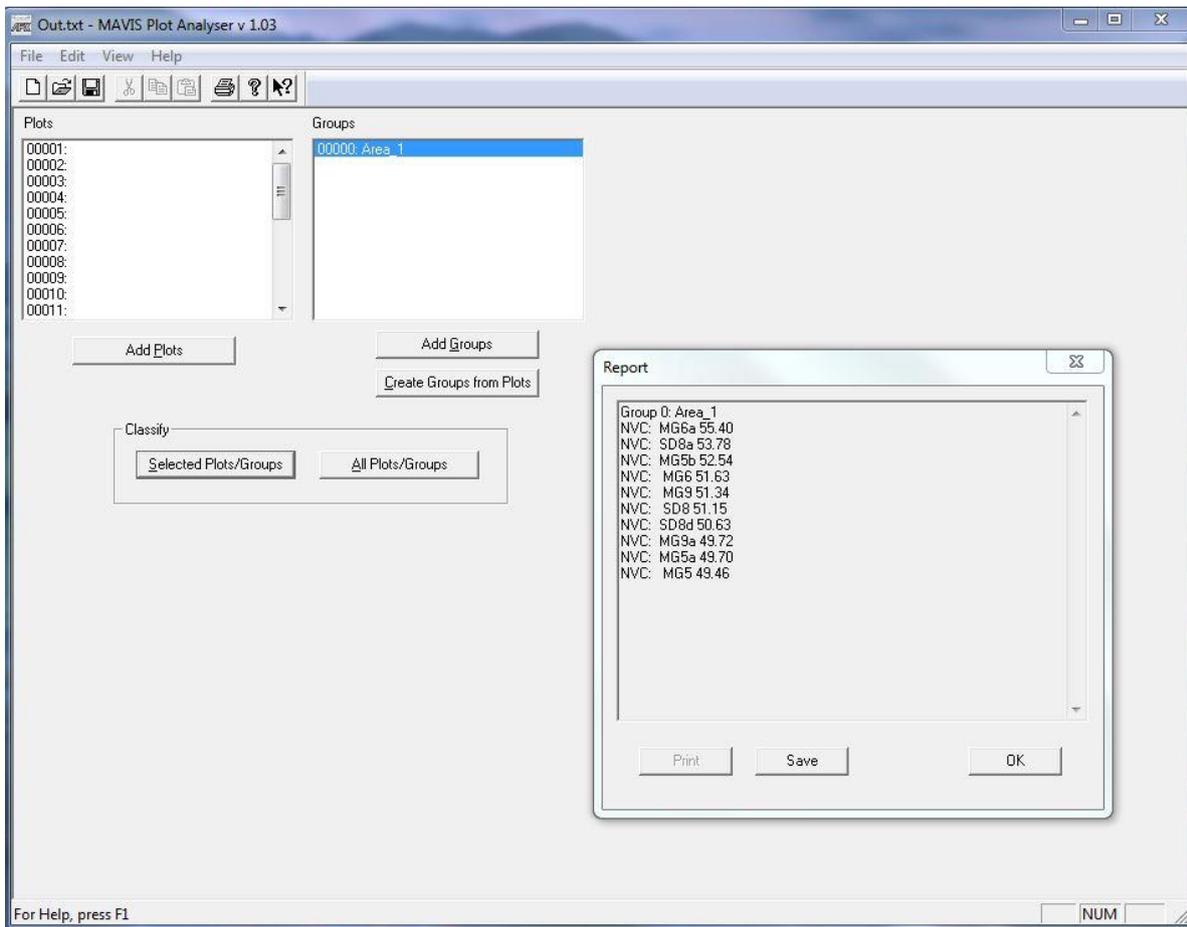
Creating groups of quadrats

Constancy tables can be created in three ways. First, you can build the group in MAVIS by selecting individual plots and combining them together. Second, you can enter a group directly from the keyboard without having to ever enter any individual quadrats. Third, you can load a pre-prepared batch input file thus avoiding any keyboard entry of species. This last method is suitable for large pre-existing datasets but they will need to be formatted correctly for loading into MAVIS. See creating batch import files. The first and second methods are described below.

1. Having loaded a dataset of individual plots or entered some plots from the keyboard you will see a list of all the separate plot IDs in the left-hand 'Plots' window. To build a group click on 'Create Groups from Plots'. Then click on each plot in the 'Available plots' window and click Add. Repeat for each plot that you want to be in the group. An example is shown below for the individual plots that were recorded in an ostensibly homogenous stand of vegetation.
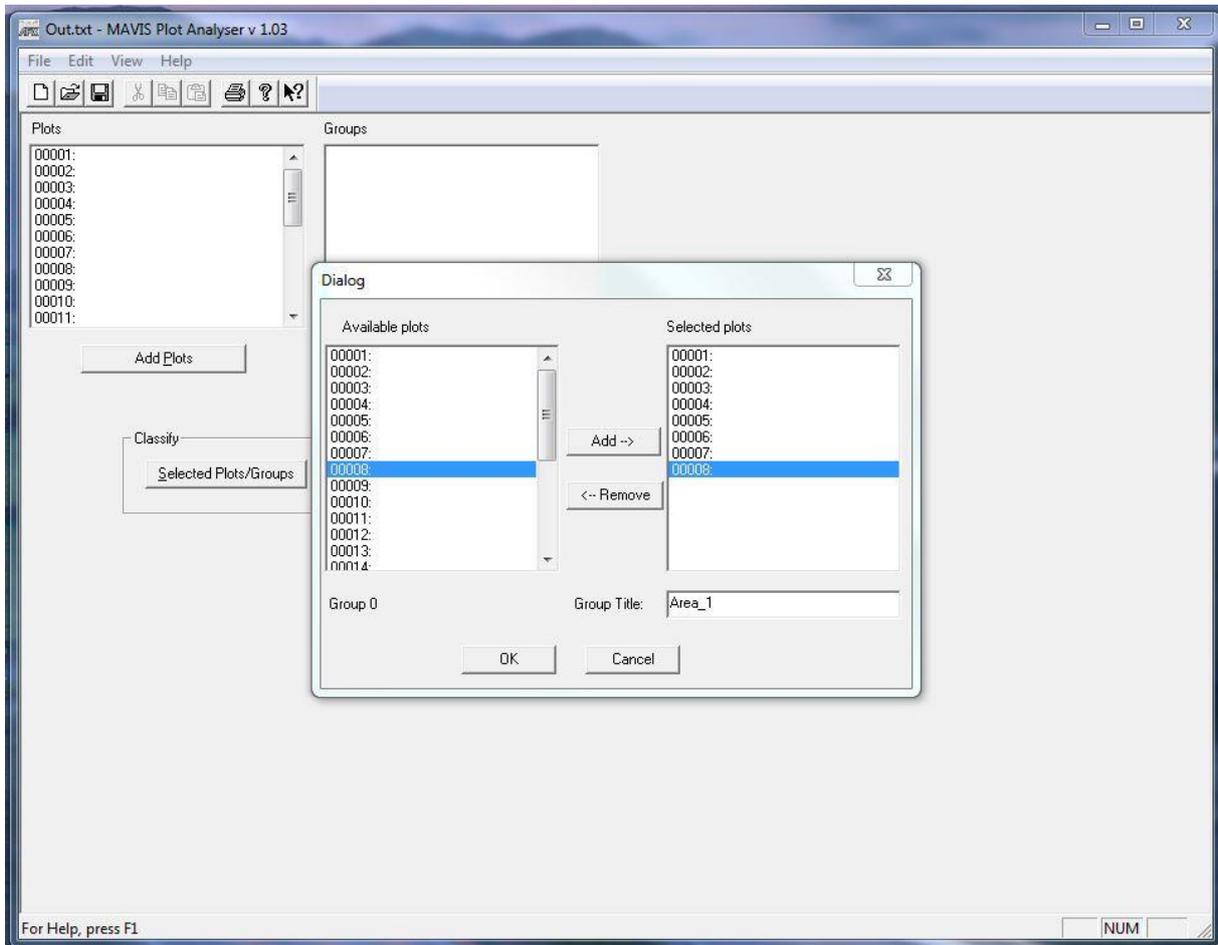
2. Once you click OK you are returned to the main screen where your new group will now be listed in the Groups window. Now to classify the group to the NVC either click Classify> All Plots/Groups or click on one group in the 'Groups' window and click Classify>Selected Plots/Groups. You should see the result of the classification process as shown below for the group named Area_1. The top ten matching coefficients are given for each group.

Out.txt - MAVIS Plot Analyser v 1.03

File   Edit   View   Help

Plots

00001:
00002:
00003:
00004:
00005:
00006:
00007:
00008:
00009:
00010:
00011:

Groups

00000: Area_1

Add Plots

Add Groups

Create Groups from Plots

Classify

Selected Plots/Groups   All Plots/Groups

Report

Group 0: Area_1
NVC: MG6a 55.40
NVC: SD8a 53.78
NVC: MG5b 52.54
NVC: MG6 51.63
NVC: MG9 51.34
NVC: SD8 51.15
NVC: SD8d 50.63
NVC: MG9a 49.72
NVC: MG5a 49.70
NVC: MG5 49.46

Print   Save   OK

For Help, press F1   NUM

3. Rather than build and classify one group at a time you can build all the groups and then once they are all listed in the 'Groups' window you can classify them all at the same time by clicking Classify> All Plots/Groups. Note that if your dataset consists of individual plots as well as groups then clicking Classify> All Plots/Groups will also return the indicator variables that apply to individual quadrats. These are mean CSR scores, mean Ellenberg scores and percentage contributions from the biogeographic elements. An example of the output for individual plots is shown below.
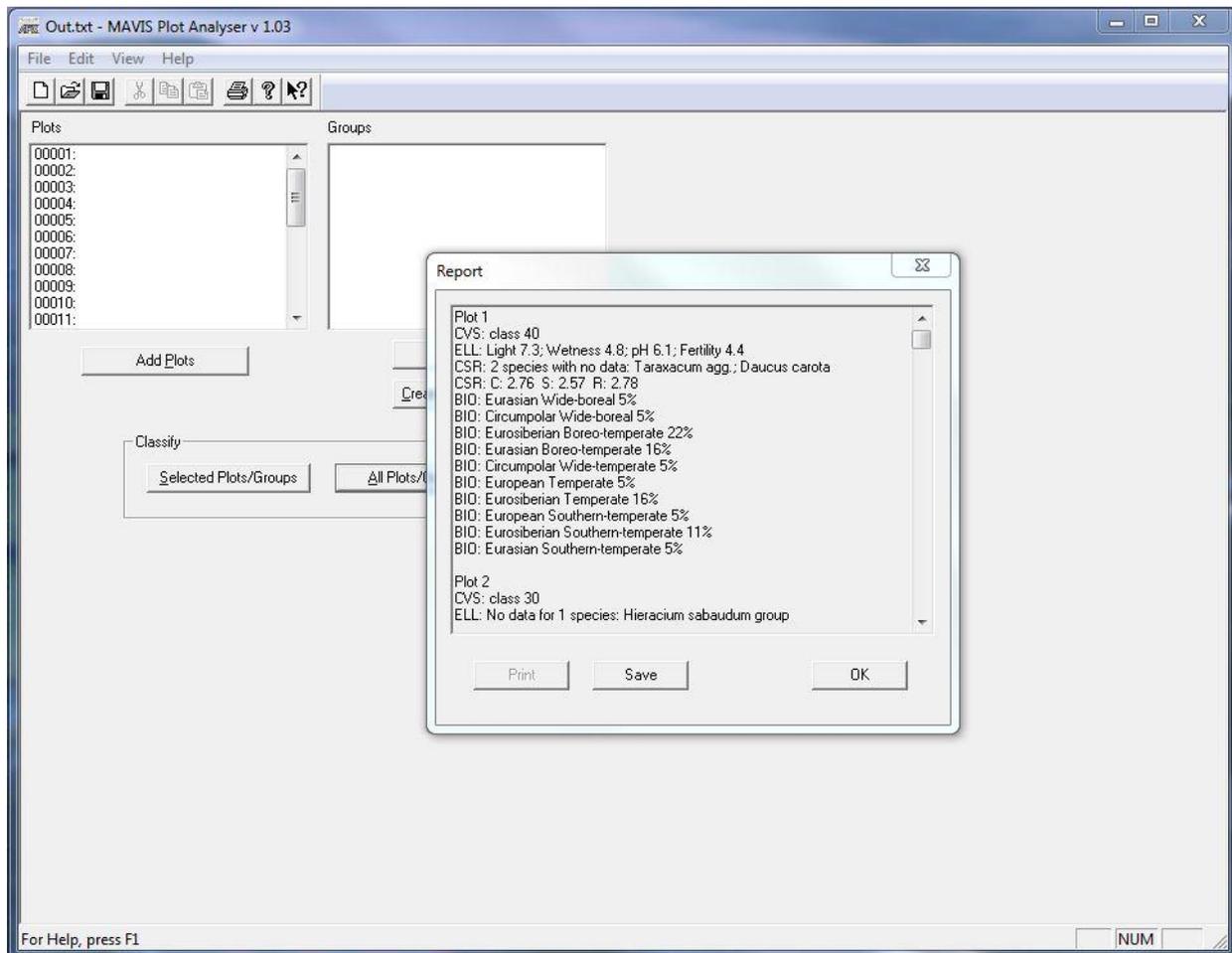
4. You can also enter a group directly from the keyboard without first entering all the constituent plots and combining these within MAVIS. The procedure is to simply click' Add Groups' rather than 'Add Plots'. Then the species selection screen appears as shown below. The only difference is that instead of an optional 'Cover value' box this is replaced by a 'Constancy value' box. Species are selected in the same way as for plots but a constancy value is added as an integer between 1 and 5 rather than a cover value. As in the NVC tables, this represents an interval of between-quadrat frequency for each species. For example 5, or V in the NVC volumes, indicates that a species occurred in between 80% and 100% of the quadrats in the group.

5. If a user wishes to classify individual quadrats then a workaround is to convert the recorded cover values into constancy using a relationship between the two. A look-up was published by Dring (2000) working at the Unit of Vegetation Science. Constancy values are the roman numerals:

I if cover <2%, II cover 2-5%, III cover 5-10%, IV cover 10-20%, V cover >=20%.

We are neither endorsing nor advising against this conversion. It is published at least. The alternative is to treat each species in the quadrat list as a species presence but then the matching software will assume the same constancy for all the species in your list. This is likely to give a more misleading match than results gained from implementing the kind of relationship above.
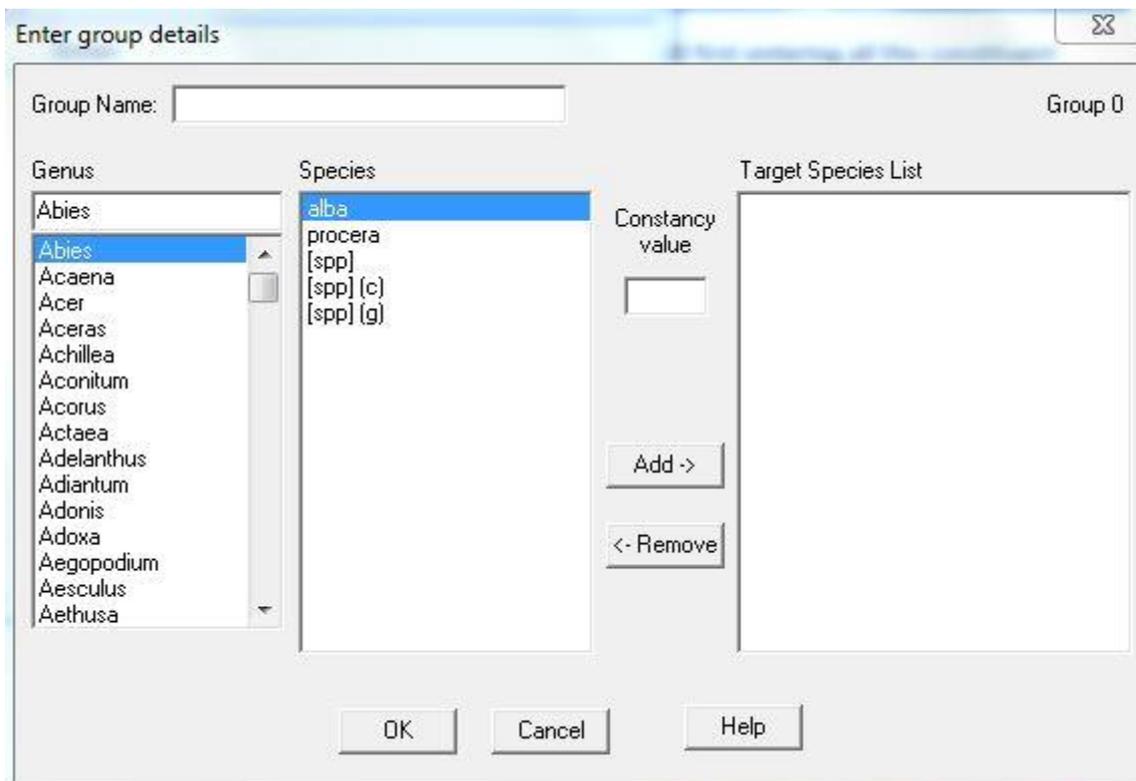
Loading a batch file of input data

1. Plots and groups may be entered manually through the application or read in from a text file. At present the maximum number of plots and groups that can be handled is 32767 and this is also the largest plot or group number that can be used.

2. To load a set of plots and groups choose Open from the File menu and select the text file that contains the data. Files previously saved will be in the correct format for opening. If you wish to create external files for opening they must obviously have the correct format. See preparing batch files for import to MAVIS.

Storing Data and Results

1. To save the set of plots and groups that you have created choose Save As from the File menu. The plots and groups will be saved to a text file in the correct format for editing, viewing, printing or exporting to external applications.

2. To save the results of a classification to a file using the Save button. The Print button has not yet been implemented, but the saved text file can easily be printed, or the data in the dialogue can be copied into the clipboard, pasted into another application and then printed. If the analysis results are too large to be displayed in a dialogue (more than around 53 plots or 126 groups) you will be prompted for a filename and the report will be sent straight to the selected file where it can be examined, printed or exported to another application.

Preparing batch import files for MAVIS

The main job to be carried out is to ensure that correct species names are used. This requires conversion of users' naming conventions into the list of names used by MAVIS. There is no easy way of automating this task because differences in naming conventions are hard to predict and may vary from user to user. Therefore there will often end up being an element of manual checking and editing needed. Once the two libraries of names have been matched up as far as possible then group edits can be achieved for example using Ctrl-H in Excel. The bulk matching of users' names with the MAVIS library can be carried out using the =VLOOKUP() function in a spreadsheet included in the downloaded archive – see below

Input file formats

Input data for MAVIS has to be in long-narrow format as below and not in short-fat matrix format as is used for programs such as CANOCO. An R script for conversion of matrix format to long-narrow format can be found in the downloaded archive file.

Input_1 : To enter data into MAVIS as a list of constancy tables, the input file should look like this;

G1 Acer pseudoplatanus (c) 5
G1 Fagus sylvatica (c) 5
G1 Luzula sylvatica 5
G1 Rubus fruticosus agg. 1
G1 Teucrium scorodonia 1
G1 Viola riviniana/reichenbiana 1
G2 Chamerion angustifolium 1
G2 Cirsium vulgare 1
G2 Hordeum distichon sens.lat. 4
G2 Matricaria discoidea 1
G2 Narcissus agg. 1

Note the absence of headers. Column 1 contains the group ID and must always be formatted with a capital G as the first character in each ID. This tells MAVIS that it is about to process a group of quadrats that have been combined into a constancy table. Column 2 is the species name as used in the MAVIS species library. Column 3 is the constancy value, which is always an integer between 1 and 5.

Input_2 : For individual plots the input file for MAVIS should look like this;

1 Achillea millefolium 10
1 Leucanthemum vulgare 5
1 Agrostis capillaris 15
1 Cerastium fontanum 5
1 Dactylis glomerata 15
1 Festuca ovina agg. 10
1 Festuca rubra agg. 10
1 Lotus corniculatus 1
1 Rumex obtusifolius 1
1 Medicago lupulina 1
1 Ranunculus acris 5
1 Senecio jacobaea 1
1 Trifolium repens 5
1 Cirsium vulgare 1

1 Holcus lanatus 35
1 Taraxacum agg. 10
1 Daucus carota 1
1 Galium verum 1
2 Veronica serpyllifolia 1
2 Achillea millefolium 1
2 Agrostis stolonifera 25
2 Alopecurus pratensis 20
2 Leucanthemum vulgare 5
2 Angelica sylvestris 1
2 Cerastium fontanum 1
2 Dactylis glomerata 10

Column 1 is the quadrat ID code and is always to be formatted as an integer sequence from 1 to n plots. Column 2 is the MAVIS library species name. Column 3 is either omitted if only presence has been recorded, or is a cover value. This can be a % or an integer representing an ordinal cover scale such as Domin. Values must not exceed 100 for each species although the sum of covers across each plot can exceed 100. Both these text file examples are included in the downloaded archive.

Note that if individual plots are to be processed as groups by MAVIS so as to produce matches to the NVC then each plot must be formatted in the style of Input_1 above. Hence cover values must be converted to constancy before uploading.

Formatting species names

An Excel file called *Preparing_data_for_MAVIS.xls* is included in the downloaded archive and is intended to help with the task of converting users' names to those used in MAVIS. Part of the worksheet in this file is shown below.

	A	B C D E F G H I J K L M	AA	AB	AE
1	Latin Name	1 2 3 4 5 6 7 8 9 10 11 12	MAVIS		MAVIS_library
2	Achillea millefolium	4 1 2 1 2	Achillea millefolium		Abies [spp]
3	Agrostis capillaris	4 5 3	Agrostis capillaris		Abies [spp] (c)
4	Agrostis stolonifera	4 6 3 4	Agrostis stolonifera		Abies [spp] (g)
5	Alchemilla glabra		Alchemilla glabra		Abies alba
6	Alopecurus pratensis	1	Alopecurus pratensis		Abies procera
7	Angelica sylvestris	1	Angelica sylvestris		Acaena anserinifolia
8	Anthoxanthum odoratum		Anthoxanthum odoratum		Acaena novae-zelandiae
9	Anthyllis vulneraria	2	Anthyllis vulneraria		Acer [spp]
10	Arenaria serpyllifolia	1	Arenaria serpyllifolia		Acer campestre
11	Arrhenatherum elatius		Arrhenatherum elatius		Acer campestre (c)
12	Bellis perennis		Bellis perennis		Acer campestre (g)
13	Brassica rapa		Brassica rapa		Acer platanoides
14	Carex flacca		Carex flacca		Acer platanoides (c)
15	Carex nigra	1	Carex nigra		Acer pseudoplatanus
16	Centaurea nigra	1 1 2 1	Centaurea nigra		Acer pseudoplatanus (c)
17	Cerastium fontanum	2 4 1 2 2 1	Cerastium fontanum		Acer pseudoplatanus (g)
18	Chamerion angustifolium		Chamerion angustifolium		Acer seedling/sp
19	Cirsium arvense	1 3 2 1	Cirsium arvense		Aceras anthropophorum
20	Cirsium vulgare	1 2 1	Cirsium vulgare		Achillea millefolium
21	Cornus sanguinea (seedl.)		#N/A		Achillea ptarmica
22	Crataegus monogyna (seedl.)		#N/A		Aconitum napellus
23	Cynosurus cristatus	2 1	Cynosurus cristatus		Acorus calamus
24	Dactylis glomerata	1 1	Dactylis glomerata		Actaea spicata
25	Dactylorhiza fuchsii	1	Dactylorhiza fuchsii		Adelanthus decipiens
26	Dactylorhiza purpurella		Dactylorhiza purpurella		Adiantum capillus-veneris

The worksheet contains some users' data in columns A to M. In col A two species names applied by the user are highlighted that do not match those in the MAVIS species names library. The extent of the initial match between users' names and MAVIS is determined using the =VLOOKUP() function as applied in col AA. For each species name in the users' data in col A the function searches the entire MAVIS species names list in col AE. If a match exists then the corresponding MAVIS name is returned in col AA, which is by definition the same as the name in col A. If no match is found, exemplified in

rows 21 and 22, than an error flag is given (#N/A) in col AA. The ideal scenario is that most species names match, as in this example. If all species match then no further manual editing need be done to the species names. Where a mismatch is found then the MAVIS list (col AA) must be searched manually to find the correct name. In these instances the correct names are *Cornus sanguinea* (g) and *Crataegus monogyna* (g). This manual retrieval of the correct names is the job that may take up an irritating amount of time and probably cannot be automated.

In the above case the other formatting issue to be tackled is the conversion of the users' data from short-fat matrix format to long-narrow list format as in the examples above. To do this copy the matrix of cover entries and the correct species names into another worksheet. Format the ID columns to have a letter – any letter – at the start e.g. p1, p2 etc. The data should look like that in the worksheet "To_R" in *Preparing_data_for_MAVIS.xls*. Then save as a *.csv file. Process the file using the R script in *Short_fat_to_long_narrow_v2.R*. The output file should look exactly like the long-narrow extracts above – Input_1 and Input_2 - and is ready to be read into MAVIS. If the output file is a list of constancy tables rather than quadrats then edit the R script to prefix each plot ID number with a "G" so that MAVIS knows it is processing groups rather than plots, as in Input_1 above.

Note on use of suffixes for woody species

Users will need to make a decision about the correct use of trees and shrubs suffixes since in the version of the NVC synoptic tables used in MAVIS, many woody species are subdivided into (c)=canopy, (s) = shrub and (g) = ground layer/seedlings. For example, when processing Countryside Survey plot data we apply the following rules. If the plot is in a woodland polygon select trees = c and shrubs = s. For area plots not in a mapped woodland polygon apply trees = g, shrubs = g. If a linear plot then apply trees = c and shrubs = s. *Ulex* spp. *Rubus*, *Prunus spinosa*, *Crataegus* spp, *Hedera* among others are all entered without a suffix since this is how they are represented in the NVC tables for the scrub communities they dominate e.g. W23 and W24. The effect of applying these rules is somewhat hard to predict since the way these species are coded in the source NVC tables is not consistent either. It seems most logical to code trees as canopy constituents when in woodland and as seedlings when not. A degree of mismatch is expected to result from the lack of discrimination of seedlings in CS plot data although if at low cover these will tend to be downweighted in the matching because they will be given low constancy when applying the cover to constancy conversion of Dring (2000). Similarly if CS plots are formed into groups then trees in the canopy are likely to be rendered more frequent than tree seedlings because they will occupy much higher cover. The best policy is probably to be consistent. At least then any bias is constant throughout the datasets and analyses.

New community and sub-community units included in MAVIS

MG13v2, MG8v2 and MG4v2 are all expanded constancy tables that have been added in but without replacing the original NVC community. This means users can compare matches against the old and new synoptic tables. MG6d is an accepted new sub-community of MG6. MG8v2 and MG4v2 now have 4 sub-communities each. MG14 and MG15 are new communities with 2 sub-communities each and MG16 is another new community.

MG8v2	*Cynosurus cristatus-Carex panicea-Caltha palustris* grassland	
MG8a	*Cynosurus cristatus-Carex panicea-Caltha palustris* grassland	*Sanguisorba officinalis* subcommunity
MG8b	*Cynosurus cristatus-Carex panicea-Caltha palustris* grassland	Typical subcommunity
MG8c	*Cynosurus cristatus-Carex panicea-Caltha palustris* grassland	*Carex nigra-Ranunculus flammula* subcommunity
MG8d	*Cynosurus cristatus-Carex panicea-Caltha palustris* grassland	*Caltha palustris-Bellis perennis* subcommunity
MG13v2	*Agrostis stolonifera-Alopecurus pratensis* grassland	
MG14	*Carex nigra-Agrostis stolonifera-Senecio aquaticus* grassland,	
MG14a	*Carex nigra-Agrostis stolonifera-Senecio aquaticus* grassland,	Typical subcommunity
MG14b	*Carex nigra-Agrostis stolonifera-Senecio aquaticus* grassland,	*Anthoxanthum odoratum-Trifolium repens* subcommunity
MG15	*Alopecurus pratensis-Poa trivialis-Cardamine pratensis* grassland.	
MG15a	*Alopecurus pratensis-Poa trivialis-Cardamine pratensis* grassland.	*Agrostis stolonifera* subcommunity
MG15b	*Alopecurus pratensis-Poa trivialis-Cardamine pratensis* grassland.	*Lolium perenne-Ranunculus acris* subcommunity
MG16	*Agrostis stolonifera-Eleocharis palustris* community	

MG6d	*Lolium perenne-Cynosurus cristatus* grassland	*Filipendula ulmaria* subcommunity
MG4v2	*Alopecurus pratensis-Sanguisorba officinalis* grassland	
MG4a	*Alopecurus pratensis-Sanguisorba officinalis* grassland	*Dactylis glomerata* subcommunity
MG4b	*Alopecurus pratensis-Sanguisorba officinalis* grassland	Typical subcommunity
MG4c	*Alopecurus pratensis-Sanguisorba officinalis* grassland	*Holcus lanatus* subcommunity
MG4d	*Alopecurus pratensis-Sanguisorba officinalis* grassland	*Agrostis stolonifera subcommunity.*