DEPARTMENT OF PLANNING, INDUSTRY & ENVIRONMENT

Floristic data audit and preparation
for data driven benchmarks for the Biodiversity Assessment Method

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Cover photo: Native vegetation, Wallumatta Nature Reserve. John Spencer/DPIE

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1. Introduction

Vegetation benchmarks can be used to describe a reference state for a given community, against which the biodiversity values of sites of interest can be compared (OEH 2017). The three primary components of biodiversity; composition, structure and function, can be expressed as site level benchmarks (Noss 1990). Appropriately derived benchmarks can provide a transparent and repeatable basis for site level decision making in natural resource management and are an important component of decision-making tools such as the Biodiversity Assessment Method (BAM).

Due to the complexities and scale of data analyses involved, previous benchmarks in New South Wales have been largely derived via an expert process. The aim of the current BAM project was to develop a set of benchmarks derived directly from vegetation plot data. This not only improves the transparency and repeatability of the benchmarks, it also allows for a reliable estimate of confidence in benchmarks to be made and for continual improvements in reliability and confidence as new data become available. This move from expert derived to data driven benchmarks required the development of a consistent set of plot level vegetation data with all of the required attributes in a standardised format.

This report describes the processes undertaken to compile and audit a dataset suitable for generating empirical vegetation condition benchmarks for composition (growth form richness) and structure (growth form cover) to underpin the BAM. For this purpose, a review of existing data and their metadata was required. The absence of accurate metadata on plot and survey methods impedes the numerical analyses needed to calculate vegetation benchmarks and other applications to which these data are required. This body of work represents a comprehensive statewide undertaking to develop a corporate vegetation database that better serves the needs of numerical ecology.

2. Allocation of plots to Vegetation Class

As benchmarks were to be developed for combinations of a NSW Vegetation Class (Keith 2004) within a given Bioregion (Department of the Environment 2012) plots needed to be allocated to a Class. Vegetation classification is hierarchical, so all plots that have been allocated to a finer scale Plant Community Type can be directly allocated to a Class. Some plots that have insufficient floristic information cannot be allocated to PCT but can be allocated to Class.

Initially, the existing allocations of plots to Plant Community Type (PCT) or Class were taken from two previous programs. For the western catchments, this was the State Vegetation Type Mapping Program (SVTMP) and for the eastern catchments by the State Vegetation Type Classification Program (SVTCP).

For the western catchments the SVTMP included the following steps;

- Hierarchical agglomerative clustering of plots based on floristics followed by SIMPROF analysis in Primer (Clarke & Gorely 2006) to identify significant groupings.
- SIMPER analyses in Primer to identify characteristic species within each group.
- Automated comparison of characteristic species derived from these analyses with *a priori* characteristic species of PCTs, using the SAAP program (Oliver et al. 2012), to identify the most likely PCT matches for each grouping of plots.
- Expert review of outputs of SAAP and final allocation to PCT.

For the eastern catchments, the SVTCP undertook a compilation of plot to PCT allocations from large, regional classification projects in the Hunter, North Coast, Sydney Basin and South Coast. Sites not allocated via these classification projects were assigned to a Vegetation Class via a process of non-hierarchical clustering in PATN (ALOC, Belbin 1993), with the resulting groups assigned to a Class via expert consideration of characteristic species.

Because there was significant spatial overlap between these two programs many sites have multiple PCT or Class allocations, and allocations may change as more data are collected or as classifications become more refined. To manage these data for BAM analyses, a plot allocation standalone database was developed to store all plots and their allocated PCT or Class level. This database holds over 72,000 individual plot allocations, with 71,171 plots allocated to at least Class level and 57,215 allocated to PCT level.

For the purposes of BAM benchmarking, a single *a priori* Vegetation class allocation was required for each plot. Because allocations derived from the two programs did not always align, a process was developed to categorise and prioritise all plot allocations scored by suitability within the context of generating BAM benchmarks (Table 1). Where a plot was allocated to more than one Class or PCT, the allocation method with the highest score was used. Given BAM benchmarks are derived for the current *a priori* Vegetation Classes, either *Numerical / a priori* (Method 4) or *Intuitive / a priori* (Method 3) was assigned to sites with more than one allocation. Where possible, sites were allocated to PCT level to retain the finer scale classification information and because PCT and Class have a known and hierarchical relationship.

All final allocations to PCT were automatically allocated to Class and spatially checked by the project team by Bioregion. All spatial outliers were flagged for further checking. Flagged sites were either reallocated to a more appropriate Class, retained in the same Class as acceptable outliers or excluded as problematic. A binary field was added to the database to flag sites which were removed through this process.

Table 1   **Plot allocation categorisation and prioritisation schema**

Rank	Method	Description
6	Numerical/primary	Plot assigned via statistical process direct to PCT as a primary* classification
5	Intuitive/primary	Plot assigned via intuitive / expert process direct to PCT as a primary* classification
4	Numerical/a priori	Plot assigned via statistical process direct to PCT as an a priori classification
3	Intuitive/a priori	Plot assigned via intuitive / expert process direct to PCT as an a priori classification
2	Numerical/lineage	Plot allocated to local communities via statistical process then assigned to PCT via lineage
1	Intuitive/lineage	Plot allocated to local communities via intuitive/ expert process then assigned to PCT via lineage

* a primary classification is a classification derived empirically from the available data, compared with an existing *a priori* classification to which new data are compared and assigned.

3. BioNet Atlas data remediation

The open-access, corporate database that contained the floristic data which formed the basis of this work was the Systematic Flora Surveys module of <u>BioNet Atlas</u>. At the date of extraction (30/12/2016) our dataset included a total of 97,999 individual census records. The term census record, or censusID describes each unique plot in the database. In some cases, a plot can have multiple censusIDs, which is described as true replicates and discussed in section 5.4.

The State Vegetation Type Mapping Program (SVTMP) and the State Vegetation Type Classification Program (SVTCP) extract floristic data from the BioNet Atlas for vegetation classification and mapping. The SVTMP undertook successive audits of the western catchments of the State. In the east of the state the SVTCP is undertaking a similar audit of floristic data in the eastern catchments. Both programs identified plots (synonymous with census records or censusID) with floristic data that were unsuitable for classification and mapping. Some reasons for excluding data are duplicate sites (identical data with different census ids); sites which were not full floristic (full floristic = all observed vascular plant species recorded along with a measure of cover-abundance); or sites not from systematic surveys (fixed plot size). As the BAM benchmarking project required unique, full floristic and systematic survey data, all sites excluded by these previous audits were also excluded from our initial dataset.

Approximately 69,000 records formed the initial dataset and have been collected over a number of decades for a variety of purposes. For this reason, many of the fields within BioNet Atlas are not fully populated for all records, and errors or omissions in the data entered have often been carried over from earlier compilation efforts. In addition, not all data collected with the original plots have come across to BioNet Atlas (e.g. date) and in some cases attributes required by this project were simply not available in the database (e.g. rainfall in prior 12 months) or not stored in a searchable format (e.g. free text field entry). To develop a consistent dataset for deriving benchmarks a metadata review and rehabilitation process was undertaken, which in some cases involved going back to original reports, original field sheets or contacting the person responsible for the original survey effort.

A number of existing fields in BioNet Atlas were required for this work and had to be checked for completeness and for errors. Table 2 provides details of the key fields in BioNet Atlas which contained the censusID level metadata required for filtering sites.

Table 2   Existing fields checked and corrected as part of this data audit

BioNet field name	Description	Review and remediation
Rep no	Plot replicate number for each census record	All true replicates to be included, so all non-true replicates were identified and filtered out
Date first	Start date for census record	Where Date first did not equal Date last this indicates that the precise date of survey was unknown
Date last	End date for census record	As for Date first
Species score method	System used to record cover (e.g. species actuals; cover 1 to 6). For more recent datasets with actual per cent values, this records the ordinal system	Required as all cover scores needed to be transformed to estimates of per cent cover

BioNet field name	Description	Review and remediation
	they have been automatically converted to, usually cover 1 to 6	
Floristics quadrat	Free text field recording information about plot dimensions	Used to compile information on plot dimensions
Full floristics	Binary field indicating whether all species were recorded	Used to compile information on whether a plot was full floristic and systematic
Is dimensionless plots	Binary field indicating whether a dimensionless plot was used	Used to compile information on whether a plot was dimensionless, e.g. random walk
Is measured plots	Binary field indicating whether a measured plot was used	Used to compile information on whether systematic survey was used
Is nested plots	Binary field indicating whether nested plots were used	Used to compile information on whether subplots were used
Subplot	Numerical field indicting the identity of the Subplot	Used to identify taxa outside the specified plot dimensions (e.g. additional taxa) to identify smaller plots within a larger area (e.g. 1x1m quadrats along a 50m transect)
Is unknown plots	Binary field indicating whether the plot type was unknown	Used to compile information on whether the plot type was unknown
Method notes	Free text, note field containing information on survey methods, including cover and abundance score system, plot dimensions and whether full floristic	Often used to compile information on plot dimensions and cover score systems
Survey description	Free text, note field primarily recording information on survey location and purpose, may also contain information of survey methods	Used to compile information on survey method

4.   The BAM Benchmarks Project Database

A project specific database was developed (the BAM Benchmarks Project Database) for the purposes of storing searchable census record level metadata as required by the project, filtering the final dataset and performing the calculations required at the level of growth form groups. Where attributes were required as filters but were stored as free text, new fields were created in the BAM Benchmarks Project Database and data entered in a consistent numerical or categorical format (Table 3). These fields have wider utility to vegetation data users more generally and should be considered as potential improvements to future development of BioNet Atlas.

Table 3   Additional proposed fields for inclusion in the BioNet Atlas database

Field	Data Type	Description
Plot size	Double (floating point)	Mandatory field at the census level recording size of bounded plots in m^2
Exotics recorded	Binary (yes/no)	Mandatory field at the survey level recording whether a survey effort recorded exotic species
Cover method	Restricted list	Mandatory field at the survey level recording the method used to estimate tree or overstorey cover. List – crown cover (CC); foliage cover (FC); projective foliage cover (PFC)
Minimum actuals value	Double (floating point)	Field at the survey level to record what minimum value was used in surveys where species actuals or actual banded values were recorded. It is unclear otherwise whether a survey has used 1% as the minimum cover and rounded all lower covers up to this

5.   Metadata review and data preparation

5.1   Data filters

In order to build a repeatable and transparent dataset, all census records needed to conform to a standard set of characteristics that could be used to filter the data. Table 4 lists the rules applied to the dataset of approximately 69,000 census records and provides a brief description of each. Some of the metadata required are not available in BioNet Atlas and had to be sourced from original reports, field sheets or discussions with original data custodians. Additional metadata collected by the project were stored in standardised fields in the BAM Benchmarks Project Database at the census record level (Table 4).

Sites which conformed to each of these data filtering rules, were accepted in the final benchmarks dataset. The following sections discuss each of these data filtering rules and their implementation in the BAM Benchmarks Project Database.

Table 4   Data filtering rules specific to the BAM Benchmark analyses

Rule	Description
Full floristic/systematic	Full floristic survey undertaken within a bounded area.
Plot size	Only plots of 400m^2, or dimensions approximating 400m^2.
Replicates	Where replicates were recorded these were checked as being 'true' replicates (a resurvey of the same plot at another time). Where replicates were not true, all other replicates higher than 1 were removed.
Date	Date of survey. Missing dates and all dates earlier than 1/1/1971 were considered too old and were removed. All dates falling on January 1 of any year (system default when no date was manually entered) were corrected if possible, or census records removed.
Spatial and temporal proximity	Where two sites were within 50m distance and had survey dates within 30 days of each other, one site from each pair was removed.
Exotics recorded	Where a survey recorded no exotic species, sites were assessed based on a range of spatial attributes and removed if it was considered unlikely that no exotic species occurred within a survey.
Subplot 1 only	Only Subplot 1 data were used as other subplots often recorded additional species outside of the standard plot area, e.g. North-East Forest Survey (NEFVEG).
Adu species excluded	Additional overstorey species recorded with stratum as 'Adu' were removed.
Known cover score system	Only surveys which recorded cover using a known Braun-Blanquet cover score system or

Rule	Description
	using actual per cent cover values were used. Presence/absence only data were excluded.
Veg class allocation	Site has been allocated to a NSW Vegetation Class.

5.2   Full floristic and systematic

Currently, whether a plot is full floristic is recorded within BioNet Atlas in a binary (true/false) field. Frequently, this field is not addressed, or incorrectly checked when entering data, with the system-imposed default setting being 'false'. Metadata were compiled for all plots to identify those that were 'full floristic' and therefore suitable as candidates to be included as potential informants for numerical analyses. Some plot-based vegetation surveys collected only the minimum National Vegetation Information System (NVIS) Level 5 set of taxa, that is, three to five dominant taxa with the upper, mid and lower strata. These plots are not full floristic and were identified as not full floristic in the BAM Benchmarks Project Database and excluded, via the 'full floristic' filter.

Information on whether a plot was undertaken in a systematic fashion within a bounded, regular area, was sometimes contained in various free text fields within BioNet Atlas. Where this information was not complete it was sourced from original reports, previous metadata reviews or by contacting the person responsible for the original survey effort. This information was built into two new binary fields ('UsePA' for presence/absence sites and 'UseCA' for sites with cover/abundance recorded) in the BAM Benchmarks Project Database and used to filter out non-systematic surveys.

5.3   Plot size

Free text information on plot size was available within multiple fields in BioNet Atlas. Missing information on plot size was collected as part of the metadata review. A standard numerical field was created in the BAM Benchmarks Project Database (Dimensions) and populated with the plot size in m^2. Only plots of $400m^2$, or plots with dimensions approximating that size (within 10%), were included in the final BAM output, but through this remediation effort, we have collated plot dimensions for approximately 60,000 census records and identified approximately 10,500 census records that are either dimensionless, missing dimension information, or require further effort to extract dimension information.

5.4   Plot replicates

Within BioNet Atlas, all true replicates, that is repeat surveys of the same plot at a different time, are allocated a unique census identifier (CensusID). However, it was known that many of these were not true repeat visits to the same location on a different date, but were instead used to store information on other survey elements such as nested subplots. Information on whether a survey undertook true repeat surveys of the same plots (true replicates), was recorded during the metadata review. Two new fields were created in the BAM Benchmarks Project Database to indicate those census records incorrectly entered as replicates as well as identifying which information stored as 'replicate' to remove.

5.5   Date

The date on which a plot was sampled is stored in two fields, 'Date first' and 'Date last'. In many cases different dates have been entered for a given census record, that is 'Date first'

does not equal 'Date last'. This indicates that the actual date of survey is unknown, and in these cases, the correct date had to be ascertained in order to use these sites.

In addition, a number of plots were recorded as being surveyed on 1 January (of different years). A legacy attribute of BioNet Atlas was to populate missing date information as 1 January for the year the data were entered. However, for our project needs (and no doubt the needs of many projects) an accurate date was needed. Where possible, correct date information was sourced from original reports or by contacting the survey principal.

5.6   Spatial and temporal proximity

All sites within 50 metres of each other and surveyed within 30 days of each other were flagged using a Python script in ArcMap (ESRI 2011), and one of each pair filtered out of the final dataset. It was considered that these sites would cause issues for the modelling processes. Where relevant, the least disturbed, based on floristics and imagery, was retained. Records removed through this process were flagged in a binary field in the BAM Benchmarks Project Database.

Subplots are defined as smaller quadrats within a larger area (e.g. multiple 1x1m quadrat along a 50m transect). The 'SubplotID' field in BioNet Atlas is used to identify number of subplots within a larger plot, number of nested plots or additional species recorded outside of the main plot. The most common application of subplot is to record floristic composition within 20 x 20m quadrat; and estimate vegetation structure from a 20 x 50m quadrat). The unique taxa are observed within the 20 x 50m area (those that were not already recorded in the 20 x 20m) are stored as '2' in the 'SubplotID' field, or sequential numbers of each subplot. For simple quadrats, without subplots, all floristic data from within the plot are recorded as 'Subplot 1'. For our project, all plots were to be regular, bounded plots of a 400 m^2 area, so all nested plots and other types of subplots had to be excluded, therefore only species recorded in Subplot 1 were used.

During the data screening process, some sites were identified as having recorded all observations as Subplot 1. In collaboration with the State Vegetation Type Classification Team, data custodians were contacted to determine if field records and datasheets could be verified to identify observations outside the 20m x 20m quadrat (but within the 20 x 50m) and allocate those unique taxa to Subplot 2. Additional species recorded outside the plot are also recorded with 'Adu' entered into the 'Stratum' field. These species were also excluded from the final dataset.

5.7   Exotic taxa

An analysis of the data showed that there were a large number of surveys with no exotic taxa recorded in any plot. We assessed sites to determine the likelihood that either: i) exotics were not present or ii) the observer neglected to record exotics at the time of survey. Plots where exotics were not present was not a criterion that excluded sites from our analyses. Rather, we excluded sites where we expected exotics to be present, yet none were recorded. As it was a requirement of our project that exotic cover was recorded, these surveys were considered potentially problematic. The likelihood that a plot had no exotic taxa in all plots within the survey was assessed by checking the: location, isolation, topography, dominant lithology, time of year, vegetation type, tenure and number of sites in the survey

A new binary field was created in the BAM Benchmarks Project Database and surveys lacking exotic species but expected to have exotic species were tagged.

5.8   Cover score system

Cover estimates are stored in BioNet. A multitude of 'Braun-Blanquet' style ordinal cover score systems have been used to record cover-abundance scores; as well as actual per cent cover values or simple presence/absence data (no cover recorded). For estimating cover benchmarks, all records had to be converted to a common system for estimating cover, which in this case was actual per cent cover values (see section 6.3 for a description of the conversion process). For this purpose, the cover score system used had to be known and checked against the cover data. Where the cover score system used was found to be incorrectly recorded this was updated in the BAM Benchmarks Project Database.

5.9   Cover estimate method

A review was also undertaken of the method used to estimate cover, as this is not recorded in BioNet Atlas and estimates using different methods can vary significantly. There are a number of methods for estimating cover of vegetation, with three having been identified as primarily used within BioNet Atlas; crown cover; foliage cover; and projective foliage cover. Crown cover is defined as the percentage of the plot which is covered by the vertical projection of the periphery of the crowns, with the crowns treated as opaque (Walker & Hopkins 1990). Foliage cover is defined as the percentage of the plot covered by the vertical projection of leaves and branches and projective foliage cover as the percentage covered by foliage only (Walker & Hopkins 1990).

The variation between cover estimates derived using each of these methods differs between different vegetation structural classes, however as an example the vegetation formation 'Mallee Woodlands and Shrublands' is considered to have an overstorey projective foliage cover of 10-30% and a crown cover of 20-50% (Department of Environment and Energy 2006). Table 5 provides plot counts for each of the main overstorey cover estimate methods as well as unknown plots. This attribute was included in the raw data used to model cover benchmarks.

Table 5   Plot count by cover estimate method

Cover Estimate Method	Sites
Crown cover (CC)	7022
Foliage cover (FC)	12302
Projective foliage cover (PFC)	2565
Unknown	13465

5.10 The filtered BAM Benchmarks Project Benchmarks dataset

When all filters and spatial checks were applied, the final dataset consisted of 36,335 individual census records used to calculate benchmarks for structure and composition. The full output dataset, including census identifiers and raw cover and richness values, can be found at Vegetation Condition Benchmarks Cover and Richness raw data V1.2. These records were used to calculate the native richness and native cover of growth forms at each site as described in section 6.

6. Deriving the native richness and native cover of growth forms for each replicate

For the purposes of the BAM benchmarks, composition is represented by the richness of native plant species by growth form group, and structure by total per cent foliage cover by growth form group.

6.1 Growth form groups

An expert consultation process (Oliver et al. 2019) was undertaken to assign each of the 7,265 native vascular plants in NSW to one of 19 primary growth forms (Walker & Hopkins 1990). Genus only records were allocated the growth form most common to native species within the genus. These 19 growth forms were grouped into six growth form groups (GFG). Table 6 shows a summary of growth forms and growth form groups, and the number of taxa within each (Oliver et al. 2019).

Table 6   Links between growth forms and BAM growth form groups

Growth form group	Growth form	Count of native taxa allocated
Tree	Tree	776
	Mallee tree	39
Shrub	Shrub	2,326
	Chenopod shrub	208
	Heath shrub	159
	Mallee shrub	11
Grass & grass-like	Tussock grass	452
	Sedge	268
	Rush	143
	Other grass	42
	Hummock grass	10
Forb	Forb	2,187
Fern	Fern and fern allies	210
Other	Vine	252
	Epiphyte and lithophyte	103
	Cycad and cycad-like	27
	Xanthorrhoea	20
	Tree fern	17
	Palm and palm-like	15

6.2   Native richness by growth form group

For calculations of native richness by growth form group, all native taxa that were assigned to a growth form in BioNet Atlas were included. For taxonomic consistency, sighting records at the subspecific level were aggregated to species level for calculations of richness. Richness was then calculated as the count of all included taxa within a growth form group for each plot replicate.

6.3   Native cover by growth form group

Total native cover by growth form group was required for each census record as an input to modelling of native foliage cover benchmarks. Given around 72% of the benchmark dataset have cover estimates recorded in an ordinal cover-abundance scale, these data needed to be transformed to a quantitative scale. Existing approaches to transforming cover-abundance data have taken the midpoint of the range – on the assumption that cover data are normally or uniformly distributed within each cover class. McNellie et al. (2019) have demonstrated that data within classes are skewed meaning that class midpoint is not the appropriate transform.

McNellie et al. (2019) used 2,805 geo-referenced, fixed-area (0.04 ha) plots from BioNet Atlas (16 September 2016) with visual estimates of the proportion of cover (0.1% as the minimum) and counts of abundance (n = 95,812 floristic records) to generate appropriate per cent cover transforms for each growth form for each Braun-Blanquet class.

The transforms used for native taxa, were the observed mean per cent cover as calculated for each of the cover-abundance classes (BBCA) for each growth form group. Despite the large size of the dataset, some growth form groups were not represented (e.g. no forbs observed in BBCA5 or BBCA6). In these cases, the overall observed mean of the BBCA was used. This approach was extended to 15 different hybrid cover-abundance scoring systems which have varied cut point between classes, thus altering the observed mean (see Appendix 2 for native species cover transformations).

6.4   Minimum actual cover values

Where actual cover values were recorded (0-100%), these were used untransformed, except in the case where a minimum value of 1% was used. In these cases, we made an assumption that if visual estimates of cover were recorded as 1%, it was due to either a database limitation or a field method which did not specify that cover could be recorded below 1%. Using all records where cover was estimated at <1% (n = 73,730), we calculated the observed mean cover by growth form group. Exotic taxa recorded as 1% were transformed to 0.31% (Table 7). The values used in Table 7 were used to transform 1% minimum values prior to delivery of the final dataset for benchmark modelling.

Table 7   Transforms applied to records where the minimum survey-wide cover record was 1%

Row labels	Observed mean (% cover)	Count of obs.
Exotic	0.31	11,384
Fern	0.33	2,850
Forb	0.28	20,674
Grass	0.34	12,846
Other	0.30	8,007

Row labels	Observed mean (% cover)	Count of obs.
Shrub	0.34	13,186
Tree	0.45	4,783
Grand Total	**0.32**	**73,730**

6.5 Total exotic cover

Exotics were not allocated to a GFG, however, summed total exotic cover was used as an indicator of disturbance. For calculations of total exotic cover (TEC), all taxa identified in BioNet Atlas as exotic and which had been assigned a cover value or score, were included. Where Braun-Blanquet type cover cores were used, these were transformed to a per cent cover value according to Appendix 1 and Table 7. The transformations for exotics used were developed using the same process as that used for native species described in section 6.3. For exotic taxa the observed mean for all exotic taxa within each BBCA was used.

6.6 Estimating prior and long-term rainfall

In order to derive the raw data for developing benchmarks a number of additional fields of data had to be calculated and stored for each census record within the BAM Benchmarks Project Database.

Accumulated precipitation for intervals of 3, 6, 12 and 36 months prior to a given survey as well as the long-term (116 year (1910-2016)) mean, were calculated for each census record from the Australian Water Availability Project data (AWAP, www.bom.gov.au/jsp/awap; Jones et al. 2009).

The AWAP dataset is at a resolution of 0.05° by 0.05° (approximately 5 km by 5 km) and is derived by interpolating data from a network of stations between 1910 and 2016. The location and date of survey are used for extracting precipitation time series from the AWAP dataset using the following process;

1. Prepare location (latitude and longitude) and survey date tables for all available survey.

2. Interpolate precipitation from the AWAP grids to survey sites to have precipitation time series for each survey site.

3. Calculate the start point for 3, 6, 12 and 36-month before the survey date for each survey site.

4. Extract 3, 6, 12 and 36-month precipitation time series from the entire time series (1910-2016) for each survey site.

5. Calculate 3, 6, 12 and 36-month accumulated precipitation prior to survey date and the 116-year long-term mean for each site.

Precipitation data were provided by Fei Ji (OEH, Climate and Atmospheric Science).

The raw data for developing composition and structure benchmarks contains 36,335 rows and 31 columns (see Vegetation Condition Benchmarks Cover and Richness raw data V1.2). Table 8 describes the columns and their origin.

Table 8   Calculated fields for deriving benchmarks

Field name	Description	Origin
CensusDBID	Unique census ID from VIS	BioNet Atlas attribute
SiteNo	Site ID	BioNet Atlas attribute
SurveyName	Survey name	BioNet Atlas attribute
DateTxt	Start date of plot	BioNet Atlas attribute
Year	converted date field to text field	BAM remediation information
Month	converted date field to text field used to model seasonal variation	BAM remediation information
Day	converted date field to text field	BAM remediation information
KeithFormation	Keith vegetation formation V2	External allocation of plots to vegetation formation
KeithClass	Keith vegetation class V2	External allocation of plots to Vegetation Class
Latitude	Latitude in GDA94	BioNet Atlas attribute
Longitude	Longitude in GDA94	BioNet Atlas attribute
Reg_Name_7	IBRA v7 Region	Spatial interrogation
Tenure	Site tenure category	Spatial interrogation
Rain12	Rainfall for 12 months prior to date	Spatial interpolation
FrCov	Native fern cover	calculated from raw data
FCov	Native forb cover	calculated from raw data
GCov	Native grass and grass-like cover	calculated from raw data
OCov	Native 'other' cover	calculated from raw data
SCov	Native shrub cover	calculated from raw data
TCov	Native tree cover	calculated from raw data
FrNR	Native fern richness	calculated from raw data
FNR	Native forb richness	calculated from raw data
GNR	Native grass and grass-like richness	calculated from raw data
ONR	Native 'other' richness	calculated from raw data
SNR	Native shrub richness	calculated from raw data
TNR	Native tree richness	calculated from raw data
TEC	Total Exotic Cover	calculated from raw data
TotCov	Summed total cover	calculated from raw data
Rain12	Rainfall for 12 months prior to Date	Spatial interpolation
CoverMethod	Tree canopy estimate method	BAM remediation information
CoverType	Cover estimates as score or %	BAM remediation information

7. Dataset limitations and opportunities

7.1 Spatial and floristic data gaps

The distribution of plots across the State is highly uneven and reflects the drivers for vegetation survey. As the current output is broken down by IBRA region, it is important to have a sufficient density of sites in each IBRA region. Table 9 provides a breakdown of sites per area within the current output dataset in each IBRA region. The table also provides information on the proportion of additional, unallocated sites that could be available, as well as the percentage of additional sites with plot dimensions other than 400m^2. These latter could be used to lift numbers of sites for native cover calculations.

Table 9   Breakdown of plots by IBRA region

IBRA region name	Area ha (10,000s)	density of sites used[a]	number of sites allocated to type[b]	number of sites used[c]	Unallocated[d]	% Additional unallocated[e]	% Not 400m² [f]
Brigalow Belt South	562.3	7.4	4762	4157	630	15.16	5.4
Cobar Peneplain	738.5	1.4	1692	1017	9	0.88	13.4
Darling Riverine Plains	941.3	2.3	4440	2144	18	0.84	8.0
Murray Darling Depression	794.9	0.7	2422	556	2	0.36	56.2
Mulga Lands	658.1	0.5	808	310	0	0.00	15.3
Nandewar	207.2	11.3	2558	2336	101	4.32	2.9
New England Tablelands	285.7	10.1	3920	2885	439	15.21	13.3
NSW North Coast	399.6	10.7	5470	4261	456	10.70	11.6
NSW South Western Slopes	811.4	2.3	2432	1864	56	3.00	10.6
Riverina	703.1	2.6	3203	1818	1	0.06	12.7
South East Corner	120.6	10.3	3377	1239	747	60.29	25.3
South Eastern Highlands	494.5	7.2	5281	3560	333	9.35	5.1
Simpson Strzelecki Dunefields	109.4	0.3	77	36	0	0.00	52.6
Sydney Basin	362.2	22.8	12324	8267	1526	18.45	0.8
Australian Alps	464	5.0	1107	230	4	1.74	39.2
South Eastern Queensland	165.5	9.2	1944	1499	154	10.06	12.0

IBRA region name	Area ha (10,000s)	density of sites used[a]	number of sites allocated to type[b]	number of sites used[c]	Unallocated[d]	% Additional unallocated[e]	% Not 400m2 [f]
Broken Hill Complex	376.6	0.4	168	152	0	0.00	7.1
Channel Country	233.5	0.0	230	4	0	0.00	100.4

[a] density of sites that met all filters and were used to create benchmarks expressed within 10,000ha

[b] number of sites allocated to type prior to applying other filters

[c] number of sites allocated to type that remained after applying other filters

[d] number of unallocated sites within region

[e] additional, unallocated sites as a percentage of sites which currently meet all filters

[f] percentage of sites within a region which have plot size other than 400m

A number of Classes have considerably lower plot counts than other classes and would benefit from additional sampling. Table 10 provides site counts by Class.

Table 10   Breakdown of plot by Vegetation Class, showing counts for poorly sampled (less than 100 plots) classes (shaded in grey) and classes with no data are shown in bold

Vegetation Formation	Vegetation Class	Site count
Rainforests	Cool Temperate Rainforests	20
	Dry Rainforests	526
	Littoral Rainforests	139
	Northern Warm Temperate Rainforests	452
	Southern Warm Temperate Rainforests	68
	Subtropical Rainforests	283
	Oceanic Rainforests	**0**
	Oceanic Cloud Forests	**0**
	Western Vine Thickets	116
Wet sclerophyll forests (Grassy subformation)	Montane Wet Sclerophyll Forests	123
	Northern Hinterland Wet Sclerophyll Forests	1329
	Northern Tableland Wet Sclerophyll Forests	436
	Southern Lowland Wet Sclerophyll forests	301
	Southern Tableland Wet Sclerophyll Forests	229
Wet sclerophyll forests (Shrubby subformation)	North Coast Wet Sclerophyll Forests	1379
	Northern Escarpment Wet Sclerophyll Forests	343
	South Coast Wet Sclerophyll Forests	291
	Southern Escarpment Wet Sclerophyll Forests	519
Grassy woodlands	Coastal Valley Grassy Woodlands	994
	Floodplain Transition Woodlands	656
	New England Grassy Woodlands	565
	Southern Tableland Grassy Woodlands	601
	Subalpine Woodlands	306
	Tableland Clay Grassy Woodlands	423
	Western Slopes Grassy Woodlands	2380
Grasslands	Maritime Grasslands	46
	Riverine Plain Grasslands	324
	Semi-arid Floodplain Grasslands	412

Vegetation Formation	Vegetation Class	Site count
	Temperate Montane Grasslands	339
	Western Slopes Grasslands	269
Dry sclerophyll forests (Shrub/grass subformation)	Central Gorge Dry Sclerophyll Forests	511
	Clarence Dry Sclerophyll Forests	430
	Cumberland Dry Sclerophyll Forests	78
	Hunter-Macleay Dry Sclerophyll Forests	551
	New England Dry Sclerophyll Forests	811
	Northern Gorge Dry Sclerophyll Forests	272
	North-west Slopes Dry Sclerophyll Woodlands	1435
	Pilliga Outwash Dry Sclerophyll Forests	208
	Southern Hinterland Dry Sclerophyll Forests	37
	Upper Riverina Dry Sclerophyll Forests	308
Dry sclerophyll forests (Shrubby subformation)	Coastal Dune Dry Sclerophyll Forests	302
	North Coast Dry Sclerophyll Forests	206
	Northern Escarpment Dry Sclerophyll Forests	242
	Northern Tableland Dry Sclerophyll Forests	748
	South Coast Sands Dry Sclerophyll Forests	53
	South East Dry Sclerophyll Forests	423
	Southern Tableland Dry Sclerophyll Forests	1109
	Southern Wattle Dry Sclerophyll Forests	9
	Sydney Coastal Dry Sclerophyll Forests	1227
	Sydney Hinterland Dry Sclerophyll Forests	809
	Sydney Montane Dry Sclerophyll Forests	315
	Sydney Sand Flats Dry Sclerophyll Forests	132
	Western Slopes Dry Sclerophyll Forests	2726
	Yetman Dry Sclerophyll Forests	398
Heathlands	Coastal Headland Heaths	194
	Northern Montane Heaths	269
	South Coast Heaths	62
	Southern Montane Heaths	104
	Sydney Coastal Heaths	248
	Sydney Montane Heaths	129

Vegetation Formation	Vegetation Class	Site count
	Wallum Sand Heaths	114
Alpine complex	Alpine Bogs and Fens	5
	Alpine Fjaeldmarks	**0**
	Alpine Heaths	1
	Alpine Herbfields	15
Freshwater wetlands	Coastal Floodplain Wetlands	304
	Coastal Freshwater Lagoons	121
	Coastal Heath Swamps	271
	Inland Floodplain Shrublands	270
	Inland Floodplain Swamps	185
	Montane Bogs and Fens	324
	Montane Lakes	19
Forested wetlands	Coastal Swamp Forests	740
	Eastern Riverine Forests	376
	Inland Riverine Forests	775
Saline wetlands	Inland Saline Lakes	167
	Mangrove Swamps	54
	Saltmarshes	102
Arid shrublands (Acacia subformation)	Gibber Transition Shrublands	65
	North-west Plain Shrublands	79
	Sand Plain Mulga Shrublands	144
	Stony Desert Mulga Shrublands	119
Semi-arid woodlands (Grassy subformation)	Brigalow Clay Plain Woodlands	114
	Inland Floodplain Woodlands	332
	North-west Floodplain Woodlands	936
	Riverine Plain Woodlands	99
Semi-arid woodlands (Shrubby subformation)	Desert Woodlands	4
	Dune Mallee Woodlands	109
	Inland Rocky Hill Woodlands	452
	North-west Alluvial Sand Woodlands	53
	Riverine Sandhill Woodlands	247

Vegetation Formation	Vegetation Class	Site count
	Sand Plain Mallee Woodlands	169
	Semi-arid Sand Plain Woodlands	175
	Subtropical Semi-arid Woodlands	38
	Western Peneplain Woodlands	594
Arid shrublands (Chenopod subformation)	Aeolian Chenopod Shrublands	93
	Gibber Chenopod Shrublands	44
	Riverine Chenopod Shrublands	411
Total		36335

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9. Appendices

9.1 Appendix 1

Table 11   Cover score system transformations for exotics

SpeciesScoreSystem	Species cover score	Transformed
Cover 1 to 10 (a)	1	0.1
Cover 1 to 10 (a)	2	1.9
Cover 1 to 10 (a)	3	9.6
Cover 1 to 10 (a)	4	14.9
Cover 1 to 10 (a)	5	18.8
Cover 1 to 10 (a)	6	30
Cover 1 to 10 (a)	7	41.9
Cover 1 to 10 (a)	8	64.4
Cover 1 to 10 (a)	9	86.7
Cover 1 to 10 (a)	10	100
Cover 1 to 21	1	0.1
Cover 1 to 21	2	1.9
Cover 1 to 21	3	9.6
Cover 1 to 21	4	14.9
Cover 1 to 21	5	20
Cover 1 to 21	6	25
Cover 1 to 21	7	30
Cover 1 to 21	8	35
Cover 1 to 21	9	40
Cover 1 to 21	10	45
Cover 1 to 21	11	50
Cover 1 to 21	12	55
Cover 1 to 21	13	60
Cover 1 to 21	14	65
Cover 1 to 21	15	70
Cover 1 to 21	16	75
Cover 1 to 21	17	80
Cover 1 to 21	18	84.4
Cover 1 to 21	19	90
Cover 1 to 21	20	95
Cover 1 to 21	21	98.3

SpeciesScoreSystem	Species cover score	Transformed
Cover 1 to 5	1	0.6
Cover 1 to 5	2	12.8
Cover 1 to 5	3	34.7
Cover 1 to 5	4	64.4
Cover 1 to 5	5	86.9
Cover 1 to 5 (a)	1	0.3
Cover 1 to 5 (a)	2	4.5
Cover 1 to 5 (a)	3	18.7
Cover 1 to 5 (a)	4	37.7
Cover 1 to 5 (a)	5	73.8
Cover 1 to 6	1	0.3
Cover 1 to 6	2	0.7
Cover 1 to 6	3	10
Cover 1 to 6	4	37.7
Cover 1 to 6	5	64.4
Cover 1 to 6	6	86.9
Cover 1 to 6 (a)	1	0.3
Cover 1 to 6 (a)	2	0.7
Cover 1 to 6 (a)	3	10
Cover 1 to 6 (a)	4	34.7
Cover 1 to 6 (a)	5	64.4
Cover 1 to 6 (a)	6	86.9
Cover 1 to 6 (b)	1	0.1
Cover 1 to 6 (b)	2	1.4
Cover 1 to 6 (b)	3	10
Cover 1 to 6 (b)	4	37.7
Cover 1 to 6 (b)	5	64.4
Cover 1 to 6 (b)	6	86.9
Cover 1 to 6 (c)	1	0.6
Cover 1 to 6 (c)	2	14
Cover 1 to 6 (c)	3	37.7
Cover 1 to 6 (c)	4	64.4
Cover 1 to 6 (c)	5	86
Cover 1 to 6 (c)	6	98.3
Cover 1 to 7	1	0.3
Cover 1 to 7	2	0.4

SpeciesScoreSystem	Species cover score	Transformed
Cover 1 to 7	3	0.6
Cover 1 to 7	4	3.5
Cover 1 to 7	5	34.7
Cover 1 to 7	6	64.4
Cover 1 to 7	7	86.9
Cover 1 to 7 (c)	1	0.3
Cover 1 to 7 (c)	2	0.3
Cover 1 to 7 (c)	3	0.4
Cover 1 to 7 (c)	5	32.5
Cover 1 to 7 (c)	6	58.6
Cover 1 to 7 (c)	7	85.1
Cover 1 to 7 (c)	41	1
Cover 1 to 7 (c)	42	9.2
Cover 1 to 7 (d)	1	0.3
Cover 1 to 7 (d)	2	0.3
Cover 1 to 7 (d)	3	0.7
Cover 1 to 7 (d)	4	8
Cover 1 to 7 (d)	5	28.7
Cover 1 to 7 (d)	6	58.6
Cover 1 to 7 (d)	7	85.1
Cover 1 to 7 (e)	1	0.3
Cover 1 to 7 (e)	2	0.3
Cover 1 to 7 (e)	3	0.4
Cover 1 to 7 (e)	5	34.8
Cover 1 to 7 (e)	6	64.4
Cover 1 to 7 (e)	7	86.9
Cover 1 to 7 (e)	41	1
Cover 1 to 7 (e)	42	9.1
Cover 1 to 7 (f)	1	0.3
Cover 1 to 7 (f)	2	0.5
Cover 1 to 7 (f)	3	8
Cover 1 to 7 (f)	4	21.9
Cover 1 to 7 (f)	5	37.7
Cover 1 to 7 (f)	6	64.4
Cover 1 to 7 (f)	7	86.9
Cover 1 to 8 (a)	1	0.3

SpeciesScoreSystem	Species cover score	Transformed
Cover 1 to 8 (a)	2	0.4
Cover 1 to 8 (a)	3	0.6
Cover 1 to 8 (a)	4	1.2
Cover 1 to 8 (a)	5	10
Cover 1 to 8 (a)	6	37.7
Cover 1 to 8 (a)	7	64.4
Cover 1 to 8 (a)	8	86.9
Cover 5 to 9 Hunter Councils (modified)	6	10
Cover 5 to 9 Hunter Councils (modified)	7	37.7
Cover 5 to 9 Hunter Councils (modified)	8	64.4
Cover 5 to 9 Hunter Councils (modified)	9	86.9
Cover 5 to 9 Hunter Councils (modified)	51	0.3
Cover 5 to 9 Hunter Councils (modified)	52	0.5

9.2 Appendix 2

Table 12   Cover score transformations for native growth form groups

Species Score System	Cover Score	Growth form group	Transformed
Cover 1 to 10 (a)	1	Fern (EG)	0.1
Cover 1 to 10 (a)	2	Fern (EG)	2
Cover 1 to 10 (a)	3	Fern (EG)	9.4
Cover 1 to 10 (a)	4	Fern (EG)	14.5
Cover 1 to 10 (a)	5	Fern (EG)	19.8
Cover 1 to 10 (a)	6	Fern (EG)	30
Cover 1 to 10 (a)	7	Fern (EG)	43.8
Cover 1 to 10 (a)	8	Fern (EG)	63.3
Cover 1 to 10 (a)	9	Fern (EG)	80
Cover 1 to 10 (a)	10	Fern (EG)	100
Cover 1 to 10 (a)	1	Forb (FG)	0.1
Cover 1 to 10 (a)	2	Forb (FG)	1.6
Cover 1 to 10 (a)	3	Forb (FG)	9.5
Cover 1 to 10 (a)	4	Forb (FG)	14.7
Cover 1 to 10 (a)	5	Forb (FG)	18.7
Cover 1 to 10 (a)	6	Forb (FG)	30
Cover 1 to 10 (a)	7	Forb (FG)	42.1
Cover 1 to 10 (a)	8	Forb (FG)	63.8
Cover 1 to 10 (a)	9	Forb (FG)	84.5
Cover 1 to 10 (a)	10	Forb (FG)	100
Cover 1 to 10 (a)	1	Grass & grass-like (GG)	0.1
Cover 1 to 10 (a)	2	Grass & grass-like (GG)	2.3
Cover 1 to 10 (a)	3	Grass & grass-like (GG)	9.5
Cover 1 to 10 (a)	4	Grass & grass-like (GG)	14.8
Cover 1 to 10 (a)	5	Grass & grass-like (GG)	19.2
Cover 1 to 10 (a)	6	Grass & grass-like (GG)	30
Cover 1 to 10 (a)	7	Grass & grass-like (GG)	42.4
Cover 1 to 10 (a)	8	Grass & grass-like (GG)	64
Cover 1 to 10 (a)	9	Grass & grass-like (GG)	83.3
Cover 1 to 10 (a)	10	Grass & grass-like (GG)	100
Cover 1 to 10 (a)	1	Other (OG)	0.1

Species Score System	Cover Score	Growth form group	Transformed
Cover 1 to 10 (a)	2	Other (OG)	1.8
Cover 1 to 10 (a)	3	Other (OG)	9
Cover 1 to 10 (a)	4	Other (OG)	14.4
Cover 1 to 10 (a)	5	Other (OG)	19.4
Cover 1 to 10 (a)	6	Other (OG)	29.8
Cover 1 to 10 (a)	7	Other (OG)	42.1
Cover 1 to 10 (a)	8	Other (OG)	63.5
Cover 1 to 10 (a)	9	Other (OG)	86.3
Cover 1 to 10 (a)	10	Other (OG)	100
Cover 1 to 10 (a)	1	Shrub (SG)	0.2
Cover 1 to 10 (a)	2	Shrub (SG)	2.1
Cover 1 to 10 (a)	3	Shrub (SG)	9.4
Cover 1 to 10 (a)	4	Shrub (SG)	14.7
Cover 1 to 10 (a)	5	Shrub (SG)	18.7
Cover 1 to 10 (a)	6	Shrub (SG)	30
Cover 1 to 10 (a)	7	Shrub (SG)	42.6
Cover 1 to 10 (a)	8	Shrub (SG)	64.4
Cover 1 to 10 (a)	9	Shrub (SG)	82.3
Cover 1 to 10 (a)	10	Shrub (SG)	100
Cover 1 to 10 (a)	1	Tree (TG)	0.1
Cover 1 to 10 (a)	2	Tree (TG)	2.7
Cover 1 to 10 (a)	3	Tree (TG)	9.3
Cover 1 to 10 (a)	4	Tree (TG)	14.6
Cover 1 to 10 (a)	5	Tree (TG)	18.7
Cover 1 to 10 (a)	6	Tree (TG)	29.9
Cover 1 to 10 (a)	7	Tree (TG)	41.3
Cover 1 to 10 (a)	8	Tree (TG)	62.8
Cover 1 to 10 (a)	9	Tree (TG)	82.1
Cover 1 to 10 (a)	10	Tree (TG)	100
Cover 1 to 21	1	Fern (EG)	0.1
Cover 1 to 21	2	Fern (EG)	2
Cover 1 to 21	3	Fern (EG)	9.4
Cover 1 to 21	4	Fern (EG)	14.5
Cover 1 to 21	5	Fern (EG)	19.9

Species Score System	Cover Score	Growth form group	Transformed
Cover 1 to 21	6	Fern (EG)	25
Cover 1 to 21	7	Fern (EG)	30
Cover 1 to 21	8	Fern (EG)	35
Cover 1 to 21	9	Fern (EG)	40
Cover 1 to 21	10	Fern (EG)	45
Cover 1 to 21	11	Fern (EG)	50
Cover 1 to 21	12	Fern (EG)	55
Cover 1 to 21	13	Fern (EG)	60
Cover 1 to 21	14	Fern (EG)	65
Cover 1 to 21	15	Fern (EG)	70
Cover 1 to 21	16	Fern (EG)	75
Cover 1 to 21	17	Fern (EG)	80
Cover 1 to 21	18	Fern (EG)	84.7
Cover 1 to 21	19	Fern (EG)	90
Cover 1 to 21	20	Fern (EG)	95
Cover 1 to 21	21	Fern (EG)	98.7
Cover 1 to 21	1	Forb (FG)	0.1
Cover 1 to 21	2	Forb (FG)	1.6
Cover 1 to 21	3	Forb (FG)	9.5
Cover 1 to 21	4	Forb (FG)	14.7
Cover 1 to 21	5	Forb (FG)	20
Cover 1 to 21	6	Forb (FG)	25
Cover 1 to 21	7	Forb (FG)	30
Cover 1 to 21	8	Forb (FG)	35
Cover 1 to 21	9	Forb (FG)	40
Cover 1 to 21	10	Forb (FG)	45
Cover 1 to 21	11	Forb (FG)	50
Cover 1 to 21	12	Forb (FG)	54.9
Cover 1 to 21	13	Forb (FG)	59.9
Cover 1 to 21	14	Forb (FG)	64.9
Cover 1 to 21	15	Forb (FG)	70
Cover 1 to 21	16	Forb (FG)	75
Cover 1 to 21	17	Forb (FG)	80
Cover 1 to 21	18	Forb (FG)	84.7

Species Score System	Cover Score	Growth form group	Transformed
Cover 1 to 21	19	Forb (FG)	90
Cover 1 to 21	20	Forb (FG)	95
Cover 1 to 21	21	Forb (FG)	98.7
Cover 1 to 21	1	Grass & grass-like (GG)	0.1
Cover 1 to 21	2	Grass & grass-like (GG)	2.3
Cover 1 to 21	3	Grass & grass-like (GG)	9.5
Cover 1 to 21	4	Grass & grass-like (GG)	14.8
Cover 1 to 21	5	Grass & grass-like (GG)	20
Cover 1 to 21	6	Grass & grass-like (GG)	25
Cover 1 to 21	7	Grass & grass-like (GG)	30
Cover 1 to 21	8	Grass & grass-like (GG)	34.9
Cover 1 to 21	9	Grass & grass-like (GG)	40
Cover 1 to 21	10	Grass & grass-like (GG)	45
Cover 1 to 21	11	Grass & grass-like (GG)	50
Cover 1 to 21	12	Grass & grass-like (GG)	55
Cover 1 to 21	13	Grass & grass-like (GG)	60
Cover 1 to 21	14	Grass & grass-like (GG)	65
Cover 1 to 21	15	Grass & grass-like (GG)	70
Cover 1 to 21	16	Grass & grass-like (GG)	75
Cover 1 to 21	17	Grass & grass-like (GG)	80
Cover 1 to 21	18	Grass & grass-like (GG)	85
Cover 1 to 21	19	Grass & grass-like (GG)	90
Cover 1 to 21	20	Grass & grass-like (GG)	95
Cover 1 to 21	21	Grass & grass-like (GG)	99
Cover 1 to 21	1	Other (OG)	0.1
Cover 1 to 21	2	Other (OG)	1.8
Cover 1 to 21	3	Other (OG)	9
Cover 1 to 21	4	Other (OG)	14.4
Cover 1 to 21	5	Other (OG)	19.9
Cover 1 to 21	6	Other (OG)	24.7
Cover 1 to 21	7	Other (OG)	29.7
Cover 1 to 21	8	Other (OG)	34.5
Cover 1 to 21	9	Other (OG)	40
Cover 1 to 21	10	Other (OG)	45

Species Score System	Cover Score	Growth form group	Transformed
Cover 1 to 21	11	Other (OG)	49.3
Cover 1 to 21	12	Other (OG)	52
Cover 1 to 21	13	Other (OG)	60
Cover 1 to 21	14	Other (OG)	64.9
Cover 1 to 21	15	Other (OG)	70
Cover 1 to 21	16	Other (OG)	75
Cover 1 to 21	17	Other (OG)	80
Cover 1 to 21	18	Other (OG)	84.7
Cover 1 to 21	19	Other (OG)	90
Cover 1 to 21	20	Other (OG)	95
Cover 1 to 21	21	Other (OG)	98.7
Cover 1 to 21	1	Shrub (SG)	0.2
Cover 1 to 21	2	Shrub (SG)	2.1
Cover 1 to 21	3	Shrub (SG)	9.4
Cover 1 to 21	4	Shrub (SG)	14.7
Cover 1 to 21	5	Shrub (SG)	20
Cover 1 to 21	6	Shrub (SG)	24.9
Cover 1 to 21	7	Shrub (SG)	30
Cover 1 to 21	8	Shrub (SG)	34.8
Cover 1 to 21	9	Shrub (SG)	40
Cover 1 to 21	10	Shrub (SG)	45
Cover 1 to 21	11	Shrub (SG)	50
Cover 1 to 21	12	Shrub (SG)	55
Cover 1 to 21	13	Shrub (SG)	60
Cover 1 to 21	14	Shrub (SG)	65
Cover 1 to 21	15	Shrub (SG)	70
Cover 1 to 21	16	Shrub (SG)	75
Cover 1 to 21	17	Shrub (SG)	79.4
Cover 1 to 21	18	Shrub (SG)	84.7
Cover 1 to 21	19	Shrub (SG)	90
Cover 1 to 21	20	Shrub (SG)	95
Cover 1 to 21	21	Shrub (SG)	100
Cover 1 to 21	1	Tree (TG)	0.1
Cover 1 to 21	2	Tree (TG)	2.7

Species Score System	Cover Score	Growth form group	Transformed
Cover 1 to 21	3	Tree (TG)	9.3
Cover 1 to 21	4	Tree (TG)	14.6
Cover 1 to 21	5	Tree (TG)	19.9
Cover 1 to 21	6	Tree (TG)	24.7
Cover 1 to 21	7	Tree (TG)	29.9
Cover 1 to 21	8	Tree (TG)	34.7
Cover 1 to 21	9	Tree (TG)	39.9
Cover 1 to 21	10	Tree (TG)	45
Cover 1 to 21	11	Tree (TG)	50
Cover 1 to 21	12	Tree (TG)	54.9
Cover 1 to 21	13	Tree (TG)	59.7
Cover 1 to 21	14	Tree (TG)	64.7
Cover 1 to 21	15	Tree (TG)	70
Cover 1 to 21	16	Tree (TG)	75
Cover 1 to 21	17	Tree (TG)	80
Cover 1 to 21	18	Tree (TG)	85
Cover 1 to 21	19	Tree (TG)	90
Cover 1 to 21	20	Tree (TG)	95
Cover 1 to 21	21	Tree (TG)	98.7
Cover 1 to 5	1	Fern (EG)	0.8
Cover 1 to 5	2	Fern (EG)	12.7
Cover 1 to 5	3	Fern (EG)	34
Cover 1 to 5	4	Fern (EG)	63.3
Cover 1 to 5	5	Fern (EG)	80
Cover 1 to 5	1	Forb (FG)	0.4
Cover 1 to 5	2	Forb (FG)	12
Cover 1 to 5	3	Forb (FG)	31.8
Cover 1 to 5	4	Forb (FG)	63.8
Cover 1 to 5	5	Forb (FG)	84.8
Cover 1 to 5	1	Grass & grass-like (GG)	1
Cover 1 to 5	2	Grass & grass-like (GG)	13
Cover 1 to 5	3	Grass & grass-like (GG)	34.5
Cover 1 to 5	4	Grass & grass-like (GG)	64
Cover 1 to 5	5	Grass & grass-like (GG)	83.6

Species Score System	Cover Score	Growth form group	Transformed
Cover 1 to 5	1	Other (OG)	0.6
Cover 1 to 5	2	Other (OG)	12.1
Cover 1 to 5	3	Other (OG)	31.8
Cover 1 to 5	4	Other (OG)	63.5
Cover 1 to 5	5	Other (OG)	86.3
Cover 1 to 5	1	Shrub (SG)	0.8
Cover 1 to 5	2	Shrub (SG)	12.3
Cover 1 to 5	3	Shrub (SG)	33.6
Cover 1 to 5	4	Shrub (SG)	64.4
Cover 1 to 5	5	Shrub (SG)	84.1
Cover 1 to 5	1	Tree (TG)	1.7
Cover 1 to 5	2	Tree (TG)	12.6
Cover 1 to 5	3	Tree (TG)	32.7
Cover 1 to 5	4	Tree (TG)	62.8
Cover 1 to 5	5	Tree (TG)	82.1
Cover 1 to 5 (a)	1	Fern (EG)	0.3
Cover 1 to 5 (a)	2	Fern (EG)	4.6
Cover 1 to 5 (a)	3	Fern (EG)	19.5
Cover 1 to 5 (a)	4	Fern (EG)	37.4
Cover 1 to 5 (a)	5	Fern (EG)	65
Cover 1 to 5 (a)	1	Forb (FG)	0.3
Cover 1 to 5 (a)	2	Forb (FG)	3.8
Cover 1 to 5 (a)	3	Forb (FG)	18.4
Cover 1 to 5 (a)	4	Forb (FG)	34.7
Cover 1 to 5 (a)	5	Forb (FG)	69.7
Cover 1 to 5 (a)	1	Grass & grass-like (GG)	0.3
Cover 1 to 5 (a)	2	Grass & grass-like (GG)	4.8
Cover 1 to 5 (a)	3	Grass & grass-like (GG)	19
Cover 1 to 5 (a)	4	Grass & grass-like (GG)	37.6
Cover 1 to 5 (a)	5	Grass & grass-like (GG)	69.4
Cover 1 to 5 (a)	1	Other (OG)	0.3
Cover 1 to 5 (a)	2	Other (OG)	4.2
Cover 1 to 5 (a)	3	Other (OG)	18.7
Cover 1 to 5 (a)	4	Other (OG)	36.7

Species Score System	Cover Score	Growth form group	Transformed
Cover 1 to 5 (a)	5	Other (OG)	68.3
Cover 1 to 5 (a)	1	Shrub (SG)	0.3
Cover 1 to 5 (a)	2	Shrub (SG)	4.4
Cover 1 to 5 (a)	3	Shrub (SG)	18.5
Cover 1 to 5 (a)	4	Shrub (SG)	37.1
Cover 1 to 5 (a)	5	Shrub (SG)	69
Cover 1 to 5 (a)	1	Tree (TG)	0.4
Cover 1 to 5 (a)	2	Tree (TG)	5.4
Cover 1 to 5 (a)	3	Tree (TG)	18.4
Cover 1 to 5 (a)	4	Tree (TG)	36
Cover 1 to 5 (a)	5	Tree (TG)	66.3
Cover 1 to 6	1	Fern (EG)	0.3
Cover 1 to 6	2	Fern (EG)	0.9
Cover 1 to 6	3	Fern (EG)	10.1
Cover 1 to 6	4	Fern (EG)	37.4
Cover 1 to 6	5	Fern (EG)	63.3
Cover 1 to 6	6	Fern (EG)	80
Cover 1 to 6	1	Forb (FG)	0.3
Cover 1 to 6	2	Forb (FG)	0.5
Cover 1 to 6	3	Forb (FG)	8.2
Cover 1 to 6	4	Forb (FG)	34.7
Cover 1 to 6	5	Forb (FG)	63.8
Cover 1 to 6	6	Forb (FG)	84.8
Cover 1 to 6	1	Grass & grass-like (GG)	0.3
Cover 1 to 6	2	Grass & grass-like (GG)	0.9
Cover 1 to 6	3	Grass & grass-like (GG)	10.3
Cover 1 to 6	4	Grass & grass-like (GG)	37.6
Cover 1 to 6	5	Grass & grass-like (GG)	64
Cover 1 to 6	6	Grass & grass-like (GG)	83.6
Cover 1 to 6	1	Other (OG)	0.4
Cover 1 to 6	2	Other (OG)	0.8
Cover 1 to 6	3	Other (OG)	9.5
Cover 1 to 6	4	Other (OG)	36.7
Cover 1 to 6	5	Other (OG)	63.5

Species Score System	Cover Score	Growth form group	Transformed
Cover 1 to 6	6	Other (OG)	86.3
Cover 1 to 6	1	Shrub (SG)	0.5
Cover 1 to 6	2	Shrub (SG)	1.1
Cover 1 to 6	3	Shrub (SG)	9.5
Cover 1 to 6	4	Shrub (SG)	37.1
Cover 1 to 6	5	Shrub (SG)	64.4
Cover 1 to 6	6	Shrub (SG)	84.1
Cover 1 to 6	1	Tree (TG)	1
Cover 1 to 6	2	Tree (TG)	1.8
Cover 1 to 6	3	Tree (TG)	10.8
Cover 1 to 6	4	Tree (TG)	36
Cover 1 to 6	5	Tree (TG)	62.8
Cover 1 to 6	6	Tree (TG)	82.1
Cover 1 to 6 (a)	1	Fern (EG)	0.3
Cover 1 to 6 (a)	2	Fern (EG)	0.9
Cover 1 to 6 (a)	3	Fern (EG)	9.3
Cover 1 to 6 (a)	4	Fern (EG)	34
Cover 1 to 6 (a)	5	Fern (EG)	63.3
Cover 1 to 6 (a)	6	Fern (EG)	80
Cover 1 to 6 (a)	1	Forb (FG)	0.3
Cover 1 to 6 (a)	2	Forb (FG)	0.5
Cover 1 to 6 (a)	3	Forb (FG)	7.9
Cover 1 to 6 (a)	4	Forb (FG)	31.8
Cover 1 to 6 (a)	5	Forb (FG)	63.8
Cover 1 to 6 (a)	6	Forb (FG)	84.8
Cover 1 to 6 (a)	1	Grass & grass-like (GG)	0.3
Cover 1 to 6 (a)	2	Grass & grass-like (GG)	0.9
Cover 1 to 6 (a)	3	Grass & grass-like (GG)	9.4
Cover 1 to 6 (a)	4	Grass & grass-like (GG)	34.5
Cover 1 to 6 (a)	5	Grass & grass-like (GG)	64
Cover 1 to 6 (a)	6	Grass & grass-like (GG)	83.6
Cover 1 to 6 (a)	1	Other (OG)	0.4
Cover 1 to 6 (a)	2	Other (OG)	0.8
Cover 1 to 6 (a)	3	Other (OG)	8.6

Species Score System	Cover Score	Growth form group	Transformed
Cover 1 to 6 (a)	4	Other (OG)	31.8
Cover 1 to 6 (a)	5	Other (OG)	63.5
Cover 1 to 6 (a)	6	Other (OG)	86.3
Cover 1 to 6 (a)	1	Shrub (SG)	0.5
Cover 1 to 6 (a)	2	Shrub (SG)	1.1
Cover 1 to 6 (a)	3	Shrub (SG)	8.9
Cover 1 to 6 (a)	4	Shrub (SG)	33.6
Cover 1 to 6 (a)	5	Shrub (SG)	64.4
Cover 1 to 6 (a)	6	Shrub (SG)	84.1
Cover 1 to 6 (a)	1	Tree (TG)	1
Cover 1 to 6 (a)	2	Tree (TG)	1.8
Cover 1 to 6 (a)	3	Tree (TG)	10
Cover 1 to 6 (a)	4	Tree (TG)	32.7
Cover 1 to 6 (a)	5	Tree (TG)	62.8
Cover 1 to 6 (a)	6	Tree (TG)	82.1
Cover 1 to 6 (b)	1	Fern (EG)	0.1
Cover 1 to 6 (b)	2	Fern (EG)	1.5
Cover 1 to 6 (b)	3	Fern (EG)	10.1
Cover 1 to 6 (b)	4	Fern (EG)	37.4
Cover 1 to 6 (b)	5	Fern (EG)	63.3
Cover 1 to 6 (b)	6	Fern (EG)	80
Cover 1 to 6 (b)	1	Forb (FG)	0.1
Cover 1 to 6 (b)	2	Forb (FG)	1.3
Cover 1 to 6 (b)	3	Forb (FG)	8.2
Cover 1 to 6 (b)	4	Forb (FG)	34.7
Cover 1 to 6 (b)	5	Forb (FG)	63.8
Cover 1 to 6 (b)	6	Forb (FG)	84.8
Cover 1 to 6 (b)	1	Grass & grass-like (GG)	0.1
Cover 1 to 6 (b)	2	Grass & grass-like (GG)	1.6
Cover 1 to 6 (b)	3	Grass & grass-like (GG)	10.3
Cover 1 to 6 (b)	4	Grass & grass-like (GG)	37.6
Cover 1 to 6 (b)	5	Grass & grass-like (GG)	64
Cover 1 to 6 (b)	6	Grass & grass-like (GG)	83.6
Cover 1 to 6 (b)	1	Other (OG)	0.1

Species Score System	Cover Score	Growth form group	Transformed
Cover 1 to 6 (b)	2	Other (OG)	1.4
Cover 1 to 6 (b)	3	Other (OG)	9.5
Cover 1 to 6 (b)	4	Other (OG)	36.7
Cover 1 to 6 (b)	5	Other (OG)	63.5
Cover 1 to 6 (b)	6	Other (OG)	86.3
Cover 1 to 6 (b)	1	Shrub (SG)	0.2
Cover 1 to 6 (b)	2	Shrub (SG)	1.5
Cover 1 to 6 (b)	3	Shrub (SG)	9.5
Cover 1 to 6 (b)	4	Shrub (SG)	37.1
Cover 1 to 6 (b)	5	Shrub (SG)	64.4
Cover 1 to 6 (b)	6	Shrub (SG)	84.1
Cover 1 to 6 (b)	1	Tree (TG)	0.1
Cover 1 to 6 (b)	2	Tree (TG)	1.8
Cover 1 to 6 (b)	3	Tree (TG)	10.8
Cover 1 to 6 (b)	4	Tree (TG)	36
Cover 1 to 6 (b)	5	Tree (TG)	62.8
Cover 1 to 6 (b)	6	Tree (TG)	82.1
Cover 1 to 6 (c)	1	Fern (EG)	0.8
Cover 1 to 6 (c)	2	Fern (EG)	13.7
Cover 1 to 6 (c)	3	Fern (EG)	37.4
Cover 1 to 6 (c)	4	Fern (EG)	63.3
Cover 1 to 6 (c)	5	Fern (EG)	80
Cover 1 to 6 (c)	6	Fern (EG)	98.7
Cover 1 to 6 (c)	1	Forb (FG)	0.4
Cover 1 to 6 (c)	2	Forb (FG)	12.7
Cover 1 to 6 (c)	3	Forb (FG)	34.7
Cover 1 to 6 (c)	4	Forb (FG)	63.8
Cover 1 to 6 (c)	5	Forb (FG)	84.1
Cover 1 to 6 (c)	6	Forb (FG)	98.7
Cover 1 to 6 (c)	1	Grass & grass-like (GG)	1
Cover 1 to 6 (c)	2	Grass & grass-like (GG)	14.1
Cover 1 to 6 (c)	3	Grass & grass-like (GG)	37.6
Cover 1 to 6 (c)	4	Grass & grass-like (GG)	64
Cover 1 to 6 (c)	5	Grass & grass-like (GG)	83

Species Score System	Cover Score	Growth form group	Transformed
Cover 1 to 6 (c)	6	Grass & grass-like (GG)	99
Cover 1 to 6 (c)	1	Other (OG)	0.6
Cover 1 to 6 (c)	2	Other (OG)	13.5
Cover 1 to 6 (c)	3	Other (OG)	36.7
Cover 1 to 6 (c)	4	Other (OG)	63.5
Cover 1 to 6 (c)	5	Other (OG)	86.3
Cover 1 to 6 (c)	6	Other (OG)	98.7
Cover 1 to 6 (c)	1	Shrub (SG)	0.8
Cover 1 to 6 (c)	2	Shrub (SG)	13.1
Cover 1 to 6 (c)	3	Shrub (SG)	37.1
Cover 1 to 6 (c)	4	Shrub (SG)	64.4
Cover 1 to 6 (c)	5	Shrub (SG)	82.3
Cover 1 to 6 (c)	6	Shrub (SG)	100
Cover 1 to 6 (c)	1	Tree (TG)	1.7
Cover 1 to 6 (c)	2	Tree (TG)	13.7
Cover 1 to 6 (c)	3	Tree (TG)	35.9
Cover 1 to 6 (c)	4	Tree (TG)	62.8
Cover 1 to 6 (c)	5	Tree (TG)	82.1
Cover 1 to 6 (c)	6	Tree (TG)	98.7
Cover 1 to 7	1	Fern (EG)	0.2
Cover 1 to 7	2	Fern (EG)	0.4
Cover 1 to 7	3	Fern (EG)	1.1
Cover 1 to 7	4	Fern (EG)	5.6
Cover 1 to 7	5	Fern (EG)	34
Cover 1 to 7	6	Fern (EG)	63.3
Cover 1 to 7	7	Fern (EG)	80
Cover 1 to 7	1	Forb (FG)	0.3
Cover 1 to 7	2	Forb (FG)	0.3
Cover 1 to 7	3	Forb (FG)	0.4
Cover 1 to 7	4	Forb (FG)	1.8
Cover 1 to 7	5	Forb (FG)	31.8
Cover 1 to 7	6	Forb (FG)	63.8
Cover 1 to 7	7	Forb (FG)	84.8
Cover 1 to 7	1	Grass & grass-like (GG)	0.3

Species Score System	Cover Score	Growth form group	Transformed
Cover 1 to 7	2	Grass & grass-like (GG)	0.4
Cover 1 to 7	3	Grass & grass-like (GG)	1
Cover 1 to 7	4	Grass & grass-like (GG)	5.6
Cover 1 to 7	5	Grass & grass-like (GG)	34.5
Cover 1 to 7	6	Grass & grass-like (GG)	64
Cover 1 to 7	7	Grass & grass-like (GG)	83.6
Cover 1 to 7	1	Other (OG)	0.3
Cover 1 to 7	2	Other (OG)	0.7
Cover 1 to 7	3	Other (OG)	1.1
Cover 1 to 7	4	Other (OG)	6.3
Cover 1 to 7	5	Other (OG)	31.8
Cover 1 to 7	6	Other (OG)	63.5
Cover 1 to 7	7	Other (OG)	86.3
Cover 1 to 7	1	Shrub (SG)	0.5
Cover 1 to 7	2	Shrub (SG)	0.9
Cover 1 to 7	3	Shrub (SG)	1.5
Cover 1 to 7	4	Shrub (SG)	8.8
Cover 1 to 7	5	Shrub (SG)	33.6
Cover 1 to 7	6	Shrub (SG)	64.4
Cover 1 to 7	7	Shrub (SG)	84.1
Cover 1 to 7	1	Tree (TG)	1.4
Cover 1 to 7	2	Tree (TG)	2.1
Cover 1 to 7	3	Tree (TG)	2.9
Cover 1 to 7	4	Tree (TG)	12.6
Cover 1 to 7	5	Tree (TG)	32.7
Cover 1 to 7	6	Tree (TG)	62.8
Cover 1 to 7	7	Tree (TG)	82.1
Cover 1 to 7 (c)	1	Fern (EG)	0.2
Cover 1 to 7 (c)	2	Fern (EG)	0.4
Cover 1 to 7 (c)	3	Fern (EG)	0.7
Cover 1 to 7 (c)	5	Fern (EG)	31.1
Cover 1 to 7 (c)	6	Fern (EG)	58.3
Cover 1 to 7 (c)	7	Fern (EG)	80
Cover 1 to 7 (c)	41	Fern (EG)	1.2

Species Score System	Cover Score	Growth form group	Transformed
Cover 1 to 7 (c)	42	Fern (EG)	9.3
Cover 1 to 7 (c)	1	Forb (FG)	0.3
Cover 1 to 7 (c)	2	Forb (FG)	0.3
Cover 1 to 7 (c)	3	Forb (FG)	0.4
Cover 1 to 7 (c)	5	Forb (FG)	30
Cover 1 to 7 (c)	6	Forb (FG)	50
Cover 1 to 7 (c)	7	Forb (FG)	82.8
Cover 1 to 7 (c)	41	Forb (FG)	0.8
Cover 1 to 7 (c)	42	Forb (FG)	7.9
Cover 1 to 7 (c)	1	Grass & grass-like (GG)	0.3
Cover 1 to 7 (c)	2	Grass & grass-like (GG)	0.4
Cover 1 to 7 (c)	3	Grass & grass-like (GG)	0.7
Cover 1 to 7 (c)	5	Grass & grass-like (GG)	32.2
Cover 1 to 7 (c)	6	Grass & grass-like (GG)	57.7
Cover 1 to 7 (c)	7	Grass & grass-like (GG)	82
Cover 1 to 7 (c)	41	Grass & grass-like (GG)	1.4
Cover 1 to 7 (c)	42	Grass & grass-like (GG)	9.4
Cover 1 to 7 (c)	1	Other (OG)	0.3
Cover 1 to 7 (c)	2	Other (OG)	0.5
Cover 1 to 7 (c)	3	Other (OG)	0.8
Cover 1 to 7 (c)	5	Other (OG)	30.8
Cover 1 to 7 (c)	6	Other (OG)	59.2
Cover 1 to 7 (c)	7	Other (OG)	86.3
Cover 1 to 7 (c)	41	Other (OG)	0.8
Cover 1 to 7 (c)	42	Other (OG)	8.7
Cover 1 to 7 (c)	1	Shrub (SG)	0.4
Cover 1 to 7 (c)	2	Shrub (SG)	0.7
Cover 1 to 7 (c)	3	Shrub (SG)	1
Cover 1 to 7 (c)	5	Shrub (SG)	31.2
Cover 1 to 7 (c)	6	Shrub (SG)	55.9
Cover 1 to 7 (c)	7	Shrub (SG)	81.5
Cover 1 to 7 (c)	41	Shrub (SG)	1.3
Cover 1 to 7 (c)	42	Shrub (SG)	8.9
Cover 1 to 7 (c)	1	Tree (TG)	0.8

Species Score System	Cover Score	Growth form group	Transformed
Cover 1 to 7 (c)	2	Tree (TG)	1.3
Cover 1 to 7 (c)	3	Tree (TG)	1.9
Cover 1 to 7 (c)	5	Tree (TG)	31.5
Cover 1 to 7 (c)	6	Tree (TG)	55.9
Cover 1 to 7 (c)	7	Tree (TG)	79.5
Cover 1 to 7 (c)	41	Tree (TG)	1.4
Cover 1 to 7 (c)	42	Tree (TG)	10
Cover 1 to 7 (d)	1	Fern (EG)	0.2
Cover 1 to 7 (d)	2	Fern (EG)	0.4
Cover 1 to 7 (d)	3	Fern (EG)	0.9
Cover 1 to 7 (d)	4	Fern (EG)	7.6
Cover 1 to 7 (d)	5	Fern (EG)	25.9
Cover 1 to 7 (d)	6	Fern (EG)	58.3
Cover 1 to 7 (d)	7	Fern (EG)	80
Cover 1 to 7 (d)	1	Forb (FG)	0.3
Cover 1 to 7 (d)	2	Forb (FG)	0.3
Cover 1 to 7 (d)	3	Forb (FG)	0.5
Cover 1 to 7 (d)	4	Forb (FG)	7
Cover 1 to 7 (d)	5	Forb (FG)	25.2
Cover 1 to 7 (d)	6	Forb (FG)	50
Cover 1 to 7 (d)	7	Forb (FG)	82.8
Cover 1 to 7 (d)	1	Grass & grass-like (GG)	0.3
Cover 1 to 7 (d)	2	Grass & grass-like (GG)	0.4
Cover 1 to 7 (d)	3	Grass & grass-like (GG)	0.9
Cover 1 to 7 (d)	4	Grass & grass-like (GG)	7.9
Cover 1 to 7 (d)	5	Grass & grass-like (GG)	27.5
Cover 1 to 7 (d)	6	Grass & grass-like (GG)	57.7
Cover 1 to 7 (d)	7	Grass & grass-like (GG)	82
Cover 1 to 7 (d)	1	Other (OG)	0.3
Cover 1 to 7 (d)	2	Other (OG)	0.5
Cover 1 to 7 (d)	3	Other (OG)	0.8
Cover 1 to 7 (d)	4	Other (OG)	7.5
Cover 1 to 7 (d)	5	Other (OG)	26.4
Cover 1 to 7 (d)	6	Other (OG)	59.2

Species Score System	Cover Score	Growth form group	Transformed
Cover 1 to 7 (d)	7	Other (OG)	86.3
Cover 1 to 7 (d)	1	Shrub (SG)	0.4
Cover 1 to 7 (d)	2	Shrub (SG)	0.7
Cover 1 to 7 (d)	3	Shrub (SG)	1.1
Cover 1 to 7 (d)	4	Shrub (SG)	7.8
Cover 1 to 7 (d)	5	Shrub (SG)	26.4
Cover 1 to 7 (d)	6	Shrub (SG)	55.9
Cover 1 to 7 (d)	7	Shrub (SG)	81.5
Cover 1 to 7 (d)	1	Tree (TG)	0.8
Cover 1 to 7 (d)	2	Tree (TG)	1.3
Cover 1 to 7 (d)	3	Tree (TG)	1.8
Cover 1 to 7 (d)	4	Tree (TG)	8.6
Cover 1 to 7 (d)	5	Tree (TG)	26.7
Cover 1 to 7 (d)	6	Tree (TG)	55.9
Cover 1 to 7 (d)	7	Tree (TG)	79.5
Cover 1 to 7 (e)	1	Fern (EG)	0.2
Cover 1 to 7 (e)	2	Fern (EG)	0.4
Cover 1 to 7 (e)	3	Fern (EG)	0.7
Cover 1 to 7 (e)	5	Fern (EG)	34
Cover 1 to 7 (e)	6	Fern (EG)	63.3
Cover 1 to 7 (e)	7	Fern (EG)	80
Cover 1 to 7 (e)	41	Fern (EG)	1.2
Cover 1 to 7 (e)	42	Fern (EG)	9.3
Cover 1 to 7 (e)	1	Forb (FG)	0.3
Cover 1 to 7 (e)	2	Forb (FG)	0.3
Cover 1 to 7 (e)	3	Forb (FG)	0.4
Cover 1 to 7 (e)	5	Forb (FG)	31.8
Cover 1 to 7 (e)	6	Forb (FG)	63.8
Cover 1 to 7 (e)	7	Forb (FG)	84.8
Cover 1 to 7 (e)	41	Forb (FG)	0.8
Cover 1 to 7 (e)	42	Forb (FG)	7.9
Cover 1 to 7 (e)	1	Grass & grass-like (GG)	0.3
Cover 1 to 7 (e)	2	Grass & grass-like (GG)	0.4
Cover 1 to 7 (e)	3	Grass & grass-like (GG)	0.7

Species Score System	Cover Score	Growth form group	Transformed
Cover 1 to 7 (e)	5	Grass & grass-like (GG)	34.5
Cover 1 to 7 (e)	6	Grass & grass-like (GG)	64
Cover 1 to 7 (e)	7	Grass & grass-like (GG)	83.6
Cover 1 to 7 (e)	41	Grass & grass-like (GG)	1.4
Cover 1 to 7 (e)	42	Grass & grass-like (GG)	9.4
Cover 1 to 7 (e)	1	Other (OG)	0.3
Cover 1 to 7 (e)	2	Other (OG)	0.5
Cover 1 to 7 (e)	3	Other (OG)	0.8
Cover 1 to 7 (e)	5	Other (OG)	31.8
Cover 1 to 7 (e)	6	Other (OG)	63.5
Cover 1 to 7 (e)	7	Other (OG)	86.3
Cover 1 to 7 (e)	41	Other (OG)	0.8
Cover 1 to 7 (e)	42	Other (OG)	8.6
Cover 1 to 7 (e)	1	Shrub (SG)	0.4
Cover 1 to 7 (e)	2	Shrub (SG)	0.7
Cover 1 to 7 (e)	3	Shrub (SG)	1
Cover 1 to 7 (e)	5	Shrub (SG)	33.6
Cover 1 to 7 (e)	6	Shrub (SG)	64.4
Cover 1 to 7 (e)	7	Shrub (SG)	84.1
Cover 1 to 7 (e)	41	Shrub (SG)	1.3
Cover 1 to 7 (e)	42	Shrub (SG)	8.9
Cover 1 to 7 (e)	1	Tree (TG)	0.8
Cover 1 to 7 (e)	2	Tree (TG)	1.3
Cover 1 to 7 (e)	3	Tree (TG)	1.9
Cover 1 to 7 (e)	5	Tree (TG)	32.7
Cover 1 to 7 (e)	6	Tree (TG)	62.8
Cover 1 to 7 (e)	7	Tree (TG)	82.1
Cover 1 to 7 (e)	41	Tree (TG)	1.4
Cover 1 to 7 (e)	42	Tree (TG)	10
Cover 1 to 7 (f)	1	Fern (EG)	0.2
Cover 1 to 7 (f)	2	Fern (EG)	0.7
Cover 1 to 7 (f)	3	Fern (EG)	7.6
Cover 1 to 7 (f)	4	Fern (EG)	21.3
Cover 1 to 7 (f)	5	Fern (EG)	37.4

Species Score System	Cover Score	Growth form group	Transformed
Cover 1 to 7 (f)	6	Fern (EG)	63.3
Cover 1 to 7 (f)	7	Fern (EG)	80
Cover 1 to 7 (f)	1	Forb (FG)	0.3
Cover 1 to 7 (f)	2	Forb (FG)	0.4
Cover 1 to 7 (f)	3	Forb (FG)	7
Cover 1 to 7 (f)	4	Forb (FG)	21.3
Cover 1 to 7 (f)	5	Forb (FG)	34.7
Cover 1 to 7 (f)	6	Forb (FG)	63.8
Cover 1 to 7 (f)	7	Forb (FG)	84.8
Cover 1 to 7 (f)	1	Grass & grass-like (GG)	0.3
Cover 1 to 7 (f)	2	Grass & grass-like (GG)	0.7
Cover 1 to 7 (f)	3	Grass & grass-like (GG)	7.9
Cover 1 to 7 (f)	4	Grass & grass-like (GG)	21.5
Cover 1 to 7 (f)	5	Grass & grass-like (GG)	37.6
Cover 1 to 7 (f)	6	Grass & grass-like (GG)	64
Cover 1 to 7 (f)	7	Grass & grass-like (GG)	83.6
Cover 1 to 7 (f)	1	Other (OG)	0.3
Cover 1 to 7 (f)	2	Other (OG)	0.6
Cover 1 to 7 (f)	3	Other (OG)	7.5
Cover 1 to 7 (f)	4	Other (OG)	21.9
Cover 1 to 7 (f)	5	Other (OG)	36.7
Cover 1 to 7 (f)	6	Other (OG)	63.5
Cover 1 to 7 (f)	7	Other (OG)	86.3
Cover 1 to 7 (f)	1	Shrub (SG)	0.4
Cover 1 to 7 (f)	2	Shrub (SG)	0.8
Cover 1 to 7 (f)	3	Shrub (SG)	7.8
Cover 1 to 7 (f)	4	Shrub (SG)	21.5
Cover 1 to 7 (f)	5	Shrub (SG)	37.1
Cover 1 to 7 (f)	6	Shrub (SG)	64.4
Cover 1 to 7 (f)	7	Shrub (SG)	84.1
Cover 1 to 7 (f)	1	Tree (TG)	0.8
Cover 1 to 7 (f)	2	Tree (TG)	1.4
Cover 1 to 7 (f)	3	Tree (TG)	8.5
Cover 1 to 7 (f)	4	Tree (TG)	21.4

Species Score System	Cover Score	Growth form group	Transformed
Cover 1 to 7 (f)	5	Tree (TG)	36
Cover 1 to 7 (f)	6	Tree (TG)	62.8
Cover 1 to 7 (f)	7	Tree (TG)	82.1
Cover 1 to 8 (a)	1	Fern (EG)	0.3
Cover 1 to 8 (a)	2	Fern (EG)	0.6
Cover 1 to 8 (a)	3	Fern (EG)	1
Cover 1 to 8 (a)	4	Fern (EG)	1.3
Cover 1 to 8 (a)	5	Fern (EG)	10.1
Cover 1 to 8 (a)	6	Fern (EG)	37.4
Cover 1 to 8 (a)	7	Fern (EG)	63.3
Cover 1 to 8 (a)	8	Fern (EG)	80
Cover 1 to 8 (a)	1	Forb (FG)	0.3
Cover 1 to 8 (a)	2	Forb (FG)	0.3
Cover 1 to 8 (a)	3	Forb (FG)	0.5
Cover 1 to 8 (a)	4	Forb (FG)	1
Cover 1 to 8 (a)	5	Forb (FG)	8.2
Cover 1 to 8 (a)	6	Forb (FG)	34.7
Cover 1 to 8 (a)	7	Forb (FG)	63.8
Cover 1 to 8 (a)	8	Forb (FG)	84.8
Cover 1 to 8 (a)	1	Grass & grass-like (GG)	0.3
Cover 1 to 8 (a)	2	Grass & grass-like (GG)	0.5
Cover 1 to 8 (a)	3	Grass & grass-like (GG)	0.9
Cover 1 to 8 (a)	4	Grass & grass-like (GG)	1.7
Cover 1 to 8 (a)	5	Grass & grass-like (GG)	10.3
Cover 1 to 8 (a)	6	Grass & grass-like (GG)	37.6
Cover 1 to 8 (a)	7	Grass & grass-like (GG)	64
Cover 1 to 8 (a)	8	Grass & grass-like (GG)	83.6
Cover 1 to 8 (a)	1	Other (OG)	0.3
Cover 1 to 8 (a)	2	Other (OG)	0.7
Cover 1 to 8 (a)	3	Other (OG)	0.8
Cover 1 to 8 (a)	4	Other (OG)	1.2
Cover 1 to 8 (a)	5	Other (OG)	9.5
Cover 1 to 8 (a)	6	Other (OG)	36.7
Cover 1 to 8 (a)	7	Other (OG)	63.5

Species Score System	Cover Score	Growth form group	Transformed
Cover 1 to 8 (a)	8	Other (OG)	86.3
Cover 1 to 8 (a)	1	Shrub (SG)	0.4
Cover 1 to 8 (a)	2	Shrub (SG)	0.8
Cover 1 to 8 (a)	3	Shrub (SG)	1.1
Cover 1 to 8 (a)	4	Shrub (SG)	1.6
Cover 1 to 8 (a)	5	Shrub (SG)	9.5
Cover 1 to 8 (a)	6	Shrub (SG)	37.1
Cover 1 to 8 (a)	7	Shrub (SG)	64.4
Cover 1 to 8 (a)	8	Shrub (SG)	84.1
Cover 1 to 8 (a)	1	Tree (TG)	0.9
Cover 1 to 8 (a)	2	Tree (TG)	1.6
Cover 1 to 8 (a)	3	Tree (TG)	1.9
Cover 1 to 8 (a)	4	Tree (TG)	1.5
Cover 1 to 8 (a)	5	Tree (TG)	10.8
Cover 1 to 8 (a)	6	Tree (TG)	36
Cover 1 to 8 (a)	7	Tree (TG)	62.8
Cover 1 to 8 (a)	8	Tree (TG)	82.1
Cover 5 to 9 Hunter Councils (modified)	6	Fern (EG)	10.1
Cover 5 to 9 Hunter Councils (modified)	7	Fern (EG)	37.4
Cover 5 to 9 Hunter Councils (modified)	8	Fern (EG)	63.3
Cover 5 to 9 Hunter Councils (modified)	9	Fern (EG)	80
Cover 5 to 9 Hunter Councils (modified)	51	Fern (EG)	0.2
Cover 5 to 9 Hunter Councils (modified)	52	Fern (EG)	0.7
Cover 5 to 9 Hunter Councils (modified)	6	Forb (FG)	8.2
Cover 5 to 9 Hunter Councils (modified)	7	Forb (FG)	34.7
Cover 5 to 9 Hunter Councils (modified)	8	Forb (FG)	63.8
Cover 5 to 9 Hunter Councils (modified)	9	Forb (FG)	84.8

Species Score System	Cover Score	Growth form group	Transformed
Cover 5 to 9 Hunter Councils (modified)	51	Forb (FG)	0.3
Cover 5 to 9 Hunter Councils (modified)	52	Forb (FG)	0.4
Cover 5 to 9 Hunter Councils (modified)	6	Grass & grass-like (GG)	10.3
Cover 5 to 9 Hunter Councils (modified)	7	Grass & grass-like (GG)	37.6
Cover 5 to 9 Hunter Councils (modified)	8	Grass & grass-like (GG)	64
Cover 5 to 9 Hunter Councils (modified)	9	Grass & grass-like (GG)	83.6
Cover 5 to 9 Hunter Councils (modified)	51	Grass & grass-like (GG)	0.3
Cover 5 to 9 Hunter Councils (modified)	52	Grass & grass-like (GG)	0.7
Cover 5 to 9 Hunter Councils (modified)	6	Other (OG)	9.5
Cover 5 to 9 Hunter Councils (modified)	7	Other (OG)	36.7
Cover 5 to 9 Hunter Councils (modified)	8	Other (OG)	63.5
Cover 5 to 9 Hunter Councils (modified)	9	Other (OG)	86.3
Cover 5 to 9 Hunter Councils (modified)	51	Other (OG)	0.3
Cover 5 to 9 Hunter Councils (modified)	52	Other (OG)	0.6
Cover 5 to 9 Hunter Councils (modified)	6	Shrub (SG)	9.5
Cover 5 to 9 Hunter Councils (modified)	7	Shrub (SG)	37.1
Cover 5 to 9 Hunter Councils (modified)	8	Shrub (SG)	64.4
Cover 5 to 9 Hunter Councils (modified)	9	Shrub (SG)	84.1
Cover 5 to 9 Hunter Councils (modified)	51	Shrub (SG)	0.4
Cover 5 to 9 Hunter Councils (modified)	52	Shrub (SG)	0.8
Cover 5 to 9 Hunter Councils (modified)	6	Tree (TG)	10.8

Species Score System	Cover Score	Growth form group	Transformed
Cover 5 to 9 Hunter Councils (modified)	7	Tree (TG)	36
Cover 5 to 9 Hunter Councils (modified)	8	Tree (TG)	62.8
Cover 5 to 9 Hunter Councils (modified)	9	Tree (TG)	82.1
Cover 5 to 9 Hunter Councils (modified)	51	Tree (TG)	0.8
Cover 5 to 9 Hunter Councils (modified)	52	Tree (TG)	1.4