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Guide to a Native Vegetation Survey

Using the Biological Survey of South Australia

GUIDE TO A NATIVE VEGETATION SURVEY (AGRICULTURAL REGION) USING THE BIOLOGICAL SURVEY OF SOUTH AUSTRALIA METHODOLOGY

SECTION 1

First edition August 1997

GEOGRAPHIC ANALYSIS AND RESEARCH UNIT

INFORMATION AND DATA ANALYSIS BRANCH

DEPARTMENT OF HOUSING & URBAN DEVELOPMENT

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DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT

BIOLOGICAL SURVEY SOUTH AUSTRALIA

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DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES

Front cover photographs

1. Pressing a plant specimen. Photo: LMB Heard

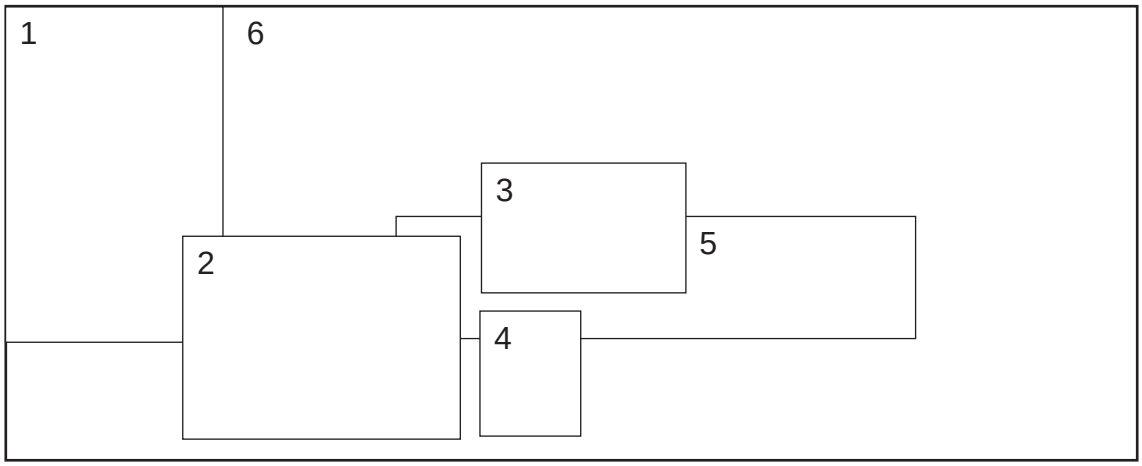
2. “Tools of the trade” - field survey equipment. Photo: LMB Heard

3. Red Sun-orchid (*Thelymitra rubra*). Photo: LMB Heard

4. Donkey Orchid (*Diuris aff. corymbosa*). Photo: AJ Kinnear

5. Native Grasses (*Danthonia* spp.). Photo: LMB Heard

6. Tothill Ranges - looking north. Photo: LMB Heard



PREFACE

Vegetation surveys should be systematic and comparable; data collection, storage and plant identification standards should be observed, and surveys should not unnecessarily duplicate existing work.

This document is intended to provide councils and consultants with brief guidelines to the standard vegetation survey method used in South Australia (SA) for the Environmental Data Base, as developed under the auspices of the Biological Survey Coordinating Committee (BSCC). The survey methodology is known as the Biological Survey of SA. In surveying the native vegetation of the agricultural regions of the State, the vegetation survey component of the Biological Survey is used. The Guide will also indicate how the Geographic Analysis and Research Unit (GAR) from the Department of Housing and Urban Development (DHUD) and the Environmental Data Base of South Australia (EDBSA) can provide support for projects, in return for collection of data for the EDBSA.

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SECTION 2 - FIELD INFORMATION

This section covers the areas of field data collection, completion of physical data sheets, completion of vegetation data sheets, plant collection, and completion of voucher lists. Post survey procedure is also discussed as are useful contacts and potential funding sources.

SECTION 3 - BIBLIOGRAPHY AND APPENDICES

This section includes examples of completed data sheets, definitions and charts to aid in data sheet completion and a proforma to be completed for the GAR Unit.

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1. INTRODUCTION

The Biological Survey of South Australia, established under the auspices of the Biological Survey Coordinating Committee, is an ongoing series of systematic surveys conducted across the state which aims to provide a broad baseline inventory of the state's flora and fauna. These surveys are based on relocatable and repeatable sites. In SA site based (quadrat) vegetation surveys are conducted in the pastoral and agricultural regions (refer to Map 1). The surveys within the pastoral region are undertaken by the Pastoral Management Branch and the Biological Survey and Research Section, both from the Department of Environment and Natural Resources (DENR). Both the GAR Unit, DHUD, and the Biological Survey and Research Section, DENR, conduct surveys within the agricultural region.

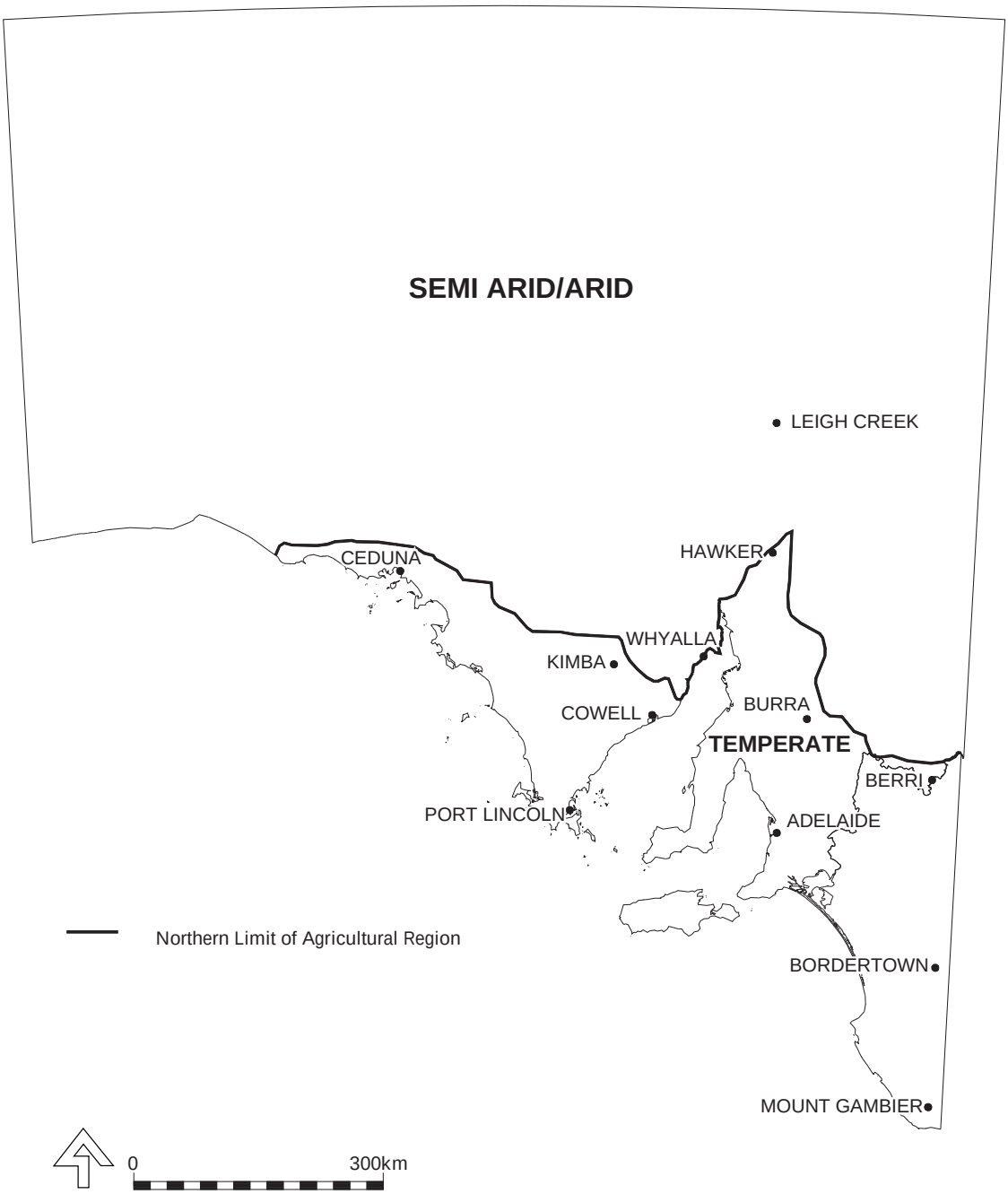
Other vegetation surveys undertaken by government agencies include roadside vegetation, fuel sampling, rare and threatened species populations, heritage agreement assessments, grazing impact assessment, weed distribution assessment and post-fire regeneration monitoring.

Site based (quadrat) vegetation surveys, following the Biological Survey methodology, are conducted to collect information on the presence of plant species, the cover abundance of species present, the structural composition of the vegetation, the physical environment, and the presence/absence of disturbances. Information from these surveys is used by Federal, State and Local governments in a range of activities such as environmental impact assessment, conservation and wilderness assessment, regional planning, fire and weed control, National Forest Inventory, coastal management and revegetation programs. It is also used by a number of non-government organisations including Landcare groups, research and academic institutions, and private consultants.

In 1982 the SA government implemented the Environmental Data Base of SA (EDBSA), to store both spatial and textual environmental data and allow easy access and manipulation. This data is held and maintained under joint custodianship by DENR and DHUD. Information from the EDBSA is used to assist in the decision making process in areas of planning and environmental management. The GAR Unit maintains the spatial component of the EDBSA accessing this database using the Environmental Systems Research Institute's (ESRI) Geographic Information System (GIS) Arc/Info software. Biological textual data stored in the database is maintained by the joint custodians, Biological Survey and Research Section (DENR) and the GAR Unit, with programming support provided by the Data Support Unit, DHUD. Both the GAR Unit and the Biological Survey and Research Section also oversee acquisition of environmental data for the EDBSA through the Biological Survey of SA and associated processes. The database currently has information for over 12,000 vegetation sites.

Two committees have been established to assist in the coordination of input of biological data. These are the Biological Survey Coordinating Committee and Biological Survey Users Group. The former deals with policy and planning issues while the latter oversees the survey methodology, refining and clarifying techniques. Updates of methodology from the Users Group will be forwarded to Councils and consultants when necessary. A third group, the Vegetation Mapping and Analysis Working Group, provides a forum for determining vegetation mapping standards.

When planning a survey, existing information from the EDBSA can assist in the design, provide background and help clarify the specific aims and outcomes of the study. Prior to commencing a survey, or in the initial stages of project planning, contact the GAR Unit to discuss what existing data may be helpful and what services the Unit can offer. A standard series of base maps showing cadastre, landcover, road access, Heritage Agreement areas, NPWS reserves, previous surveys and infrastructure are available on paper and mylar. Drainage and topography are also available for some areas. For a full list of the services the GAR Unit can provide, throughout the survey process, see Table 1. Following field acquisition, data from the new surveys and projects should be entered into the EDBSA, thus adding to the State wide information.



MAP 1 EXTENT OF PASTORAL AND AGRICULTURAL REGIONS IN SOUTH AUSTRALIA

Table 1 Gar Unit Services Available Throughout The Survey Process

Note: Fees may be charged for some services, it is advisable to clarify costs before making an application to fund a survey and again in the initial stages of a survey.

INITIAL SURVEY DATA OR DISK (MAC OR DOS)

MS Word Documents

- voucher list template (for recording vouchered plant specimens numbers and names)
- list of appropriate definitions (ie. for soils, landforms, Muir codes, plant lifestages)
- canopy type diagrams, percentage cover diagrams

Plots/Maps

- mylar overlays at 1:40 000 for aerial photo interpretation
- hardcopy paper plots detailing landcover, road access (and other linear features), cadastral boundaries, previous survey sites, floristic vegetation mapping (1:40 000), structures, drainage and topography. These may not be available for all areas.

Listings

- complete printouts of all the codes and definitions that are available for various attributes collected on the survey.

Printing

voucher numbers printed onto supplied voucher labels according to standard format

DATA ENTRY AND EDITING

- Survey Coordinators/Project Officers should allow for their own data entry in their time estimations. GAR Unit staff can provide an introduction to the survey database and assist with problems. Access to an appropriate terminal should be arranged well in advance. Allow extra time for provision of hardcopy print outs for editing and updating of corrections.

Table 1 (continued)

CARTOGRAPHIC AND ANALYSIS OUTPUTS AVAILABLE

Listings/Documents

- validation reports (for data checking/editing)
- plant species lists per survey site, for landholders

Analysis

Analysis requirements and services need to be discussed and planned, with GAR Unit staff, well in advance. Constraints to the analysis process are the availability of data for that region, and time.

Analysis results can be supplied in map format showing spatial distribution or as statistics in tabular form:

- total number of species per site
- number of introduced species per vegetation survey site
- conservation significance rating based on specified criteria which is weighted, for example:
  - species diversity
  - degree of disturbance (percentage of introduced weeds)
  - block size (area)
  - area perimeter ratio
  - conserved status (% of floristic unit in NPWS Reserve System)
  - presence of rare and threatened plant species
  - presence of vegetation communities of high conservation significance
- exploratory data analysis using CSIRO pattern analysis technique (PATN) (Belbin, 1991)
- tree cover (defined from satellite imagery, where available)

Mapping

If new or updated floristic mapping is provided at an appropriate scale on a stable base (such as mylar) then digitising services may be available. Appropriate discussions with the GAR Unit staff should occur well in advance.

Plots can be produced on a Local Government Authority (LGA) boundary, standard mapsheet or study boundary basis, as specified. It is important to note that some data is only available for certain regions at this stage and initial planning should include a time allocation for any analysis and plot production.

Useful data which may be available for a given study area include:

- site locations
- roadside vegetation mapping
- floristic vegetation mapping (major community grouping or unit level, depending on scale)
- remnant vegetation and 'Environments of South Australia' provinces, regions and association Laut et al. (1977)
- remnant vegetation and treecover
- user specified species distribution (based on survey recorded localities)
- cover/abundance of species

Any of the analysis results may be produced in map format.

2. PRE-SURVEY AND THE SURVEY PROCESS

The aims of a survey must be clearly defined. The requirements of the ultimate users of the survey results and those funding the survey should be considered. In addition there are a number of groups who should be contacted to discuss the scope, use of resources, timetabling and funding required. These groups are the BSCC, through the Biological Survey and Research Section and/or the GAR Unit, and the State Herbarium. For plant identifications it is necessary to contact the Chief Botanist at the State Herbarium to discuss the anticipated number of specimens as additional funding may be required for specimen handling and identifications.

Prior to commencing the survey, a survey number should be requested and the relevant permits obtained from DENR. Under the National Parks and Wildlife (NPW) Act, Wilderness Protection Act and Native Vegetation Management Act, any person other than a DENR employee is required to apply for permits enabling the collection of native flora and fauna species throughout the State and any survey work in National Parks and Wildlife (NPW) parks and reserves, see Appendix 5. These permits cover such work in Heritage Agreement areas. Landholder permission must always be sought, this is discussed later.

The survey process is illustrated in a flow diagram in Appendix 1. Not all steps may be relevant for every survey, however, it gives a guide to the process and timetabling required. In addition literature research and a review of previous surveys will aid in clarification of aims and avoid duplication of work. Site selection (refer to section 3) should also take this research into account.

Following the selection of sites their ownership must be ascertained, and permission to access the site obtained. The Land Ownership and Tenure System (LOTS) database, maintained by DENR, and local councils are the main sources of ownership details. Permission can be sought by writing to landholders and following this up with telephone calls.

A large-scale survey may need to be promoted. Approaching the local media is the best way to do this, as well as contacting local community groups such as Landcare and Trees for Life. Other relevant organisations should also be contacted, such as the SA Farmers Federation, Primary Industries South Australia (PI(SA)) - which should include the relevant Soil Board, and DENR (see Section 7 Useful Contacts).

3. SURVEY SITES AND QUADRATS

Two techniques commonly used for selection of vegetation sites are random sampling and stratified sampling. As fragmentation of the vegetation has occurred due to settlement and agricultural practices an initial level of stratification has already been imposed onto the site selection process. Working with this, the next level of stratification recommended is to use aerial photograph interpretation in conjunction with knowledge of the area from literature, other resources (refer to Table 2) and field knowledge. Using the aerial photographs select representative combinations of tone, texture and pattern that reflect vegetation and landform types within environmental associations (Laut et al., 1977), on a 1:50,000 mapsheet basis.

Survey sites (quadrats) should be selected to sample the range of environmental associations indicated in Laut et al. (1977), the range of vegetation and landform types across the block or area, as many remnant blocks of native vegetation as possible, and to produce a roughly even coverage of sites throughout each 1:50,000 mapsheet. The number of sites will depend on the area and diversity of native vegetation across the mapsheet; as a guide current baseline surveys have approximately one site per 600 hectares of native vegetation. Sites can be selected using 1:40,000 scale colour aerial photographs and should generally be placed away from ecotones or disturbed areas, but where access will not be too difficult. Quadrats should sample representative areas of the various vegetation and/or landform types at each site. Guidelines to site selection are given in Table 2.

A field visit to the study area, prior to the survey, to check the preliminary site selection helps to optimise final site selection by identifying vegetation types not apparent on the aerial photographs and identifying those areas that are in the best condition.

Table 2: Site Selection Guidelines

Reference material

- 1:40 000 colour aerial photography (most recent available)
- 1:50 000 topographic/cadastral mapsheets
- Environments of South Australia (appropriate region) (Laut et al. 1977)
- Other reference literature on vegetation for that region including Pre-European Settlement Vegetation mapping by early Surveyors (see Lands Title Office, DENR) where available.
- Site data from the EDBSA or site based material from other field work/studies (Native Vegetation Conservation (NVC) Section data, Department of Mines and Energy data, Review Data such as the Flinders Ranges Management Review (FRMR), Nature Conservation Society of SA (NCSSA) data etc.).
- Local knowledge from field naturalists, local people, councils, NVC Section officers, NPWS officers, Landcare officers, other community groups.
- Geology maps and soils maps. Strong correlations often occur between geology, soils and vegetation patterns, hence these maps may be helpful in identifying different vegetation types to be surveyed.

Selection process

Select representatives of vegetation associations based on the following criteria;

- colour, tone, texture, canopy spacing (overall spectral signature);

- that the unit of landform and vegetation cover is relatively homogeneous; and
- that it represents different structural and floristic communities on different landforms across the study area eg. forest, woodlands, mallee, shrublands, sedgelands, grasslands and herblands. Every mapsheet will have a variety of these structural formations with different floristics. It is important to always look for them. These communities can also exist in a naturally open structure and should be sampled.

Remember ;

- mark boundaries identifying apparent changes in vegetation types on aerial photographs. These boundaries can be checked in the field;
- avoid edge influences (ie. boundaries between vegetation associations, and the effects of where native vegetation meets cleared land);
- check references for the region;
- attempt to pick up associations of conservation significance which may be difficult to discern on the photograph eg. grasslands, sedge-lands, open grassy woodlands;
- duplicate vegetation associations;
- attempt to get geographical spread (E-W, N-S);
- to get representation of all (or as many as possible) environmental associations in the survey area;
- consider NPWS parks and reserves, Heritage Agreement areas, Sanctuaries, Clearance Applications and any other public land (eg. PISA - Forestry, coastal reserves, council land) as these areas generally haven't been surveyed and permission for access can be easily obtained;
- consider other surveys to avoid duplication;
- select close to map boundaries to ease edge matching between map sheets, particularly where big blocks are involved;
- consider ease of access, but avoid edge influences. Locate sites approximately 100 m from an access point where possible since disturbance influences decrease from this distance;
- select back-up sites in case weather or terrain prevents access to sites;
- in big blocks of remnant native vegetation put in several sites to make the most of access to the area and to adequately cover or check whether there are different communities present within the block;
- attempt to map changes in vegetation types on the aerial photographs when selecting sites so these may be checked when the site is surveyed in the field; and,
- that the fungus *Phytophthora cinnamomi*, which is a very serious plant disease that kills many native species, has been recorded in certain areas of the state. Discuss its location with DENR officers, and take appropriate action to avoid inadvertently spreading contaminated soil.

The site/quadrat locations can be marked on the topographic maps, but the more precise locations of the quadrats are best marked on the aerial photographs. Comments indicating specific landforms and/or vegetation types to be sampled are very useful and should be listed separately on the site allocation sheets*. Locations and abbreviated comments can be noted on the aerial photographs using omnichrom pencil. The exact location and final number of quadrats to be sampled will be determined in the field by the team members when at the site. Marking the area for the site with a small circle, rather than definitively with a cross, gives the field staff the flexibility of choosing the most appropriate location within that area.

*Maintaining a list of site details cross-referenced with landowner details and surveyor details is particularly useful. During the the survey it is useful as site allocation (referred to as Site Allocation Sheets), and after the survey for distribution of feedback to landholders.

For the agricultural region the GAR Unit recommends using a three-character alpha-numeric code to identify sites.

For example 'SDC/001/02', where:

- 'SDC' is three initials of the project title, in this case Stirling District Council vegetation survey. Large scale regional surveys may use the mapsheet name such as 'CLA' for CLARE
- '001' is the site number in that area corresponding to each remnant area of vegetation
- '02' is the quadrat number at that site within the remnant area of vegetation

This coding system assists the field survey process through the identification of geographic areas, sites and quadrats.

Each quadrat at a site is to be numbered sequentially for each site, and will be unique within this survey.

For example:

- SDC/001/01 = site number and quadrat number one in the Stirling District Council survey
- SDC/001/02 = quadrat two at that same site
- SDC/002/01 = quadrat one at site number two in the Stirling District Council survey.

4. LOCATING A QUADRAT IN THE FIELD

Once in the field, examine the vegetation and landforms to decide if the recommended number of quadrats and their locations will represent the major vegetation types present in the area.

Each quadrat should be chosen in an area of vegetation which appears mappable, homogeneous and is representative of the vegetation in the immediate locality. Quadrats should be located away from vegetation edges, roads, dams, troughs and other disturbance features, as well as boundaries between different vegetation communities. They should also sample vegetation that is mappable and not unique.

A quadrat should be 30 x 30 metre square. This is based on a nested species area curve in Ngarkat mallee heath and the quadrat size used in the adjacent Victorian Mallee Survey (Gullan, 1991), appropriate for the south eastern temperate zone. In the case where vegetation occupies a linear space, such as along a particular landform, or is on a landform less than the standard quadrat size (this would only be the case if this was a common landform type in the area and therefore warranted sampling), the dimension should be varied so that the quadrat remains in one vegetation type. Examples include a dune crest or a swamp margin where a quadrat 10 metres wide by 90 metres long may be needed to sample the vegetation type found there. Another example may be a circular rise with a prominent vegetation type on the top. Where possible keep to 30 x 30 metre quadrats and use multiple sites as a preference to changing the quadrat shape. If, however, the shape is changed ensure the total area remains the same.

If there really are more vegetation types within one site locality than expected, locate additional quadrats in them. If less, do as many quadrats as necessary and then move on to the next. If quadrats are not surveyed note why not eg. access not possible.

Should you feel there is a better site, then use it, but do not use an existing site code as this may lead to confusion with any data which may have been collected prior to the survey. When naming a new site it is recommended to use the first three letters of the project or survey name, followed by the field group number including the sequential number. Write this new site number on the data sheet in the site number space. For example, one quadrat at a new site would be recorded as SDC/01A/25. That is, SDC = Stirling District Council survey, 01A = week 1 group A and 25 = the 25th quadrat the team will survey.

It is important to mark new sites onto the mapsheets and aerial photographs. Also check the hundred and section numbers of each new site. Note these on the data sheets and also the site allocation sheets (for the post-survey data checking and entry phase). Ensure you have landholder permission before surveying the new site.

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SECTION 2

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5. COLLECTING FIELD DATA

Examples of completed field data sheets are in Appendix 2. There are three types of data sheet for each quadrat, a Physical Description sheet (which includes the site locality data), a Vegetation sheet, and a Voucher List. Use sharp HB pencils to complete the data sheets as these are easier to rub out for changes, will work in the rain, and can be photocopied.

The list of codes on the data sheet are of categories relevant to most agricultural regions in SA. Other categories are available. Contact the GAR Unit or Biological Survey and Research Section for a full list of the codes and definitions if required.

It is best to fill in all parts of the data sheet while at the site. Cross through boxes not relevant to that site, thus indicating the section is not relevant rather than forgotten to be filled in. Do not rely on memory or annotations to be transcribed at a later date.

5.1.1 DESCRIBING THE PHYSICAL ENVIRONMENT

As part of understanding the location of native vegetation in the landscape it is important to have a summary of the physical environment at each quadrat. This summary information includes the landform pattern of the surrounding area, the landform the quadrat is located on and the specific details on slope and aspect. Details on the nature, amount and type of surface rock and surface soil texture are also recorded. These factors may indicate correlations between the physical environment and the vegetation. Details on the quadrat's geographic location, presence of disturbances and presence of vertebrates are also recorded.

5.1.2 THE PHYSICAL DATASHEET (INCLUDING QUADRAT LOCALITY)

One of these sheets is to be completed for every quadrat.

SITE DESCRIPTION

Survey Name	Complete prior to the survey. This can also be preprinted onto the datasheets.
Survey No	A survey number is available for all surveys registering under the Biological Survey of SA. This can be preprinted onto the datasheets.
PID	(Patch identifier from the survey system) for data entry only, please ignore
Data Entrant	(Three initials) used for computer data entry only, please ignore
Observers	Please record initials of both observers. Record the physical observer first on the physical datasheet and the botanist first on the vegetation datasheet. If an observer has only two initials then write these in and cross out the surplus box. Please use three initials if you have three.
Date	The date the quadrat was visited, in format DD/MM/YY.
Site number	(Including site name, number and quadrat number). This is also listed on the vegetation data sheet, site allocation sheet, the annotated 1:50,000 mapsheet and the annotated aerial photographs.

Field Order

This item aids in the taxonomic corrections and editing process. This can consist of the team number followed by a sequence number. Team numbers may only be relevant for large scale surveys and they are generally made up of the Week of the survey (eg. 1 = the first week) and the Group/Team (eg. A-F). The sequence number is allocated by you in the field indicating the order you have done the quadrats for the whole week (ie. 25 = the 25th quadrat you have completed for the week NOT the number of that quadrat at the site). For example, 1 A 25 = week 1, group A and 25th quadrat completed by that group so far that week. For small single-team surveys the sequence number may be sufficient.

Hundred/Section

Obtain this from Topographic maps. If you have moved a site from where it had been selected initially, remember to check whether the hundred and section have changed (and you have landholder permission). Write any changes onto the data sheet and your site allocation sheets.

Property/Owner

Obtain this from councils. This is recorded on the site allocation sheet and does not need to be written onto the data sheet unless the details have changed. In this case changes should also be made to the site allocation sheets. Post-survey feedback to landholders will be made easier if you have kept this information up to date.

Mapsheet number/ mapsheet name

Each 1:50,000 mapsheet is identified with a map number and name. These should be transferred to the data sheet eg. 6532-3 Melrose (use only a 1 digit extension). If using 1:10,000 maps complete for 6 digits using the 2 digit extension eg. 6627-07 and cross through the mapsheet name box.

Altitude

The altitude is read directly from contour lines on the map to the nearest 10 metres. Do not use a Global Positioning System (GPS) to determine altitude since the output is not a height above sea level measurement and is highly variable.

AMG Zone

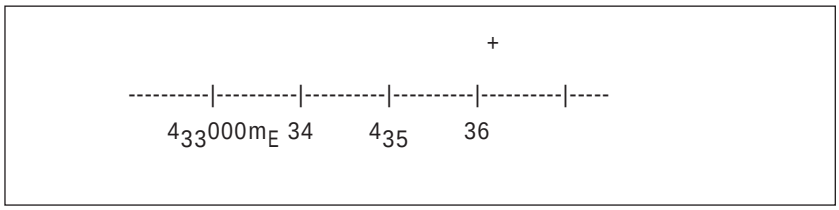
This is shown on the lower left of a 1:50 000 mapsheet, circle the appropriate box.

Easting/Northing

The reference is composed of an Easting which is a six figure number and a Northing which is a seven figure number.

These numbers indicate metres on the grid.

The Easting is read from the horizontal axis of the map, the Northing from the vertical axis of the map. An example is given below:



The cross corresponds to an Easting of 436200.

The Northing is read similarly from the vertical axis of the map.

If you use a GPS then record the reading, the GPS error/accuracy, the waypoint number and the datum used.

PLATE 1
Using a GPS

Photograph: PD Canty

Method

Circle whichever value is appropriate. Map refers to AMGs read off the mapsheet, APD refers to AMGs derived from pin-pricked aerial photographs which are referenced against film overlay maps and digitised, GPS refers to a single GPS unit and DGPS is for those recorded by using a Differential GPS (ie. base station and roving unit).

GPS Accuracy and Waypoint Number

Write the PDOP value in this box as this provides an indication of the accuracy. Enter the Waypoint Number in the space provided. Ensure all these figures are entered on the data sheet at the site, because they will be lost if the batteries in the GPS unit run flat.

It is important to note the GPS Unit must be set up correctly to provide meaningful results. Familiarity with the unit and manual is essential. Mapping datum, coordinate system, time adjustment, north reference and GPS mode are important setups.

The use of datums can be particularly complex especially when data is down-loaded to computers. Manuals may provide help, however, if still in doubt please seek appropriate advice.

Datum

Circle the value that corresponds to the correct datum used to determine the grid reference. If you are using a 1:50,000 mapsheet, the datum is shown on the lower left. If you are transcribing the grid references from the GPS display, then it is critical that you record the current GPS datum setting.

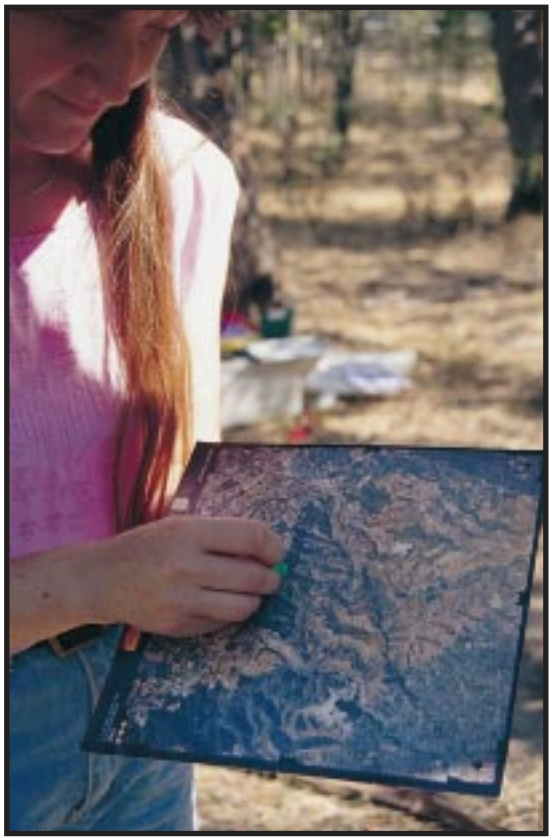


PLATE 2
Marking location on an aerial photograph with a pin-prick
Photograph: LMB Heard

PLATE 3
Measuring location on an aerial photograph
Photograph: LMB Heard

PLATE 4
Taking a site/quadrat photograph
Photograph: LA Malcolm

PLATE 5
Example of a site/quadrat photograph
Photograph: GJ Wilkins

Table 3 Guidelines To Taking Quadrat Photographs

Estimated reliability	A quadrat should be located using 1:50,000 mapping to within 30 metres, however, if you are in a particularly dense area of vegetation you may not feel you can give your grid reference to that level of accuracy. Select whichever class you think best indicates the level of reliability of your grid reference. The aim is to provide a level of observer confidence for the location of the site/quadrat on the map.

LOCATION DETAILS

Aerial photograph survey number/ photograph number	These items relate to the aerial photograph showing the site and are all shown on the edge of the photograph. Locate the quadrat on the photograph and mark it with a pin prick. In addition, clearly mark quadrat numbers relating to each pin prick on both sides of the photograph with a coloured omnichrom (chinograph) pencil. This pin prick is essential as it is the most reliable form of recording the quadrat location relative to current mapping. Also mark major vegetation types and boundaries on the aerial photographs around the sites using a coloured omnichrom pencil. This is useful for later analysis and vegetation community mapping.
E mm N mm	A reference to the exact location of the quadrat on the aerial photograph is needed in millimetres East of the western photograph edge and North from the southern edge. Measurements are to be taken from inside the black edge to the prick point. (This is needed in case the photograph with the pin prick is lost, the exact location can then be found by using these measurements on another aerial photograph.)
Quadrat photograph number and direction	Photographs taken at each quadrat should be uniquely numbered. Mark each film canister with a texta before loading it into the camera. A useful identification is the team number eg. 1A. Record the canister number and the film frame used at that site. Also record the compass direction of the photograph (ie. direction from photographer to the target). If using a linear quadrat then remember to take the photograph in the quadrat direction. See Table 3 for guidelines. When getting the film developed request the identification to be printed on the slide mount (eg. SDC BS57 1A08).

Quadrat photographs need to be taken in a standard way with a manual, 35 mm SLR camera using a 50 mm lens.

1 Select an area which best represents the quadrat. That is, an area that shows the plant species and structure of the vegetation type that you are sampling.

2 Use the range pole and attach the white board target marked with the following information, at a height of 1.5m, and placed in a central position.

Quadrat reference No.	SDC / 001 / 01
Survey abbreviation and survey number	SDC BS57
Date	18/10/92

3 Photograph the target and the surrounding vegetation from a point 10 metres away, with the camera centred on the whiteboard and focused on the vegetation behind the whiteboard. Use a shutter speed of 125th of a second or 60th of a second and an F stop of 16 or 22 to maximise the depth of field (if there is enough light). If there isn't sufficient light for these settings, use your own judgement, bearing in mind that less than a 60th of a second can be affected by hand shaking and an F stop of less than 8 will affect depth of field. In composing the picture maximise the amount of vegetation you see and minimise the amount of sky.

4 Use the camera's light meter effectively by taking the reading of the vegetation only.

5 Take only horizontal photographs, not vertical.

Note: In some cases the photograph can be taken in the direction of the aspect (positioning the range pole and photograph board down slope) to avoid confusion regarding the aspect direction versus the photograph direction. However, ensure that this is providing the best photographic representation of the vegetation type being sampled, not just a canopy view.

Location Map and Description

A sketch map, and notes, showing the location of the quadrat in relation to roads, fencelines and any other important landmarks will assist in relocation of the site. Show the relative location of any other quadrats at the site and any distinctive physical features relative to each quadrat, such as tracks, fences, watering points, landforms etc. It is also important to indicate the location of where the quadrat photograph was taken from, relative to any features, as this will assist anyone referring to the site in the future. Indicate approximate distances to the features noted (and between quadrats if possible). Indicate the direction of north in the circled area. Also draw in significant vegetation types and their boundaries. This will be used, in conjunction with aerial photograph interpretation, if any final floristic mapping is undertaken.

This map should also show disturbance factors and fire scars if listed in the physical data sheet.

Mark any major vegetation boundaries and types around the quadrat, and any obvious changes noticed as you are driving along, on the aerial photographs. Observe your surroundings and not just the quadrat you are sampling. This will assist any vegetation mapping that may be undertaken following the survey.

Location Comments

Provide a written description of the directions to the site location. It is important to indicate distances in kilometres or metres from permanent landmarks to the site/quadrat. For example, distance and direction from a road intersection or a house/sheds. The vehicle's odometer is a useful tool for accurate recordings.

Plate 6
Completing a datasheet
Photograph: LMB Heard

Plate 7
Taking a compass bearing - cross-section
Photograph: LMB Heard

Plate 8 Taking a compass bearing
Photograph: LMB Heard

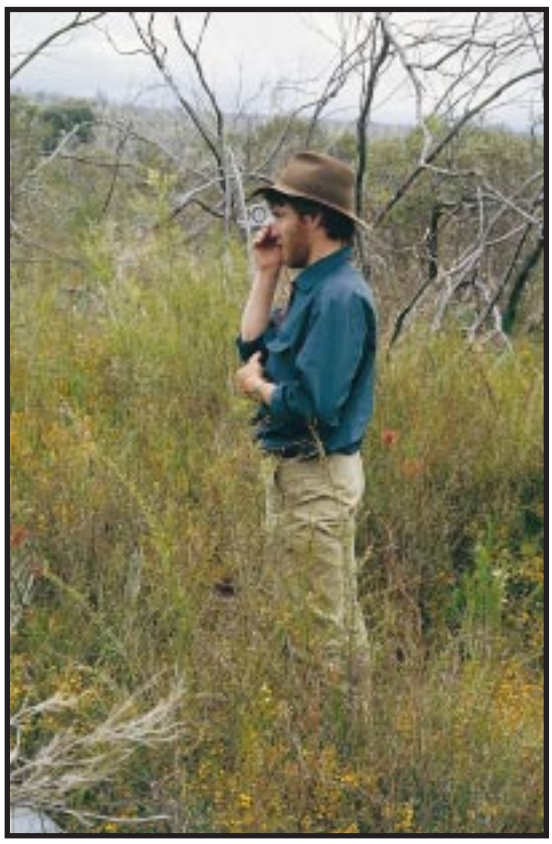


Plate 9 Using a Clinometer
Photograph: LMB Heard

PHYSICAL DESCRIPTION (PHY)

A number of features describing the physical attributes of the quadrat and surrounding area are required. Definitions are listed in Appendix 3. It is useful to have a laminated copy of this in the field. The lists on the datasheet are of categories most likely to be relevant to the agricultural regions of SA. If you require more categories refer to the table of codes in Appendix 3.

General Landscape Description	Briefly describe the landscape of the surrounding area, eg. steeply inclined range of hills.
Landform Pattern	This is the overall landform pattern the quadrat and surrounding land are part of, ie. the area of about 600 metres diameter around the quadrat.
Landform Element	This is the specific landform at the quadrat. If another type of landform element occurs which is not listed then please select the code 990 = other, and then describe it in the comments line below.
Site slope and aspect	The average slope at the quadrat site should be estimated using a clinometer as described below. If there is no slope write 0 in both the slope and aspect boxes, don't leave them blank. Blank boxes could mean the data was not collected rather than 'not present'. Use whole numbers only, and round up or down. The range pole should be placed in a location where the slope appears to be average for the quadrat. Attach the white board used as the photographic target so an identifiable part of it is at the exact eye level of the observer. A sighting is then made from approximately 10 metres away, looking either downslope or upslope, to the target and the angle shown in the clinometer recorded. If the clinometer has two scales check to see you use the one referring to angles (degrees) not % slope. On a SUUNTO device the right hand scale is % slope and the left is angles (degrees). To check, look straight up to see 90 degrees. If you are not familiar with this instrument remember you must keep both eyes open. The cross hair then appears to be suspended outside the device and can be superimposed onto the target. The aspect (direction facing) of this slope is then determined using a compass and the bearing recorded. This reading is taken looking down the slope. Note that due north is recorded as 360 degrees. Aspect can only have a value of 1 - 360 degrees.
Outcrop Cover	The percent coverage of a rock outcrop (not surface strew) is to be recorded using these three percent classes. An outcrop is defined to be any exposed area of rock which is inferred to be continuous with the underlying bedrock (McDonald et al., 1990). Therefore any exposed continuous sheets, for example of limestone/calcrete, should be recorded under outcrop cover rather than surface strew.

Outcrop Lithology	Write in the code of the dominant outcrop type most appropriate to the site. Note any other minor types or comments in the space for 'Other'. The term calcareous material should be used instead of either calcrete and limestone unless you know your geology extremely well. Include in your kit a small bottle of hydrochloric acid (HCl) to test for calcareous material. If the rock effervesces then it is calcareous, one or two drops of HCl are sufficient to test this. If another type of rock occurs which is not mentioned in the list then specify it in the space for 'Other'. Use code 777 (not identified) if you are unable to identify the rock type. If there are two or more outcrop types then record the subdominant type in 'Other'.
Surface Strew Size	(surface stones/rocks) - The size (form) of the surface strew is to be recorded using the three size classes given on the data sheet.
Surface Strew Cover	The percent coverage of the strew is to be recorded using the four percent classes. The percent coverage chart (Appendix 3) may be useful for this.
Surface Strew Lithology	Write in the code of the dominant strew type. Note any other minor types or comments in the space for 'Other'. If another rock type occurs specify in 'Other'. Use code 777 (not identified) if you are unable to identify the rock type. Again, use HCl to test for calcareous material.
Fire Scars Last Year of Fire	If known, the fire history of the block of vegetation should be entered here. Look for scorch marks on tree trunks etc. The information required is whether fire scars are present (either on the aerial photograph or on the ground) and the date if known, or at least an estimated year. If there is some doubt about the date then use '~' as a prefix, eg. ~ 1985. Ask landholders for this information. Please show these scar patterns on the site locality and quadrat map on the first data sheet. Comments on the fire history should be added into the Comments Section following the % Bare Earth % Litter estimate.
Bare Earth and Plant Litter Coverage	These are recorded as an estimated percentage. Look at the bare earth then the plant litter and estimate the percentage. The chart for estimating abundance of coarse fragments (surface strew cover) may assist with your estimations. The sum of these shouldn't necessarily add up to 100%, as there is also living plants, exposed rock and moss/lichen cover. A comments section is provided.

DISTURBANCE

Erosion Comments (*ERO)

Notes on the type of erosion and whether it is active or not (partially stabilised or stabilised) or regarding the severity can be entered into this comments section. For example:

- gullying - non active, now stabilised
- rilling - active
- scalded - recovering, partially stabilised

Notes regarding animal tracks/pads (stock or wildlife) should go under the Vertebrate Presence section.

Disturbance Impacts (DIS)

These are to be noted if they occur in a 30 metre radius of the quadrat. To indicate the presence of the listed physical disturbance categories circle the boxed letters. Cross through the boxes if these disturbances are absent. If you have any comments (*DIS) on the disturbance write these in the comments section below the boxes.

VERTEBRATE PRESENCE (VPR)

Vertebrate Presence

To indicate the presence of different vertebrate species circle the appropriate boxed letters. For all vertebrates present place a Y or N in each box to indicate which items (dung, tracks, burrows/warrens/nests, sightings or material) demonstrated the presence of that vertebrate. Refer to reference books on vertebrate tracks, traces, and scats. Note: obvious bird roosts would be recorded under burrows/nests/etc. and stock (eg. sheep/cattle) camps would be recorded under the dung and tracks categories. Use the comments section to describe any significant impacts (eg. obvious browsed vegetation). For wombat warrens or mallee fowl mounds indicate if these are active. Include relevant comments (*VPR) on fauna sighted by landholders. If you see any other vertebrates, indicate the common name in the comments section.

SOILS (SOI)

Surface Soil Texture Class

To determine a soil texture take a small handful of soil (below the crust) add water, a little at a time, and work, kneading and moistening, into a bolus (elongated ball) until it just fails to stick to the fingers. If there are no more apparent changes in the soil bolus, it is ready for ribbon formation (shearing). The behaviour of the bolus and of the ribbon produced by shearing (pressing out) between the thumb and forefinger characterise the texture. In addition, the behaviour and feel, smoothness or graininess, during bolus formation are also indicative of its texture. Refer to the soil texture grades provided in Appendix 3.

Soils are not generally examined in detail on vegetation surveys, however, some basic information about the surface soil texture can be of interest and use when analysing data. Enter the code corresponding to the class present. Any other distinctive characteristics can also be noted. If the soil does not appear to fit those definitions provided then describe it in the comments (*SOI) section.

Plate 10
Forming a ribbon from a soil bolus
Photograph: LMB Heard

5.2.1 DESCRIBING THE VEGETATION

The vegetation is described at species level, in terms of its structural assemblages to provide an overview of the habitat levels, and at the structural formation level. It is important for the integrity of the data collected to take voucher specimens of the plant species which are then lodged at the State Herbarium. To assist with this process two datasheets are used. The vegetation data sheet records the plant species, structural assemblages, and the structural formation at the quadrat. The voucher data sheet is crucial to the voucher specimen identification process and the post survey correction of the datasheets.

5.2.2 PLANT COLLECTION

A specimen of each plant species referred to in the data sheets is collected and provided with a voucher number so that every plant record can be correlated with a particular species as later determined by the SA Herbarium (Note: Prior to collection a permit is required - refer to section 2 and Appendix 5). This will also improve the representation of the flora in the Herbarium and provide permanent taxonomic and biogeographical records.

Collect specimens of every plant encountered for the first time so all identifications can be verified. At subsequent quadrats any new plants, or anything else encountered you cannot positively identify, should be collected. Collect duplicates if they provide better material, otherwise try to avoid duplication of specimens of species already collected. However, do collect anything you are not sure about.

Collect enough material to cover a Herbarium sheet (A3 sized paper). An ideal sample should contain: flower or buds, leaf, fruit, bark (for trees), and should be represented by as few pieces as possible. Use paper envelopes for small specimens and attach these to the voucher label, so they are not lost in transit.

Smaller annuals and ephemerals should be represented by a whole plant, including basal area and roots. This is particularly important for Gramineae (Poaceae), Cyperaceae and Juncaceae. Care should be taken to leave bulbs (eg. orchids and lilies) in the ground, where possible, to ensure their populations remain viable. For smaller annuals and ephemerals collect a number of individuals, again collecting specimens with roots.

Tag each specimen as it is collected with a voucher label, placed away from parts that need to be examined in the identification process. Section 5.2.3 explains the process of recording voucher numbers. Larger specimens can be placed directly into a plastic bag until ready to transfer to a press. To assist in the drying process, especially if plants are wet, it is a good idea to lightly wrap newspaper around each specimen. Smaller ones should be kept in a small snap-top bag, with a little paper if the plant is wet.

Plants are best pressed before leaving each site, however, as a minimum they should be pressed by the end of each day's field work. Pressing plants in the field ensures none are lost and also speeds up the identification process. The papers should be changed if the specimens were damp when collected or are succulent thus preventing specimens becoming mouldy in the press. Succulent plants are best kept in a separate press to facilitate changing papers. Use only one folded full newspaper sheet for each specimen, but cardboard dividers should be used frequently, particularly between bulky specimens.

As plants are identified their correct scientific name should be entered on the voucher list in the Final ID's Column along with the determiner's initials and surname in the appropriate column. The determiner's details are required for the Herbarium database and assists in tracing any queries. All the presses should be taken to the Herbarium for drying at the end of the survey.

There may be a number of species for each study area which always need to be vouchered because of taxonomic revisions in progress. Check with the GAR Unit and the Biological Survey and Research Section to ascertain which are applicable to your study area during the time of year the survey is being conducted.

PLATE 11
Vouchering and pressing a plant sample

Photograph: SD Kenny

5.2.3 THE VEGETATION DATA SHEET

VEGETATION DESCRIPTION (PLA)

At each site, a listing of all flowering plants and fern species present in a 30 x 30 metre quadrat will be made. This list should start for convenience with the upper stratum and work down to the mosses and lichen level (individual moss and lichen species are not identified but their presence and cover is estimated).

The observers, date and site number are repeated from the physical sheet. This is in case the sheets are ever separated.

Survey Name	As for physical sheet
Survey No	As for physical sheet.
PID and Data Entrant	for data entry only, ignore.
Observers	As for physical sheet, except the botanist's initials are recorded first followed by the physical observer's initials.
Date	As for physical sheet.
Site number	(including site name, number and quadrat number) As for physical sheet.
Quadrat size	Indicate the actual size of the quadrat surveyed if not 30m x 30m. It may be necessary to change the quadrat size if in sparse vegetation which requires a larger quadrat or if on a linear landform feature. Put a tick in the box if it is 30m x 30m.
Field Order	As for physical sheet.
Climatic Conditions	preceding the survey. This is to give an indication of the reliability of the data in terms of species diversity and abundance of seasonal vegetation, which depends on preceding weather conditions, mainly rainfall. This should be discussed and declared at the commencement of the survey, assuming all sites are surveyed close to the same time in the same year.
Species	The name of each plant present at the site is recorded here. Start with the upper stratum and work down to the lowest. If unsure of a plant's botanical name, provide it with your own descriptive label (eg. tiny yellow flowered herb, flat spiky mat plant). Avoid using labels such as Erodium sp., use a descriptive word instead of sp., eg. 'Erodium curly', this saves confusion later regarding whether it was a genuine sp. (in a non identifiable vegetative form) or not. Please use the names (and the voucher numbers of unidentified species) consistently when encountering already collected and vouchered species at other sites. Collect a specimen of unknowns so they can be identified, and the data sheets edited with the correct names. On the datasheet the shaded line below each species is for the final identification where it differs from the field one. Keeping an updated Voucher List (Section 5.3) helps tremendously, allowing easy reference back to previously vouchered specimens with the original voucher number and descriptive label.

Previously Collected Voucher number	This column is specifically set aside for recording the original voucher number of a previously collected plant whose identity you are unsure about. Consult your up-to-date Voucher List so you can write down the original descriptive label you have given that plant (put this in the species column) then add the original voucher number into this column. Use of the Previously Vouchered Number column is necessary for later corrections.
Voucher number	These are on adhesive labels supplied in a single sticker width sheet, with the numbers in sequence. This number is stuck to each specimen and identifies it. It is much easier to check the data afterwards if these numbers are applied as the plants are collected and are in numerical order. Write the voucher number in the Voucher Number column (at the time of collection) and in the Previously Collected Voucher Number column (whenever an unidentified species is encountered again).
"AD" Vegetation Association Description	flag the dominant/codominant overstorey, dominant/codominant understorey and emergent species in this column for: - up to 3 overstorey species (O) - up to 3 emergent species (E) - up to 5 understorey species (U). This column is easiest to complete once you have a good overview and understanding of the quadrat, which is generally after all the plant list and assemblage information has been completed. Note: Dominant/codominant overstorey species are defined as species that dominate the tallest stratum with a canopy cover ≥5%. If there are no layers that have a canopy cover ≥5% then the dominant/codominant overstorey species are defined as species that dominate the tallest layer which has the maximum recorded cover/abundance (check plant list). An emergent species is defined as a species that emerges above the overstorey and occupies a stratum that has a canopy cover less than 5%. Emergents are always in a layer taller than the dominant structure and therefore cannot be a part of the dominant structural layer eg. *Banksia ornata* shrubland with *Eucalyptus arenacea* emergents.

"LF" Life form/ height class

Determine the average life form and height class for each species using the codes for trees, shrubs etc. of various height classes on the adapted Muir's Table (definitions are in Appendix 3). Where there is a species with two or more lifeform height classes choose an average. There are a number of tricky plants in terms of choosing an appropriate lifeform. Some examples:

Xanthorrhoea sp.
these are usually generalised as shrubs (SA - SD) with different height categories used depending on the plant height (the height can often correlate with a different species also).

Dianella sp.
these are included under the sedge lifeform category (VL or VT) depending on height.

Lepidosperma sp. and *Lomandra sp*.
these are included in the sedge lifeform category (VL or VT).

If the plant is occurring in a different lifeform to normal then indicate this. For example a *Lomandra sp*. which is occurring as dense hummock may be best described as a Hummock grass (H) with some explanatory remarks in the comments column.

If there is some confusion over what sort of lifeform some species have, discuss this with the Vegetation Survey Coordinator (GAR Unit, DHUD).

Grasses and sedges are often difficult to differentiate, this list of characteristics may help.

Grasses	Sedges
Leaf sheaf always split	Leaf sheaf never split (except Restionacceae)
Ligule present	Usually no ligule
Leaf usually flat	Leaf not always flat
Stem cross-section circular	Stem cross-section circular, triangular or polygonal
Evenly spaced internodes	Extended internode below inflorescence

Source: McDonald et al. (1990)

Note: All grasses should go under the GT or GL lifeform codes.

"CA" Cover / Abundance — Modified Braun-Blanquet scale estimating cover/abundance.

For each species present, an estimate is required of both cover and abundance measured on this modified seven point scale.
Do not use the Muir Table Canopy Cover codes.

N - not many, 1 - 10 individuals*

T - sparsely or very sparsely present; cover very small (less than 5%)

1 - plentiful but of small cover (less than 5%)

2 - any number of individuals covering 5-25% of the area

3 - any number of individuals covering 25-50% of the area

4 - any number of individuals covering 50-75% of the area

5 - covering more than 75% of the area

Note: *where large shrubs or trees are involved choose a category to reflect the cover rather than the number of individuals.

This table is on the Vegetation Association Description table in Appendix 3 and is adapted from Braun-Blanquet (1965).

"LS" Life Stages — Enter each respective code where it is relevant to greater than 10% of individuals of the population at that representative site. However, this does not apply to seedlings. Enter seedlings whenever they are present. For reproductive stages (fruiting or budding) only note if more than 10% of the reproductive organs are at that stage.

Note: a species can have more than one lifestage code entered.

Use the following codes:

S - seedling	record when any number of seedlings observed
B - budding	plants have buds formed in varying stages of development for flowering
F - flowering	plants are in flower
I - immature fruit	immature fruits not shedding seed
M - mature fruit	fruits ripe and/or shedding seed
X - recently shed	plants are in a non-reproductive phase which show signs of having shed seed or fruits within the last 12 months
D - dead/dormant	indicates above-ground material only is dead and includes plant species that may still have dormant below ground organs (eg orchids, lilies etc.)
V - vegetative	only refers to plants in a non-reproductive phase ie. no flowers, buds or unshed seed
R - regenerating	woody perennial which is resprouting after significant loss of foliage

The codes and definitions are also on the Vegetation Association Description page.

To assess the reproductive stages use several individuals in the population of the quadrat then extrapolate these results to the rest of the population. Some confusing cases may be *Callitris* spp. with very old cones. In this situation, because the cones are very old (>12 months) and contain no unshed seed, the appropriate lifestage would be V (vegetative). Another example may be *Acacia* spp. which have shed pods underneath the bush but no pods attached. If these pods appear to be less than 12 months old (not too weathered looking) the appropriate lifestage would be X (recently shed).

Comments

A comments section is available for remarks regarding unusual features of the species, for example a different flower colour to normal or a hybrid form, or in the case of mistletoes the species name of the host plant.

VEGETATION ASSOCIATION DESCRIPTION (PLA)

Assemblage Information

VEGETATION STRUCTURAL SUMMARY

This section should be completed having collected all of the plant species data. It provides information which summarises the structure of the vegetation in the quadrat, hence providing fauna habitat details.

Complete by viewing the quadrat (not from the plant list you have just filled in) to determine the different life form height classes which represent the various dominant stratum levels existing and their corresponding canopy cover. Describe the overall vegetation association (and habitat) as you see it. Summarise the canopy cover, "C", for the dominant strata (structural layer/lifeform/height classes) using the codes from Muir's table (ie. d - dense, 70-100%; c - mid-dense, 30-70%; i - sparse, 10-30%; r - very sparse, 1-10%).

eg. KS/i indicates that, taken altogether, the low mallees at the site are sparse and their combined projected cover lies between 10-30%.

Remember to view the quadrat; if there appears to be several distinct height class layers then record them separately under their appropriate categories (life form height classes), even if it is the same species. This is particularly relevant to the shrub layers.

See the completed data sheet in Appendix 2, for an example. Don't forget to cross through lifeform height classes that are not applicable.

Note: All life forms "LF" with significantly high cover/abundance recorded in the plant list should also occur here. Check all lifeforms recorded in this section are indicated on the plant list. For example, if a GL (low grass) is on the plant list check you haven't mistakenly put it down as a VL or vice versa.

Structural Description

Describe the vegetation structure, using the SA Vegetation Structural Formations table (Appendix 3), based on the average height of the overstorey as you view it. Dominant/codominant overstorey species are defined as species that dominate the tallest stratum with a canopy cover ≥5%. If there are no layers that have a canopy cover ≥5% then the dominant/codominant overstorey species are defined as species that dominate the tallest layer which has the maximum recorded cover/abundance. Check Braun-Blanquet cover/abundance on plant list as these give finer resolution.

If two different lifeforms are more or less codominant, eg. a Mallee/Callitris mix, then use the average of both to allocate a height class and the most prevalent or conspicuous lifeform to select a name. Combine both in determining the overstorey projective foliage cover.

Flag the dominant/codominant overstorey species (up to 3), any emergent species (up to 3) and up to five major understorey species in the column "AD" on the plant list.

For helpful definitions of the dominant/codominant overstorey species and emergent species refer to the previous section on the Vegetation Association Description "AD". The definitions are also provided on the plant data sheet above the plant list.

Upper Stratum Age Class

Circle the boxed letters of whichever age classes are present in the dominant and codominant species present in the overstorey (tree layer only). Indicate which species this applies to in the comments section beside each age class category present. Remember to look for hollows in the trees, any extra observations such as scratches present or smoothed worn edges should be put in the comments section. Cross out any categories not present.

OVERSTOREY MEASUREMENTS (OVE)

Canopy Type

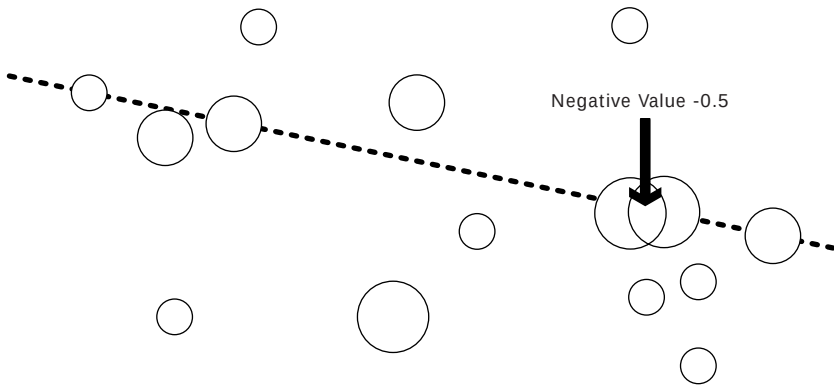
Using the chart of canopy type (in Appendix 3) select the appropriate percentage which represents the estimated average canopy type for the species measured. Remember to assess this for shrubs if the dominant overstorey is a shrubland. Enter this percentage in the appropriate box. This estimate is required for the projective foliage cover calculation which is used to quantitatively determine the appropriate structural formation.

Overstorey Measurements

View the quadrat initially in cross-section to distinguish the stratum and to determine the height range of the overstorey. Then for the overstorey, measure ten individuals, or discrete foliage clumps, of any species that occurs in the broad lifeform category that corresponds to the structural description (SA Vegetation Structural Formation table) previously completed. Broad life form categories include trees, mallees and shrubs. In the measurements include all individuals regardless of height, except where there is a recognisable height gap corresponding to a separate lower stratum. In those circumstances where two lifeforms are codominant in an overstorey layer include measurements for both.

Create a transect which intersects with ten trees (or shrubs, depending on whether they are present in the broad lifeform category or not) and reflects the canopy gaps which actually occur in the vegetation association. Then measure these ten trees for their individual height, canopy depth (ie. distance from the top to the bottom of the canopy), canopy diameter and the gap between individual trees' (shrubs') canopies or discrete foliage clumps. The range pole is very useful for estimating these parameters. These estimates will be averaged later, then used in the projective foliage cover calculation which is used to quantitatively determine the appropriate structural formation. The figure below illustrates a transect in the quadrat intersecting with the trees to pick up canopy gaps which reflect what is actually occurring within the quadrat.

CANOPY GAP (in a quadrat with clumped canopies that is woodland, not a closed forest):



Dotted line represents a transect to obtain an estimate of canopy gap which reflects crown separation distances. If canopy overlap occurs then negative values are used, eg. -0.5m. If there are only one or two large trees in your quadrat, which represents an open woodland, then measure individuals outside the quadrat to make up the ten measurements. Remember to measure the gaps which reflect what you observe the community structure to be.

OVERALL COMMENTS (COM)

* VEG (Optional) - If you notice anything significant about the vegetation of the site write it here.

Remember to mark any mappable vegetation boundaries on the aerial photographs.

PLATE 12
Estimating overstorey height
Photograph: LMB Heard

PLATE 13
Measuring overstorey height using a range pole
Photograph: LMB Heard

PLATE 14
Measuring canopy gap using a range pole

Photograph: LMB Heard

5.3 THE VOUCHER LIST

By ensuring that voucher numbers are used in sequence the data sheet editing, once specimen's identifications are known, runs smoothly (since the data sheets and voucher numbers and plants can be worked through and edited in sequence). To enable this complete the voucher list of voucher numbers used, detailing the name given to each vouchered plant specimen (whether the name is scientific or not). These lists are used for cross-referencing specimens, voucher numbers, site collected and field botanists, and enable easy correction of the original data sheets; particularly where descriptive names have been used, or a wrong identification has been repeated throughout the data sheets. Hence the need to be consistent in the use of descriptive names (with correct voucher numbers) throughout the data sheets. It is best to complete the voucher list in the field as the specimens are vouchered.

Once species have been identified it is useful to carry with you a small personal field herbarium to assist with identifications at future sites. This also applies to plants which couldn't be identified but need to be remembered for their original descriptive name and original voucher number (to be entered in the previously collected voucher number column).

As mentioned in Section 5.2.2, Plant Collection, all full identifications made during the survey should be provided to the Herbarium when the specimens are lodged for final verification. To enable clarification of any queries at a later date indicate who made the determinations by recording their surname and initials on the voucher list. This information is required for the Herbarium database.

PLATE 15
Example of a field herbarium
Photograph: LMB Heard

6. POST SURVEY

Upon completion of the survey all specimens must be dried and then identified by an experienced taxonomist (this should have been arranged before the survey). The corrected data sheets should then be entered into the EDBSA, having already made arrangements with the GAR Unit regarding data entry, data editing and data analysis procedures. The data entry and editing process can take a number of weeks, not including the analysis work, so be sure to timetable this into your survey/project. A survey summary proforma (Appendix 6) must be completed by each survey organiser, and lodged with the GAR Unit, before data can be entered into the Biological Survey System.

A complete list of all the observer surnames, initials, preferred first name and the observer's role (ie. physical observer, botanist, determiner) on the survey is required to update the survey observers lookup in the database, this aids data entry.

If you have surveyed vegetation on private land, it is a courtesy to provide feedback to these landowners. Your up-to-date list of site details cross-referenced with landowner details will help with this. Include a species list (common names listed beside scientific names) for sites on their land; these lists can be produced readily from data entered into the EDBSA. Species distribution maps or vegetation mapping, if completed of the surveyed area, may also be appropriate.

There are a variety of analysis processes which can be completed, with graphical or tabular statistical outputs depending on needs.

7. USEFUL CONTACTS AND FUNDING SOURCES

CONTACTS (SUBJECT TO CHANGE):

The Geographic Analysis and Research Unit	Manager, GAR Unit DHUD ph. (08) 8303 0715 email: ida@dep.sa.gov.au
The Biological Survey Coordinating Committee	Manager, Biological Survey and Research Section, Resource Management Branch, DENR ph. (08) 8204 8888
Biological Survey Users Group	Care of the GAR Unit, DHUD ph. (08) 8303 0715
The Vegetation Mapping and Analysis Working Group:	Care of GAR Unit, DHUD ph. (08) 8303 0715
Biological Survey & Research Section, DENR	ph. (08) 8204 8888
Native Vegetation Conservation Section, DENR	ph. (08) 8204 8888
Coastal Management Section, DENR	ph. (08) 8204 8888
State Herbarium	ph. (08) 8228 2311
Primary Industries (SA)	ph. (08) 8303 9511 Soil Manager Revegetation Officers Land Management Coordinator Farm Forestry Development Landcare Officers
SA Farmers Federation	ph.(08) 8232 5555
Media	Farmer and Stockowner ph.(08) 8372 5262 Stock Journal ph.(08) 8372 5222 Landcare News ph.(08) 8665 5011 Advertiser: On the Land ph.(08) 8206 2274 ABC: The Country Hour ph.(08) 8343 4383 Bush Chronicle ph.(08) 8235 0012 (Denys Slee)

POTENTIAL FUNDING SOURCES:

GRANTS AND PROGRAMS (SUBJECT TO CHANGE):

Commonwealth

Coastcare (funded in conjunction with local government).

Murray Darling Basin Commission (MDBC).

National Forest Inventory (NFI).

National Heritage Trust Board:

- National Vegetation Initiative
- Murray-Darling 2001
- National Rivercare Initiative
- National Land and Water Resources Audit
- National Weeds Strategy
- Endangered Species Program
- Rural Adjustment Scheme - Advanced Property Management Planning
- Waste Management Awareness Program
- National Landcare Program
- Coasts and Clean Seas Initiative
- National Reserves System
- Farm Forestry Program
- National Feral Animal Control Strategy
- Air Pollution in Major Cities
- World Heritage Area Management
- National Wetlands Program

State

Natural Resources Council - Fire Research Coordination Group (SAFRCG) for small scale projects.

Department of Environment and Natural Resources (DENR) - Wildlife Conservation Fund.

Native Vegetation Council (DENR) - Native Vegetation Council Fund

GUIDE TO A NATIVE VEGETATION SURVEY (AGRICULTURAL REGION) USING THE BIOLOGICAL SURVEY OF SOUTH AUSTRALIA METHODOLOGY

SECTION 3

First edition August 1997

GEOGRAPHIC ANALYSIS AND RESEARCH UNIT

INFORMATION AND DATA ANALYSIS BRANCH

DEPARTMENT OF HOUSING & URBAN DEVELOPMENT

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SECTION 3 - BIBLIOGRAPHY AND APPENDICES

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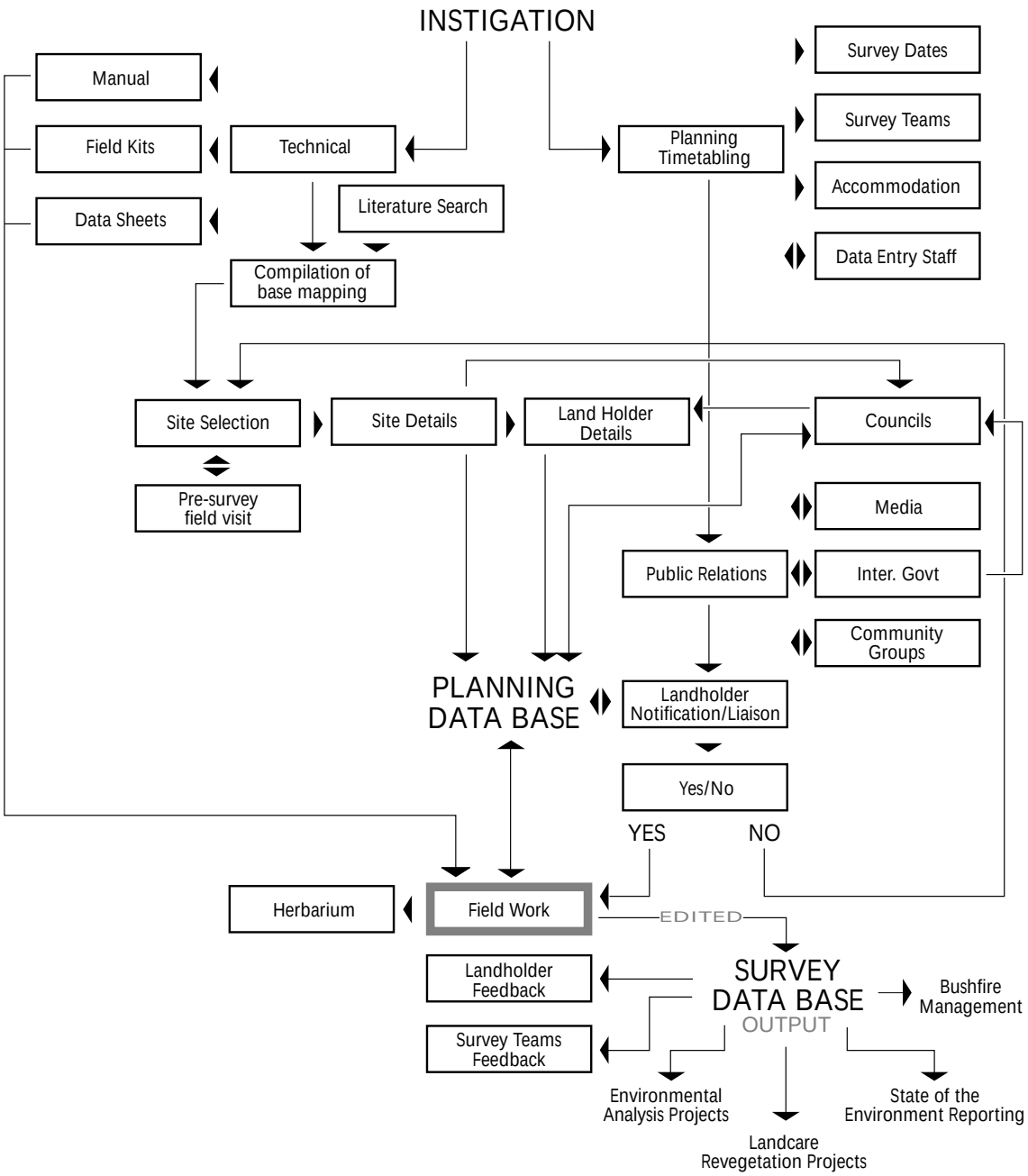
APPENDIX 1

FLOW DIAGRAM OF THE SURVEY PROCESS



APPENDIX 2

EXAMPLES OF COMPLETED DATA SHEETS

Blank datasheets, suitable for photocopying, are in the inside cover.

THE PHYSICAL DESCRIPTION (INCLUDING QUADRAT LOCALITY) DATA SHEET

1. Site Description
2. Location Details
3. Physical Description (PHY)
4. Disturbance
5. Vertebrate Presence (VPR)
6. Soils (SOI)

THE VEGETATION DATA SHEET

7. Vegetation Description (PLA)
8. Vegetation Association Description (PLA)
9. Overstorey Measurements (OVE)
10. Overall Comments (COM)

THE VOUCHER LIST DATA SHEET

Blank template, suitable for photocopying, is in the inside cover.

EXAMPLE OF A SITE ALLOCATION SHEET

EXAMPLE OF A VOUCHER LABEL

SURVEY NAME SOUTHERN EYRE PENINSULA

BIOLOGICAL SURVEY SOUTH AUSTRALIA — DATA BASES

REMNANT VEGETATION SURVEY - No 080

1. SITE DESCRIPTION

PID (Office use only) | Data Entrant (3 initials) (Office use only)

Observers (3 initials): KLG PJL | Date: 17 10 95 (DD MM YY) | Site No.: JUS 006 01 (Loc site quad)

Hundred | Section | Field Order: 2B 07 (Team No Sequence No.)

Property | Owner

Mapsheet No.: 6028-2 | Mapsheet Name: JUSSIEU | Altitude: 10 m

AMG Zone: 52 (53) 54 (circle appropriate box) | Easting: O | Northing: O

Method (circle appropriate box): 1 Map (2) APD 3 GPS 4 DGPS

GPS accuracy | Waypoint No. | Datum (circle appropriate box): 1 WGS84 2 AGD84 (3) AGD66 4 GDA94

Estimated Reliability (of location) (circle appropriate box): (1) 0 - 50m 2 51 - 100m 3 101 - 250m 4 251 - 500m 5 501m - 1km 6 1 - 10km

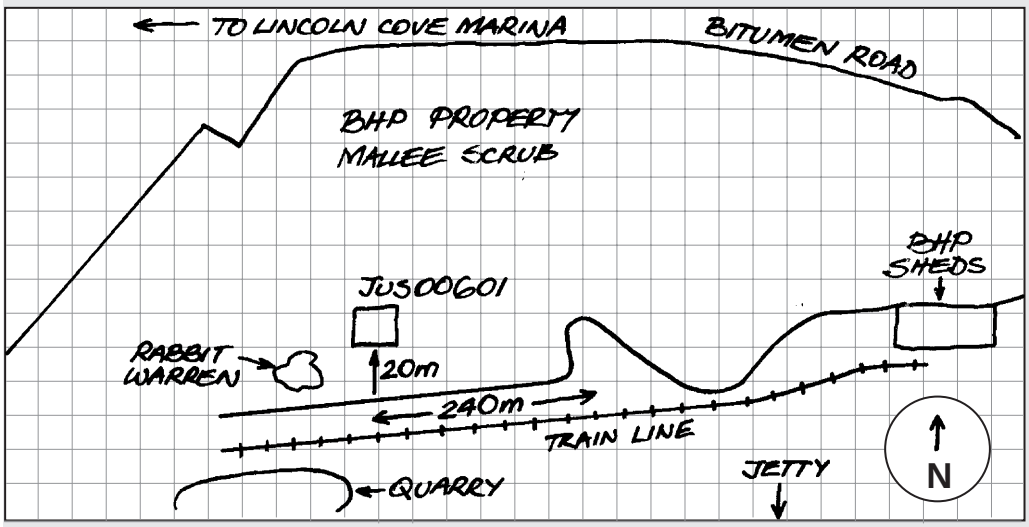
2. LOCATION DETAILS (LOC)

Aerial Photo Svy.No.: 4505 | Photo No.: 0110

(Prick the Aerial Photo!) E 98 mm N 191 mm (from inside black edge to prick point)

Quadrat Photo No.: 2B 10 (Film Frame) | Direction: 040 N

Location Map and Description (provide clear drawing as these will be scanned)



Location Comments (provide written description of local directions to the site, and mark site photo location and direction): GO PAST BHP SHEDS HEADING WSW, GO 240m PAST LAST CORNER OF TRIANGULAR LOOP. HEAD NORTH OF TRACK ABOUT 20m TO START OF QUADRAT.

1

3. PHYSICAL DESCRIPTION (PHY)

General Landscape Description (*PHY) STONY RISES

Landform Pattern R I S

ALF = Alluvial fan
ALP = Alluvial plain
BEA = Beach ridge plain
SAN = Sand plain
FLO = Floodplain
PLA = Plain
TID = Tidal Flat
CON = Consolidated Dunefield
DUN = Dunefield
LON = Longitudinal dunefield
PAR = Parabolic dunefield
ESC = Escarpment
HIL = Hill
LOW = Low hills
MOU = Mountains
RIS = Rises

Landform Element 3 0 2

100 = Plain (incl.undulating plain)
101 = Sandy plain
104 = Limestone plain
150 = Rock outcrop (on plain)
151 = Inselberg / Tor
160 = Drainage depression
811 = Open depression
812 = Closed depression
820 = Flat
990 = Other (please specify)
200 = Dune/consolidated dune
201 = Dune crest
202 = Dune slope
203 = Dune footslope
210 = Swale
211 = Interdune corridor
600 = Beach
610 = Beach ridge
620 = Fore dune
630 = Lagoon
301 = Hill crest
302 = Hill slope
303 = Hill footslope
306 = Ridge
321 = Gully
322 = Gorge
330 = Cliff
331 = Cliff footslope
360 = Rock outcrop (on hill)
400 = Stream channel
451 = Flood out
453 = Fan-alluvial
460 = Estuary
500 = Lake
510 = Salt lake
520 = Swamp
521 = Perched swamp
110 = Playa/Pan
120 = Lunette

Comments (specify if other) GENTLY INCLINED SLOPE OF SMALL RISE

Site Slope 0 4 (if zero slope (0) then put zero (0) in aspect)

Site Aspect 1 8 8 **N** (Due North = 360°)

Outcrop cover 2 **9 =** nil **1 =** <10% **2 =** 10 - 50% **3 =** > 50%

Outcrop lithology 1 1 0

110 Calcareous material
120 Sandstone
130 Siltstone
140 Shale
160 Laterite (ironstone)
220 Quartzite
230 Gneiss
240 Schist
310 Quartz
330 Granite
777 Not identified
Other .....
(or subdominant)

Surface Strew Size 1 (Surface stone) **9 =** none apparent **1 =** pebble (5-50mm) **2 =** cobble (51-250mm) **3 =** boulder (gt 250mm)

Comments (specify if other) APPROXIMATELY 1/2 PEBBLE AND 1/2 COBBLE

Surface Strew Cover 3 **9 =** nil **1 =** <10% **2 =** 10-30% **3 =** 30-70% **4 =** >70%

Surface Strew Lithology 1 1 0

110 Calcareous material
120 Sandstone
130 Siltstone
140 Shale
160 Laterite (ironstone)
220 Quartzite
230 Gneiss
240 Schist
310 Quartz
330 Granite
777 Not identified
Other .....
(or subdominant)

Fire Scars y/n N **Year of last fire** /
(estimate if unknown-prefix with "~" eg ~1984)

Bare Earth 5 % **Plant Litter** 50 %
(Sum of Bare Earth & Litter does not need to equate to 100%)

Comments LOTS OF MOSS ~ 30 %

2

4 DISTURBANCE

Erosion Comments (*ERO) (eg active gullying) .....

Disturbance Impacts (DIS) (Within 30 metre radius of quadrat) **Circle = present. Cross through = absent.** (show on map if possible)

(AT)	Access Tracks	FL	Fence Lines
BH	Bee Hives	OR	Off-road Vehicles
BQ	Borrow/Quarry Pit	PL	Power Lines
CL	Cleared land within 30m radius of quadrat	RD	Rubbish Dumping
CR	Coppice Regrowth	RV	Remnant Vegetation adjoins roadside native vegetation
DR	Drains	SL	Slashing
EA	Earthmoving/Earthworks	SR	Sprays (weed or plant growth control)
FB	Fire Breaks	WP	Watering Points

Disturbance Comments (*DIS) (indicate other disturbances) .....

5 VERTEBRATE PRESENCE (VPR)

Circle = present. Cross through = absent

For animals present indicate **Y/N** for **D**,**T**,**B**,**S** & **M**

D= Dung
T = Tracks
B = Burrows/Warrens/Nests
S = Sightings
M = Material (ie Skeletal/Fur/Feathers)

		D	T	B	S	M
Bandicoot	BA					
Cat	CT					
Cattle	CA					
Dog/Dingo	DD					
Echidna	EC					
Emu	EM					
Fox	(FO)	Y	N	N	N	N
Goat	GO					
Hare	HA					
Horse	HO					

		D	T	B	S	M
Kangaroo	KA					
Koala	KO					
Macropod	MA					
Mallee Fowl	MF					
Other Vertebrates	OV					
Pig	PI					
Possum	PO					
Rabbit	(RA)	Y	Y	N	N	N
Reptiles	RE					
Sheep	SH					
Wombat	WO					

Vertebrate Presence Comments (*VPR) (ie. grazed/severe rabbit activity/active wombat warrens/ mallee fowl mound active/specify other vertebrates/landholder sightings) RABBIT BUCK HEARS PRESENT, LARGE WARREN 25m OUT OF QUADRAT.

6 SOILS (SOI)

Surface Soil Texture Class C S

S	= sand	**L**	= loam	**CLS**	= clay loam,sandy	**MC**	= medium clay
LS	= loamy sand	**ZL**	= silty loam	**ZCL**	= silty clay loam	**MHC**	= medium heavy clay
CS	= clayey sand	**SCL**	= sandy clay loam	**LC**	= light clay	**HC**	= heavy clay
SL	= sandy loam	**CL**	= clay loam	**LMC**	= light medium clay	**P**	= peat

Soil Comments (*SOI) .....

3

To be filled out and transfered to the Vegetation Sheet

9 OVERSTOREY MEASUREMENTS (OVE)

(TAKE TEN ESTIMATES)

View the quadrat in cross section to distinguish stratum and to determine overstorey height range. For overstorey, measure **10** individuals or discrete foliage clumps of any species that occurs in the broad lifeform category that corresponds to the structural description completed above. Broad lifeforms include trees, mallees and shrubs. Include all individuals regardless of height, except where there is a recognisable height gap corresponding to a separate lower stratum. For those circumstances where two lifeforms are codominant include measurements of both.

Canopy Type 55 **%**

(Estimate average canopy type for overstorey species measured)

Overstorey Height (m)	3	4.4	4.8	4.9	3.6	4.5	3.8	4.0	3.7	3.9
Canopy Depth (m)	0.7	2.6	1	1.4	1.2	1	0.9	0.8	1.1	1.8
Canopy Diameter (m)	06	4.5	3.2	1.8	2.4	1.8	3	2.6	2.0	3.6
Gap (m)	3.5	1.2	0.8	0	0.2	2.8	1	0.5	0.3	0.8

If found please return to

Geographic Analysis and Research Unit
Information and Data Analysis Branch
Deptartment of Housing and Urban Development
GPO Box 1815
Adelaide SA 5001

4

SURVEY NAME SOUTHERN EYRE PENINSULA

BIOLOGICAL SURVEY SOUTH AUSTRALIA — ENVIRONMENTAL & SOCIO-ECONOMIC DATA BASES

7. VEGETATION DESCRIPTION (PLA)

Survey No. 080

PID (Office Use only)

Data Entrant(3 initials) (Office Use only)

Observers (3 initials) PJL KLG

Date 17/10/95

Site No. TUS 006 01 (Loc site quad)

Quadrat Size (if not 30x30m) (tick if 30 x 30m) ✓

Field Order 28 07 (Team No Sequence No.)

Climatic Conditions 1

1 = Wet Reliable data, good rainfall preceding survey, ensuring the presence of seasonal vegetation in addition to perennial vegetation; in agricultural areas winter rainfall precedes the survey.

2 = Dry Moderately reliable data, recorded during dry conditions making it likely that the seasonal component of vegetation is under represented; in agricultural areas summer conditions precede the survey.

Vegetation Association Description (AD) **Flag the dominant/codominant overstorey, understorey and emergent species in column AD on the plantlist for;**

- up to 3 overstorey species (O) - up to 3 emergent species (E) - up to 5 understorey species (U)

*Note

Dominant/ Codominant overstorey species are defined as species that dominate the tallest layer that has a canopy cover of ≥ 5%. If there are no layers that have a canopy cover ≥ 5% then the dominant/ codominant overstorey species are defined as species that dominate the tallest layer which has the maximum recorded cover/abundance (check plantlist).

An emergent species is defined as a species that emerges above the overstorey and occupies a stratum that has a canopy cover of less than 5%.

	Species *Final corrected species will be written in the shaded area	Previously collected Voucher No.	Voucher No.	AD	LF	CA	LS /Comments
1	Eucalyptus rugosa		BS80-1475	O	KT	3	FIMB
*							
2	Eucalyptus oleosa		-1476	O	KT	3	IFBM
*							
3	Rhagodia candolleana		-1477		SC	1	BF
*							
4	Eucalyptus gracilis		-1478		KT	1	M
*							
5	Melaleuca lanceolata			U	SA	3	M
*							
6	Acacia triquetra				SC	1	I
*							
7	Acacia anceps		-1482		SB	T	BI
*							
8	Dianella revoluta var. brevicaulis				VT	T	V
*							
9	Amyema melaleucae		-1479		MI	2	MB on M. lanceolata
*							
10	Pimelea serpyllifolia		-1480		SC	T	F
*							
11	Exocarpus aphyllus		-1488		S	1	IMBF
*							
12	Templetonia retusa		-1489		SA	1	VSI
*							
13	Santalum acuminatum				LB	1	V
*							
14	Cassytha melantha				V	1	I
*							
15	Acacia cupularis				SB	N	V
*							
16	Comesperma volubile				V	N	FB
*							
17	Lasiopetalum discolor		-1481	U	SC	1	FBI
*							5

	Species *Final corrected species will be written in the shaded area	Previously collected Voucher No.	Voucher No.	AD	LF	CA	LS /Comments
18	Carpobrotus rossii		BS80-1483	U	P	1	IF bisexual fl.
*							
19	Acacia alcockii		-1484		SB	1	BS
*							
20	Cassytha peninsularis var. peninsularis				V	T	IB
*							
21	Acacia nematophylla		-1485		SB	T	BIX
*							
22	Moss				MO	3	V
*							
23	Trachymene pilosa				J	1	FIM
*							
24	Anagallis arvensis				J	1	FBI
*							
25	Galium murale				J	1	FBI
*							
26	Desmazeria rigida				GL	1	FI
*							
27							
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42							
*							
43							
*							6

8 VEGETATION ASSOCIATION DESCRIPTION (PLA)

Assemblage Information: Vegetation Structural Summary : (From highest to lowest stratum) :

Life form height class (LF) / Canopy Cover (C); (This should be filled out from viewing the quadrat not from the plant list
(refer to Muir's table)

- Cross through if not applicable ie. ~~KT/_____)~~

Note: All life forms (LF) with significantly high cover/abundance recorded in the plant list should also occur here.

~~T / _____,~~	~~M / _____,~~	~~LA / _____,~~	LB / r ,
KT / c ,	KS / r ,	S / r ,	SA / c ,
~~SB / _____,~~	SC / r ,	SD / i ,	P / r ,
~~H / _____,~~	~~GT / _____,~~	~~GL / _____,~~	J / r ,
~~VT / _____,~~	~~VL / _____,~~	V / r ,	MI / r ,
~~X / _____,~~	~~MO / _____,~~	~~LI / _____,~~	

Vegetation Association Description cont.

Describe the vegetation structure, using the SA Structural Formation Table, based on the average height of the overstorey as you view it.

Structural Description (Using SA Structural Formation Table) Mallee

Check that the (AD) column on the plant list is completed - for explanation see above plant list

***Note**

If two different lifeforms are more or less codominant eg. a Mallee / Callitris mix, then use the average of both to allocate a height class and the most prevalent or conspicuous lifeform to select a name. Combine both in determining the overstorey projective foliage cover.

Upper Stratum Age Class (for dominant / codominant species) **Circle = present. Cross through = absent.**

(Tree layer only)

		Comments
Seedling (<1m)	~~SE~~	
Sapling (juvenile)	SA	
Mature	MA	
Senescent	~~SN~~	
Hollows	~~HO~~	

9 OVERSTOREY MEASUREMENTS (OVE)

(TAKE TEN ESTIMATES)

View quadrat in cross section to distinguish stratum and to determine overstorey height range. For overstorey, measure **10** individuals or discrete foliage clumps of any species that occurs in the broad lifeform category that corresponds to the structural description completed above. Broad lifeforms include trees, mallees and shrubs. Include all individuals regardless of height, except where there is a recognisable height gap corresponding to a separate lower stratum. For those circumstances where two lifeforms are codominant include measurements of both.

Canopy Type 55 **%**

(Estimate average canopy type for overstorey species measured)

Overstorey Height (m)	3	4.4	4.8	4.9	3.6	4.5	3.8	4.0	3.7	3.9
Canopy Depth (m)	0.7	2.6	1	1.4	1.2	1	0.9	0.8	1.1	1.8
Canopy Diameter (m)	0.6	4.5	3.2	1.8	2.4	1.8	3	2.6	2.0	3.6
Gap (m)	3.5	1.2	0.8	0	0.2	2.8	1	0.5	0.3	0.8

PLEASE MARK ANY MAPPABLE VEGETATION BOUNDARIES ON THE AERIAL PHOTOS.

10 OVERALL COMMENTS (COM)

(on Vegetation of the Site) : Optional

(*VEG) .....

VOUCHER LIST (Southern Eyre Peninsula Survey)

BIOLOGICAL SURVEY SOUTH AUSTRALIA — ENVIRONMENTAL & SOCIO-ECONOMIC DATA BASES

Observers (3 initials) D E M R L T **Group A** **Week 1** **Date** 0 9 / 1 0 9 5

Herbarium acronym BS80

Deter-miner	Species (Night/Final ids)	Species (Field use)	Voucher Nos.	Site No.
DM		Eucalyptus diversifolia	BS80- 1	COV01501
DM		Eucalyptus oleosa	BS80- 2	
DM		Melaleuca lanceolata	BS80- 3	
DM		Eucalyptus rugosa	BS80- 4	
RT	Acacia alcockii	Acacia 'narrow phyllodes'	BS80- 5	
DM		Beyeria lechenaultii	BS80- 6	
DM		Correa pulchella	BS80- 7	
DM		Acacia anceps	BS80- 8	
DM		Pomaderris obcordata	BS80- 9	
DM		Lasiopetalum discolor	BS80- 10	
DM		Pimelea serpyllifolia	BS80- 11	
DM		Eutaxia microphylla var. microphylla	BS80- 12	
DM		Eremophila crassifolia	BS80- 13	
DM		Acacia spinescens	BS80- 14	
DM		Billardiera scricophora	BS80- 15	
DM		Microcybe pauciflora	BS80- 16	
DM		Senecio pterophorus	BS80- 17	
DM		Acrotriche patula	BS80- 18	
DM		Comesperma volubile	BS80- 19	
DM		Gahnia deusta	BS80- 20	
DM		Gahnia lanigera	BS80- 21	
DM		Acacia triquetra	BS80- 22	
DM		Anagallis arvensis	BS80- 23	

EXAMPLE OF A SITE ALLOCATION SHEET

GAR Unit Record No	112
Mapsheet No	59292
Site No	COU00101
Comments	Dark Fine Hilltop
Hundred	ULIPA
Section	999
Other Comments	Choose best area within block
LGA	Lower Eyre Peninsula
Surname	Smith
Initials	J S
Company	N
Address	PO Box 999
City	Wangary
Post Code	5607
Area Code	08
Phone Nos	86123456
Comment	Wants help fencing block - Will send information re Save the Bush
Other Sites also Owned	COU00101 CUM00901 KIA02101
GAR Unit Site Allocation	1A
Permission	Yes
Comments	May need GPS - Come in track that runs North thru sect 89 Follow it as best as you can to site
Fire History	Not burnt for at least 26 years
Grazing History	Stock have access
Fauna Comments	Owner has seen kangaroos, possums and emus

EXAMPLE OF A VOUCHER LABEL

Voucher
BS80-394
Southern Eyre Peninsula Survey
October 1995

Voucher
BS80-394
Southern Eyre Peninsula Survey
October 1995

APPENDIX 3A

LANDFORM PATTERN DEFINITIONS

CODE	DESCRIPTION	DEFINITION
ALF	Alluvial fan	Level (<1% slope) to very gently inclined complex landform pattern of extremely low relief. The rapidly migrating alluvial stream channels are shallow to moderately deep, locally numerous, but elsewhere widely spaced. The channels form a centrifugal to divergent, integrated, reticulated to distributary pattern. (1)
ALP	Alluvial plain	Level landform pattern with extremely low relief. The shallow to deep alluvial stream channels are sparse to widely spaced, forming an unidirectional integrated network. There may be frequently active erosion and aggradation by channelled and overbank stream flow, or the landforms may be relict from these processes. (1)
ANA	Anastomotic plain	Flood plain with slowly migrating deep alluvial channels, usually moderately spaced, forming a divergent to unidirectional integrated reticulated network. There is frequently active aggradation by over-bank and channelled stream flow. (1)
BAD	Badlands	Landform pattern of low to extremely low relief (less than 90m) and steep to precipitous slopes, typically with numerous fixed erosional stream channels which form a non-directional integrated tributary network. There is continuously active erosion by collapse, landslide, sheet flow, creep and channelled stream flow. (1)
BAR	Bar plain	Flood plain with numerous rapidly migrating shallow alluvial channels forming a unidirectional integrated reticulated network. There is frequently active aggradation and erosion by channelled stream flow. (1)
BEA	Beach ridge plain	Level to gently undulating landform pattern of extremely low relief on which stream channels are absent or very rare: it consists of relict parallel beach ridges. (1)
CAL	Caldera	Rare landform pattern typically of very high relief and steep to precipitous slope. It is without stream channels or has fixed erosional channels forming a centripetal integrated tributary pattern. The landform has subsided or was excavated as a result of volcanism. (1)
CHE	Chenier plain	Level to gently undulating landform pattern of extremely low relief on which stream channels are very rare. The pattern consists of relict, parallel linear ridges built up by waves, separated by, and built over flats (mud flats) aggraded by tides or over-bank stream flow. (1)

CON	Consolidated dunefield	Level to rolling landform pattern of very low or extremely low relief without stream channels, built up or locally excavated, eroded or aggraded by wind and consolidated by stabilising effects of vegetation. (2)
COR	Coral reef	Continuously active or relict landform pattern built up to the sea level of the present day or of a former time by corals and other organisms. It is mainly level, with moderately inclined to precipitous slopes below the sea level. Stream channels are generally absent, but there may occasionally be fixed deep erosional tidal stream channels forming a disintegrated non-tributary pattern. (1)
COV	Covered plain	Flood plain with slowly migrating deep alluvial channels, usually widely spaced and forming a unidirectional integrated non-tributary network. There is frequently active aggradation by over-bank stream flow. (1)
DEL	Delta	Flood plain projecting into a sea or lake, with slowly migrating deep alluvial channels, usually moderately spaced, typically forming a divergent integrated distributary network. This landform is aggraded by frequently active over-bank and channelled stream flow that is modified by tides. (1)
DUN	Dunefield	Level to rolling landform pattern of very low or extremely low relief without stream channels, built up or locally excavated, eroded or aggraded by wind. (1)
ESC	Escarpment	Steep to precipitous landform pattern forming a linearly extensive, straight or sinuous inclined surface, which separates terrains at different altitudes, that above the escarpment commonly being a plateau. Relief within the landform pattern may be high (hilly) or low (planar). The upper margin is often marked by an included cliff or scarp. (1)
FLO	Flood plain	Alluvial plain characterised by frequently active erosion and aggradation by channelled or over-bank stream flow. Unless otherwise specified, 'frequently active' is to mean that flow has an Average Recurrence Interval of 50 years or less. (1)
HIL	Hills	Landform pattern of high relief (90-300m) with gently inclined to precipitous slopes. Fixed, shallow erosional stream channels, closely to very widely spaced, form a non-directional or convergent integrated tributary network, There is continuously active erosion by wash and creep and, in some cases, rarely active erosion by landslides. (1)
KAR	Karst	Landform pattern of unspecified relief and slope typically with fixed deep erosional stream channels forming a non-directional disintegrated tributary pattern and many closed depressions without stream channels. It is eroded by continuously active solution and rarely active collapse, the products being removed through underground channels. (1)

LAC	Lacustrine plain	Level landform pattern with extremely low relief formerly occupied by a lake but now partly or completely dry. It is relict after aggradation by waves and by deposition of material from suspension and solution in standing water. The pattern is usually bounded by wave-formed features such as cliffs, rock platforms, beaches, berms, and lunettes. (1)
LAV	Lava plain	Level to undulating landform pattern of very low to extremely low relief typically with widely spaced fixed erosional stream channels that form a non-directional integrated or interrupted tributary pattern. The landform pattern is aggraded by volcanism (lava flow) that is generally relict: it is subject to erosion by continuously active sheet flow, creep and channelled stream flow. (1)
LON	Longitudinal dunefield	Dunefield characterised by long narrow sand dunes and wide flat swales. The dunes are orientated parallel with the direction of the prevailing wind, and in cross section one slope is typically steeper than the other. (1)
LOW	Low hills	Landform pattern of low relief (30-90m) and gently to very steep slopes, typically with fixed erosional stream channels, closely to very widely spaced, which form a non-directional or convergent integrated tributary pattern. There is continuous active sheet flow, creep, and channelled stream flow. (1)
MAD	Made land	Landform pattern typically of very low or extremely low relief and with slopes in the classes level and very steep. Sparse, fixed deep artificial stream channels form a non-directional interrupted tributary pattern. The landform pattern is eroded and aggraded, and locally built up or excavated, by rarely active human agency. (1)
MAR	Marine plain	Plain eroded or aggraded by waves, tides, or submarine currents, and aggraded by deposition of material from suspension and solution in sea water, elevated above sea level by earth movements or eustasy, and little modified by subaerial agents such as stream flow or wind. (1)
MEA	Meander plain	Flood plain with widely spaced, rapidly migrating, moderately deep alluvial stream channels which form a unidirectional integrated non-tributary network. There is frequently active aggradation and erosion by channelled stream flow with subordinate aggradation by over-bank stream flow. (1)
MET	Meteor crater	Rare landform pattern comprising a circular closed depression with a raised margin: it is typically of low to high relief and has a large range of slope values, without stream channels, or with a peripheral integrated pattern of centrifugal tributary streams. The pattern is excavated, heaved up and built up by a meteor impact and now relict. (1)

MOU	Mountains	Landform pattern of very high relief (>300m) with moderate to precipitous slopes and fixed erosional stream channels that are closely to very widely spaced and form a non-directional or diverging integrated tributary network. There is continuously active erosion by collapse, landslide, sheet flow, creep, and channelled stream flow. (1)
PAR	Parabolic dunefield	Dunefield characterised by sand dunes with a long scoop-shaped form, convex in the downwind direction so that its trailing arms point upwind: the ground plan when perfectly developed approximates the form of a parabola. (1)
PED	Pediment	Gently inclined to level (less than 1%) landform pattern of extremely low relief, typically with numerous rapidly migrating, very shallow incipient stream channels, which form a centrifugal to diverging integrated reticulated pattern. It is underlain by bedrock, eroded and locally aggraded, by frequently active channelled stream flow or sheet flow, with subordinate wind erosion. Pediments characteristically lie down-slope from adjacent hills with markedly steeper slopes. (1)
PEP	Pediplain	Level to very gently inclined landform pattern with extremely low relief and no stream channels, eroded by barely active sheet flow and wind. Largely relict from more effective erosion by stream flow in incipient stream channels as on a pediment. (1)
PLA	Plain	Level to undulating or, rarely, rolling landform pattern of extremely low relief (less than 9m). (1)
PLT	Plateau	Level to rolling landform pattern of plains, rises or low hills standing above a cliff, scarp or escarpment that extends around a large part of its perimeter. A bounding scarp or cliff landform element may be included or excluded: a bounding escarpment would be an adjacent landform pattern. (1)
PLY	Playa plain	Level landform pattern with extremely low relief, typically without stream channels, aggraded by rarely active sheet flow and modified by wind, waves, and soil phenomena. (1)
PNP	Peneplain	Level to gently undulating landform pattern with extremely low relief and sparse slowly migrating alluvial stream channels which form a non-directional integrated tributary pattern. It is eroded by barely active sheet flow, creep, and channelled and over-bank stream flow. (1)
RIS	Rises	Landform pattern of very low relief (9-30m) and very gentle to steep slopes. The fixed erosional stream channels are closely to very widely spaced and form a non-directional to convergent, integrated or interrupted tributary pattern. The pattern is eroded by continuously active to barely active creep and sheet flow. (1)
SAN	Sand plain	Level to gently undulating landform pattern of extremely low relief and without channels: formed possibly by sheet flow or stream flow, but now relict and modified by wind action. (1)

SHF	Sheet-flood fan	Level (less than 1% slope) to very gently inclined landform pattern of extremely low relief with numerous rapidly migrating very shallow incipient stream channels forming a divergent to unidirectional, integrated or interrupted reticulated pattern. The pattern is aggraded by frequently active sheet flow and channelled stream flow, with subordinate wind erosion. (1)
STA	Stagnant alluvial plain	Alluvial plain on which erosion and aggradation by channelled and over-bank stream flow is barely active or inactive because of reduced water supply, without apparent incision or channel enlargement that would lower the level of stream action. (1)
TEL	Terraced land (alluvial)	Landform pattern including one or more terraces and often a flood plain. Relief is low or very low (9m to 90m). Terrace plains or terrace flats occur at stated heights above the top of the stream bank. (1)
TER	Terrace (alluvial)	Former flood plain on which erosion and aggradation by channelled and over-bank stream flow is barely active or inactive because deepening or enlargement of the stream channel has lowered the level of flooding. A pattern that has both a former flood plain and a significant active floodplain, or that has former floodplains at more than one level, becomes terraced land. (1)
TID	Tidal flat	Level landform pattern with extremely low relief and slowly migrating deep alluvial stream channels, which form non-directional integrated tributary patterns it is aggraded by frequent active tides.(1)
VOL	Volcano	Typically very high and very steep landform pattern without stream channels, or with erosional stream channels forming a centrifugal interrupted tributary pattern. The landform is built up by volcanism, and modified by erosional agents. (1)

(1) Reproduced from McDonald et.al. (1990) *Australian Soil and Land Survey Field Handbook (2nd ed)* Inkata Press, Melbourne.

(2) Modified from McDonald et.al. (1990) *Australian Soil and Land Survey Field Handbook (2nd ed)* Inkata Press, Melbourne.

APPENDIX 3B

LANDFORM ELEMENT DEFINITIONS

CODE	DESCRIPTION	DEFINITION
100	plain (including undulating plain)	Large very gently inclined or level element, of unspecified geomorphological agent or mode of activity. (1)
101	sandy plain	Large, very gently inclined or level element composed of fine grains of weathered rocks of quartz. (1,7)
102	stony plain	Large, very gently inclined or level element covered with stones. (1,7)
103	clay plain	Large, very gently inclined or level element of heavy non-porous soil made of fine particles of silicate. (1,7)
104	limestone plain	Large, very gently inclined or level element of hard almost horizontally bedded limestone (2) (a class of rock which contains at least 80% of the carbonates of calcium or magnesium (3)).
110	playa/pan	Large, shallow, level-floored closed depression, intermittently water-filled, but mainly dry due to evaporation, bounded as a rule by flats aggraded by sheet flow and channelled stream flow. (1)
120	lunette	Elongated, gently curved, low ridge built up by wind on the margin of a playa, typically with a moderate wave modified slope towards the playa and a gentle outer slope. (1)
140	breakaway	Steep maximal mid-slope or upper slope, generally comprising both a very short sharp (free face) that is often bare rockland, and a stony scarp-foot slope (debris slope), often standing above a pediment. (1)
150	rock outcrop (on plain)	Any exposed area of rock that is inferred to be continuous with under-lying bedrock on a large, very gently inclined or level element. (6)
151	inselberg/tor	Inselberg: Steep-sided, isolated hill that stands above adjacent nearly flat plains. It may have a narrow pediment at its base, generally of granite. (2,4). Tor: Mass or exposed bedrock standing abruptly above its surroundings and typically but not exclusively developed on granitic rock. (2)
160	drainage depression	Level to gently inclined, long, narrow, shallow open depression with smoothly concave cross-section, rising to moderately inclined side slopes, eroded or aggraded by sheet wash. (1)
200	dune/consoli-dated dune	Moderately inclined to very steep ridge or hillock built up by the wind. This element may comprise dunecrest and duneslope. (1) May also be consolidated due to stabilising effects of vegetation. (6)

201	dune crest	Crest on a moderately inclined to very steep ridge or hillock, built up or eroded by the wind. (6)
202	dune slope	Slope on a moderately inclined to very steep ridge or hillock, built up or eroded by the wind. (6)
203	dune footslope	Gently inclined waning lower slope of a moderately inclined to very steep ridge or hillock built up by the wind. (6)
210	swale	i) Linear, level-floored open or closed depression excavated by wind, or left relict between ridges built up by wind or waves, or built up to a lesser height than them: ii) Long, curved open or closed depression left relict between scrolls built up by channelled stream flow. (1)
211	interdune corridor	Generally wide, linear, level floored open depression between parallel dunes. (6)
212	interdune low	Low area between parallel dunes. (1,7)
301	hill crest	Very gently inclined to steep crest, smoothly convex, eroded mainly by creep and sheet wash. A typical element of mountains, hills, low hills and rises. (1)
302	hill slope	Gently inclined to precipitous slope, commonly simple and maximal, eroded by sheet wash, creep, or water-aided mass movement. A typical element of mountains, hills, low hills and rises. (1)
303	hill footslope	Moderately to very gently inclined waning lower slope of a hill resulting from aggradation of erosion by sheet flow, earth flow or creep. (6)
304	talus	Moderately inclined or steep waning lower slope, consisting of rock fragments aggraded by gravity. (1)
305	alcove	Moderately inclined to very steep, short open depression with concave cross-section, eroded by collapse, landslides, creep or surface wash. (1)
306	ridge	Compound landform element comprising a narrow crest and short adjoining slopes, the crest length being greater than the width of the landform element. (1)
321	gully	Open depression with short, precipitous walls and moderately inclined to very gently inclined floor or small stream channel, eroded by channelled stream flow and consequent collapse and water-aided mass movement. (1)
322	gorge	A narrow passage, with precipitous, rocky sides, enclosed among mountains. (3)
330	cliff	Very wide cliffed (>72 degrees) maximal slope usually eroded by gravitational fall as a result of erosion of the base by various agencies: sometimes built up by marine organisms. (1)

331	cliff footslope	Slope situated below a cliff, with its contours generally parallel to the line of the cliff, eroded by sheet wash or water-aided mass movement, and aggraded locally by collapsed material from above. (1)
340	scarp	Very wide steep to precipitous maximal slope eroded by gravity, water-aided mass movement or sheet flow. (1)
341	scarp footslope	Waning or minimal slope situated below a scarp, with its contours generally parallel to the line of the scarp. (1)
350	pediment	Large gently inclined to level (less than 1%) waning lower slope, with slope lines inclined in a single direction, or somewhat convergent or divergent, eroded or sometimes slightly aggraded by sheet flow. It is underlain by bedrock. (1)
360	rock outcrop (on hill)	An exposed area of rock that is inferred to be continuous with underlying bedrock and is on either a mountain, hill, low hill or rise. (6)
400	stream channel	Linear, generally sinuous open depression, in parts eroded, excavated, built up and aggraded by channelled stream flow. This element comprises stream bed and banks. (1)
401	stream bed	Linear, generally sinuous open depression forming the bottom of a stream channel eroded and locally excavated, aggraded or built up by channelled stream flow. Parts that are built up include bars. (1)
402	stream bank	Very short, very wide slope, moderately inclined to precipitous, forming the marginal upper parts of a stream channel and resulting from erosion or aggradation by channelled stream flow. (1)
403	stream bar	Elongated, gently to moderately inclined low ridge built up by channelled stream flow: part of a stream bed. (1)
410	levee	Very long, very low, nearly level sinuous ridge immediately adjacent to a stream channel, built up by over-bank flow. Levees are built, usually in pairs bounding the two sides of a stream channel, at the level reached by frequent floods. This element is part of a covered plain landform pattern. (1)
420	channel bench	Flat at the margin of a stream channel aggraded and in part eroded by over-bank and channelled stream flow - an incipient flood plain. (1)
430	terrace (terrace flat + terrace plain (M))	Flat: small flat aggraded or eroded by channelled or over-bank stream flow, standing above a scarp and no longer frequently inundated: a former valley flat or part of a former flood plain. Plain: large or very large flat aggraded by channelled or over-bank stream flow, standing above a scarp and no longer frequently inundated: part of a former flood plain. (1)

451	flood out	Flat inclined radially away form a point on the margin or at the end of a stream channel, aggraded by over-bank stream flow, or by channelled stream flow associated with channels developed within the over-bank flow: part of a covered plain landform pattern. (1)
452	back plain	Large flat resulting from aggradation by over-bank stream flow at some distance from the stream channel and in some cases biological (peat) accumulation: often characterised by a high water table and the presence of swamps or lakes: part of a covered plain landform pattern. (1)
453	fan - alluvial	Large gently inclined to level element with radial slope lines inclined away from a point, resulting from aggradation, or occasionally from erosion, by channelled, often braided, stream flow, or possibly by sheet flow. (1)
454	oxbow	Long, curved, commonly water-filled closed depression eroded by channelled stream flow but closed as a result of aggradation by channelled or over-bank stream flow, during the formation of a meander plain landform pattern. The floor of an ox-bow may be more or less aggraded by over-bank stream flow, wind, and biological (peat) accumulation. (1)
455	scroll complex (scroll + scroll plain (M))	Scroll: long, curved very low ridge built up by channelled stream flow and left relict by channel migration. Part of a meander plain landform pattern. Scroll plain: large flat resulting from aggradation by channelled stream flow as a stream migrates from side to side: the dominant element of a meander plain landform pattern. This landform element may include occurrences of scroll, swale and ox-bow. (1)
460	estuary	Stream channel close to its junction with a sea or lake, where the action of channelled stream flow is modified by tide and waves. The width typically increases downstream. (1)
500	lake	Large water-filled closed depression. (1)
510	saltlake	Lake which contains a concentration of mineral salts (predominantly sodium chloride in solution as well as magnesium and calcium sulphate (roughly 3g/L NaCl2)). (2,3,5)
520	swamp	Almost level closed, or almost closed depression with a seasonal or permanent water table at or above the surface, commonly aggraded by over-bank stream flow and sometimes biological (peat) accumulation. (1)
521	perched swamp	A tract of land which is permanently saturated with moisture and is positioned on an elevated landform. (6,8,9)
530	terminal lake	Large water-filled closed depression at the end of a drainage area. (1,7)

540	salt crust	Extensive flat surface found in hot deserts consisting of salts that have accumulated in a shallow saline lake or playa. Evaporation then produces a crust of varying hardness. (10)
600	beach	Short, low, very wide slope, gently or moderately inclined, built up or eroded by waves, forming the shore of a lake or sea. (1)
610	beach ridge	Very long, nearly straight low ridge, built up by waves and usually modified by wind. A beach ridge is often a relict feature remote from the beach. (1)
620	fore dune	Very long, nearly straight, moderately inclined to very steep ridge built up by the wind from material from an adjacent beach. (1)
630	lagoon	Closed depression filled with water that is typically salt or brackish, bounded at least in part by forms aggraded or built up by waves or reef-building organisms. (1)
710	cone	Hillock with a circular symmetry built up by volcanism. The crest may form a ring around a crater. (1)
720	crater	Steep to precipitous closed depression excavated by explosions due to volcanism, human action, or impact of an extraterrestrial object. (1)
730	maar	Level floored, commonly water-filled closed depression with a nearly circular steep rim, excavated by volcanism. (1)
740	ashplain	Large, very gently inclined or level element, of the unconsolidated fine grained material formed as a result of volcanic explosions. (1,4)
760	tumulus	Hillock heaved up by volcanism (or, elsewhere, built up by human activity at a burial site). (1)
811	open depression	Landform element that extends at the same elevation, or lower, beyond the locality where it is observed. (6)
812	closed depression	Landform element that stands below all points in the adjacent terrain. (6)
820	flat	Planar landform element that is neither a crest nor a depression and is level or very gently inclined (<3% slope). (1)
830	doline/sinkhole	Steep-sided closed depression eroded by solution directed towards an underground drainage way, or by collapse consequent on such solution. A typical element of a karst landform pattern. (1)
840	cave	A natural cavity, recess, chamber, or series of chambers and galleries beneath the surface of the earth, within a mountain, a ledge of rocks, etc; sometimes a similar cavity artificially excavated. (3)
990	other	

NOTE : Symbols appearing after each definition correspond to references below.

(1)
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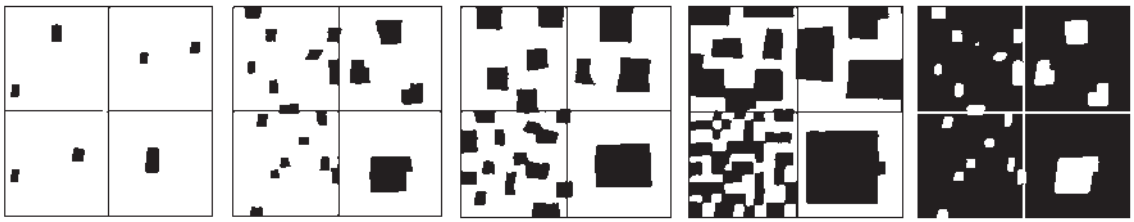
APPENDIX 3C

LITHOLOGY CODES

CODE	DESCRIPTION	CODE	DESCRIPTION
100	Sedimentary (not for field use)	230	Gneiss
110	Calcareous material	240	Schist
111	Limestone	250	Marble
120	Sandstone	260	Haematite
130	Siltstone	300	Igneous (not for field use)
140	Shale	310	Quartz
150	Conglomerate	320	Basalt
160	Laterite (Ironstone)	330	Granite
170	Silcrete	400	Miscellaneous (not for field use)
200	Metamorphic (not for field use)	410	Outwash Material
210	Slate	777	Not identified
220	Quartzite		

SURFACE STREW COVER CHART



2% 10% 20% 50% 90%

Chart for estimating abundance of coarse fragments

Each quarter of any one square has the same area of black

Source: McDonald et al. (1990) *Australian Soil and Land Survey Field Handbook, Second Edition, Inkata Press.*

APPENDIX 3D

SOIL TEXTURE GRADES

CODE	SOIL TEXTURE	BEHAVIOUR OF MOIST BOLUS	Approximate clay content (%)
S	Sand	Coherence nil to very slight, cannot be moulded: sand grains of medium size, single sand grains adhere to fingers.	Commonly less than 5%
LS	Loamy sand	Slight coherence, sand grains of medium size; can be sheared between thumb and forefinger to give minimal ribbon of about 5mm	about 5%
CS	Clayey sand	Slight coherence; sand grains of medium size, sticky when wet; many sand grains stick to fingers, will form minimal ribbon of 5-15 mm, discolours fingers with clay stain	5% - 10%
SL	Sandy loam	Bolus coherent but very sandy to touch; will form ribbon of 15-25 mm; dominant sand grains are of medium size and are readily visible.	10% - 20%
L	Loam	Bolus coherent and rather spongy; smooth feel when manipulated but with no obvious sandiness or 'silkiness'; may be somewhat greasy to the touch if much organic matter present; will form ribbon of about 25 mm.	About 25%
ZL	Silty loam	Coherent bolus; very smooth to often silky when manipulated; will form ribbon of about 25 mm.	About 25% and with silt 25% or more.
SCL	Sandy clay loam	Strongly coherent bolus, sandy to touch; medium size sand grains visible in finer matrix; will form ribbon of 25 - 40 mm	20% - 30%
CL	Clay loam	Coherent plastic bolus, smooth to manipulate; will form ribbon of 40 - 50 mm.	30% - 35%
CLS	Clay loam, sandy	Coherent plastic bolus; medium size sand grains visible in finer matrix; will form ribbon of 40-50 mm.	30% - 35%
ZCL	Silty clay loam	Coherent smooth bolus, plastic and often silky to the touch; will form ribbon of 40-50 mm.	30% - 35% and with silt 25% or more.

CODE	SOIL TEXTURE	BEHAVIOUR OF MOIST BOLUS	Approximate clay content (%)
LC	Light clay	Plastic bolus; smooth to touch; slight resistance to shearing between thumb and fore-finger; will form ribbon of 50 - 75 mm.	35% - 40%
LMC	Light medium clay	Plastic bolus; smooth to touch; slight to moderate resistance to ribboning shear; will form ribbon of about 75 mm.	40% - 45%
MC	Medium clay	Smooth plastic bolus; handles like plasticine and can be moulded into rods without fracture; has moderate resistance to ribboning shear; will form ribbon of 75 mm or more.	45% - 55%
MHC	Medium heavy clay	Smooth plastic bolus; handles like plasticine; can be moulded into rods without fracture; has moderate to firm resistance to ribboning shear; will form ribbon of 75 mm or more.	50% or more
HC	Heavy clay	Smooth plastic bolus; handles like stiff plasticine; can be moulded into rods without fracture; has firm resistance to ribboning shear; will form ribbon of 75 mm or more.	50% or more
P	Peat	No bolus test - described as a brownish or blackish fibrous substance produced by anaerobic decay of vegetation and found in bogs.*	not applicable

Source: McDonald et al. (1990) *Australian Soil and Land Survey Field Handbook, Second Edition,* Inkata Press.

* Developed in-house for the Biological Survey of South Australia.

APPENDIX 3E

MUIR'S TABLE (MODIFIED)

LIFE FORM/HEIGHT CLASS	LF
T	Trees > 30m
M	Trees 15 - 30 m
LA	Trees 5 - 15 m
LB	Trees < 5 m
KT	Mallee *(>3m)
KS	Low Mallee *(<3m)
S	Shrubs > 2m
SA	Shrubs 1.5 - 2.0 m
SB	Shrubs 1 - 1.5 m
SC	Shrubs 0.5 - 1.0 m
SD	Shrubs 0 - 0.5 m
P	Mat plants (single plant)
H	Hummock grass
GT	Grass > 0.5 m
GL	Grass < 0.5 m
J	Herbaceous spp
VT	Sedges > 0.5 m
VL	Sedges < 0.5 m
V	Vines (twiners)
MI	Mistletoes
X	Ferns
MO	Mosses, liverwort
LI	Lichens

Source : Adapted from Muir B.G. (1977) See definitions.* Adapted from 8m to 3m for South Australia.

CANOPY COVER	C
d	DENSE 70 - 100%
c	MID DENSE 30 - 70%
i	SPARSE 10 - 30%
r	VERY SPARSE 1 - 10%

CA COVER/ABUNDANCE SCALE

Adapted from Braun-Blanquet, J. (1965)

N	not many, 1 - 10 individuals **
T	sparsely or very sparsely present; cover very small (less than 5%)
1	plentiful, but of small cover (less than 5%)
2	any number of individuals covering 5 - 25% of the area
3	any number of individuals covering 25 - 50% of the area
4	any number of individuals covering 50 - 75% of the area
5	covering more than 75% of the area
**	where large shrubs or trees are involved choose a category to reflect the cover rather than the number of individuals

AD VEGETATION ASSOCIATION DESCRIPTION

O	Dominant/Codominant Overstorey species (up to 3 species may be chosen).
E	Emergent species (up to 3 species may be chosen)
U	Dominant/Codominant Understorey species (up to 5 species may be chosen).

Note: An emergent species is defined as a species that emerges above the overstorey and occupies a stratum that has a canopy cover less than 5%.

LS LIFE STAGES

Enter each respective code where it is relevant to >10% of individuals of that species population at that representative site (however, this does not apply to seedlings - enter seedlings whenever they are observed present). For the reproductive stages ie fruiting or budding, only record if more than 10% of the reproductive organs are at that stage.

DEFINITIONS

V - Vegetative	only refers to plants in a non-reproductive phase ie. no flowers, buds or unshed seed.
R - Regenerating	woody perennial which is resprouting after significant foliage loss.
D - Dead/Dormant	indicates that above ground material only is dead and includes plant species that may still have dormant below ground organs ie orchids, lilies etc.
B - Budding	plants have buds formed in varying stages of development for flowering.
F - Flowering	plants are in flower.
I - Immature Fruits	immature fruits not shedding seed.
M - Mature Fruits	fruits ripe and/or shedding
X - Recently Shed	plants that are in a non-reproductive phase that show signs of having shed seed or fruits within the last 12 months.
S - Seedling	record when any number of seedlings are observed.

APPENDIX 3F

DEFINITIONS (MUIR´S CODE)

LIFE FORMS

TREES (T,M,LA,LB)	Woody, usually perennial plants, generally erect, of variable outline but commonly with a spherical or ovoid canopy raised well above the ground. The major part of the canopy from bottom to top less than or equal to two thirds of the total height of the tree. Single stemmed, or if multi-stemmed, with fewer than 5 individual trunks that result from branching of a single trunk (which may be quite short) and which do not arise from a mallee-like lignotuber.[1]
MALLEES (KT, KS)	Woody, usually perennial plants of the genus Eucalyptus, generally erect, of variable outline but commonly with a spherical or vertically flattened canopy raised well above the ground. Leaves are commonly born only near the ends of branches. The major part of the canopy from bottom to top may extend from the ground to the maximum height of the plant, or may occupy only the upper portion of the total height. Multi-stemmed, the individual trunks arising from a lignotuber or swelling at the base of the stem, at or below soil-level, and bearing dormant buds.[1] MALLEE - Usually greater than 3m* tall LOW MALLEE - Commonly less than 3m* tall
SHRUBS (S, SA, SB, SC, SD)	Woody, usually perennial plants, generally erect but may be procumbent or of weeping habit. Commonly broadly conical in form with the foliage occupying all or only part of the total height of the plant. Multiple stems and branches arise from a rootstock or very short common trunk. Lignotubers of the mallee type absent. Shrubs may be of any height but are generally less than 5m tall. Dead hollow branches rarely reach sufficient size to provide habitats for vertebrates.[1]
MAT PLANTS (P)	Herbaceous or woody plants of prostrate habit, with major stems growing along the ground. Rarely exceeds 10 cm in height. Examples of mat plants are *Kunzea pomifera*, *Myoporum parvifolium*, *Carpobrotus rossi* and *Mimulus repens*.[2]
HUMMOCK GRASSES (H)	Herbaceous, perennial grasses of the genera *Triodia* or *Plectrachne*. Have a typical mound-like form due to trapping of debris and soil within the stem bases, building up into a hummock. Commonly with dead grass in the middle and living grass on the outer edge. The clumps are of uniform height and the seed heads rise above the clumps. The height of the clump, not the seed heads is stated.[1]

GRASSES (GT, GL)

Herbaceous or rarely woody plants of the family Poaceae (Gramineae). Perennial or annual, generally erect or spreading. Usually with distinct individual shoots arising from a single root system, or if not, then not forming a hummock.[1]

HERBS (J)

Herbaceous or slightly woody, annual or sometimes perennial plants. Herbaceous, annual species are commonly erect and woody, perennial species commonly creepers or climbers. Some species are tufted. Foliage usually covers the majority of the branches in shrubby and creeping forms. May arise from stolons, tubers, bulbs, rhizomes or seeds, but usually not from lignotubers. Rarely exceeds 0.5m in height, unless climbing species.[1]

SEDGES (VT, VL)

Herbaceous, usually perennial, erect plants. Generally of tufted habit. Arise from stolons, tubers, bulbs, rhizomes or seeds. Term includes Cyperaceae, Juncaceae, Restionaceae, Typhaceae and Xyridaceae and other plants of sedge-like form.

The following table may be of assistance in differentiating between grasses and sedges which are not flowering.

GRASSES	SEDGES
Leaf sheath always split	Leaf sheath never split
Ligule present	Usually no ligule
Leaf always flat	Leaf not always flat
Stem cross section circular	Stem cross section circular, triangular or polygonal
Evenly spaced internodes	Extended internode below inflorescence

VINES (V)

Climbing, twining, winding or scrambling plants usually with a woody stem. Excludes mat plants which have their major stems growing along the ground. Examples of vines are *Billardiera* spp., *Cassytha* spp. and *Tetragonia implexicoma.*[2]

FERNS (X)

Ferns and fern allies, ie non-vascular cryptogams of classes Filicopsida and Lycopsida. This category includes *Ophioglossum* spp., *Lycopodium* spp., *Selaginella* spp. and *Isoetes* spp.[2]

MISTLETOES (MI)

Aerial stem-parasitic shrubs of family Loranthaceae or Viscaceae. Excludes Dodders - *Cassytha* spp. and *Cuscuta* spp.[2]

LICHENS (LI)

Non-vascular cryptogams comprising a symbiotic association between a fungus and an alga. Cover is only determined for lichens growing on soil or rock; epiphytic lichens are excluded.[2]

MOSSES (MO)

Small leafy non-vascular cryptogams belonging to Class Musci of Division Bryophyta. Liverworts (Class Hepaticae) are excluded.[2]

Note:

The following categories are not intended for general use but may be used to indicate lifeform where appropriate. FG - Fungi, LV - Liverworts and AL - Algae.

1 Adapted from Muir B. G. (1977) Biological Survey of the Western Australian Wheatbelt. Part 2: Vegetation and Habitat of Bendering Reserve. Records of the Western Australian Museum, Supplement No. 3, WA Museum, Perth.

2 Developed in-house for the Biological Survey of South Australia.

* Adapted from 8m to 3m for South Australia.

APPENDIX 3G

SOUTH AUSTRALIAN VEGETATION STRUCTURAL FORMATIONS

LIFE FORM/ HEIGHT CLASS	PROJECTIVE FOLIAGE COVER OF TALLEST STRATUM			
	Dense (70-100%)	Mid-dense (30-70%)	Sparse (10-30%)	Very sparse (<10%)
Trees > 30m	Tall closed forest	Tall open forest	Tall woodland	Tall open woodland
Trees 10-30m	Closed forest	Open forest	Woodland	Open woodland
Trees 5-10m	Low closed forest	Low open forest	Low woodland	Low open woodland
Trees <5m	Very low closed forest	Very low open forest	Very low woodland	Very low open woodland
Mallee (>3m)	Closed mallee	Mallee	Open mallee	Very open mallee
Low Mallee (<3m)	Closed low mallee	Low mallee	Open low mallee	Very open low mallee
Shrubs > 2m	Tall closed shrubland	Tall shrubland	Tall open shrubland	Tall very open shrubland
Shrubs 1-2m	Closed shrubland	Shrubland	Open shrubland	Very open shrubland
Shrubs < 1m	Low closed shrubland	Low shrubland	Low open shrubland	Low very open shrubland
Mat plants	Closed mat plants	Mat plants	Open mat plants	Very open mat plants
Hummock grasses	Closed Hummock grassland	Hummock grassland	Open hummock grassland	Very open hummock grassland
Tussock grasses	Closed (tussock) grassland	(Tussock) grassland	Open (tussock) grassland	Very open (tussock) grassland
Sedges	Closed sedgeland	Sedgeland	Open sedgeland	Very open sedgeland
Herbs	Closed herbland	Herbland	Open herbland	Very open herbland
Ferns	Closed fernland	Fernland	Open fernland	Very open fernland

[Note: Table originally derived from Specht (1972) and Muir (1977)]

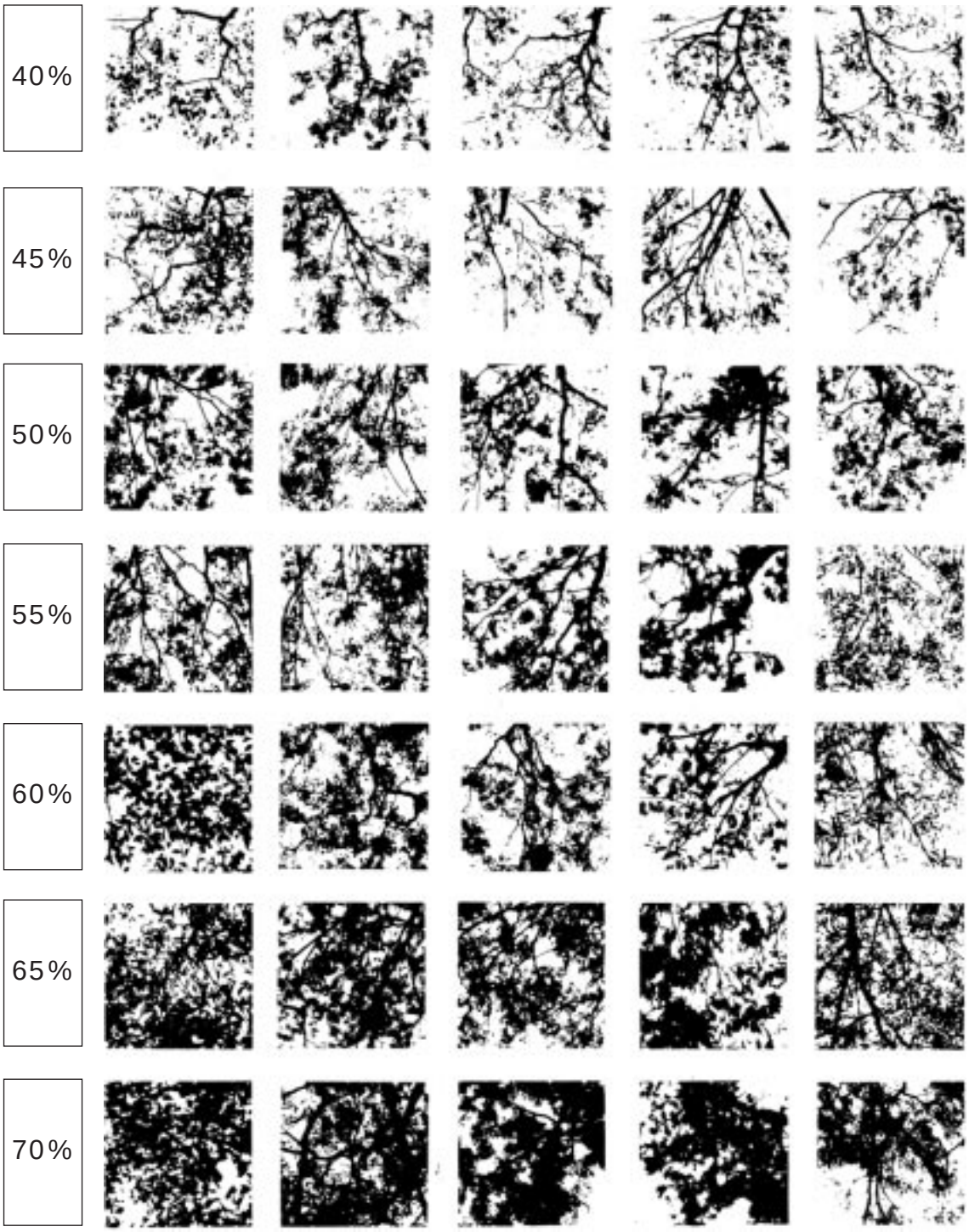
Trees	woody; perennial; erect; canopy raised well above the ground. Depth of canopy is usually less than or equal to two thirds of the total tree height. Single stemmed, or if multistemmed, fewer than five individual trunks resulting from branching of a single short trunk, that is not a mallee-like lignotuber. Height usually >2m.
Mallees	genus *Eucalyptus;* multi-stemmed, trunks arising from lignotuber. Low mallee - < 3m. Mallee - > 3m
Shrubs	woody; perennial; erect, procumbent or weeping; foliage occupies all or part of total plant height; multiple stems and branches arising from a rootstock or very short common trunk; generally <5m tall.

Mat Plants	Herbaceous or woody plants of prostrate habit, with major stems growing along the ground. Rarely exceeds 10 cm in height. Examples of mat plants are *Kunzea pomifera, Myoporum parvifolium, Carpobrotus rossi* and *Mimulus repens.*
Hummock Grass	Genera *Triodia* or *Plectrachne* only.
Grasses (tussock)	family Poaceae (Graminae); leaf sheath always split.
Sedges	herbaceous, usually perennial, erect, generally tufted; arise from stolons, tubers, bulbs, rhizomes or seeds. Leaf sheath never split. Includes Cyperaccae, Juncaceae, Restionaceae, Typhaceae and Xyridaceae and other sedge-like forms.
Herbs	herbaceous or slightly woody; annual or sometimes perennial; erect or creepers; rarely exceeds 0.5m height.
Ferns	Ferns and fern allies, i.e. non-vascular cryptogams of classes Filicopsida and Lycopsida. This category includes *Ophioglossum* spp., *Lycopodium* spp., *Selaginella* spp. and *Isoetes* spp.

Source: Adapted from Forward, L.R., and Robinson, A.C. (eds) (1996). A Biological Survey of the South Olary Plain South Australia., 1991 - 1992. Biological Survey and Research, Natural Resources Group, Department of Environment and Natural Resources, South Australia.

Appendix 3H

Canopy Type



Canopy types — Estimate the openness of individual tree or shrub canopies by matching the canopy with a photograph. The rows show similar canopy types for different canopy sizes (large to small, left to right); *Acacia* phyllodes are in the right hand row. Most Australian woody plants are in the range 40 percent to 70 percent.

Source: Adapted from McDonald et al. (1990) *Australian Soil and Land Survey Field Handbook, Second Edition,* Inkata Press.

APPENDIX 4

MAP PRESENTATION FOR DIGITAL CONVERSION

MAP TYPE

The three common materials used in map production are mylar, vellum and paper.
The preferred material is mylar, a polyester based film, which holds inks and pencil well and is not prone to tearing.

Maps should be rolled rather than folded as the creases caused by folding effect the movement of the digitising mouse; folding can also distort the shape and scale of the map.

MAP INFORMATION

The standard information required is:

- scale
- title
  - simple, informative and used consistently
- date
- nomenclature - check spelling and location
- legend
  - check that everything on the map to be digitised is mentioned in the legend
  - check the legend is uniform and located in one place
- status
  - draft or otherwise
- data source
- north arrow
- data limitations
- reference to a related report
- projection
  - whether AMGs, Lamberts (statewide coverage), longitude and latitude

Coordinate reference points are necessary for all maps.

INFORMATION QUALITY

It is essential that all polygons close (ie. vegetation boundaries meet) and only have one label. Also highlight boundaries that follow roads, tracks, fences, cadastre or other features.

Edgematch mapsheets so that the boundaries and coding is consistent from one to the other.

For everyone's benefit please ensure that all information is legible (use a sharp 2H pencil), logical, and in the correct place. Your name and contact number is also useful should any queries arise.

APPENDIX 5

SCIENTIFIC PERMITS

Before carrying out any survey, survey coordinators must obtain permits from the Department of Environment and Natural Resources (DENR) and in the case of Heritage Agreement areas gain permission from the Minister of Environment or the appropriate delegate. Under the National Parks and Wildlife (NPW) Act, any person other than a Department of Environment and Natural Resources employee is required to have a permit for the collection of native flora and fauna species anywhere in the state and any survey work in National Parks and Wildlife Service (NPWS) parks and reserves.

Specifically a person must not take a native plant:

- on any government reserve (road, railway, National Parks and Wildlife Act reserve etc.)
- on any other Crown Land
- on any land reserved for or dedicated to public purposes or
- any forest reserve.

Further to the NPWS permit system other land managers may require separate permission.

Prescribed native plant species on private land (this will include endangered, vulnerable or rare species) must not be taken. In addition a person must not take a native plant on private land without the consent of the land owner.

There are two types of permits issued to cover all these aspects. If survey work is to be carried out on NPWS parks and reserves (National, Conservation and Recreation Parks, Regional and Game Reserves) a permit to undertake scientific research on a reserve is required. For all other areas including other types of government land, a permit to take protected species for scientific purposes (not in a reserve) is required. The definition of 'reserve' in this case is limited to those specially managed by the NPW Act.

Note also, any research on a reserve requires a permit including formal observations, collection of soil, leaf litter, geological samples etc.

Permits issued under the NPW Act also satisfies the exemption requirements of the Native Vegetation Management Act.

Scientific permits are issued by the Biological Survey and Research Section of DENR based at 284 Portrush Road, Kensington. There are formal applications forms which should be obtained from any DENR office. The Executive Officer for the Wildlife Ethics Committee is also based at the Kensington Office of DENR.

Survey coordinators should also be aware of the other permit requirements which may impinge such as those required for Aboriginal Lands.

If a vegetation survey forms part of a larger biological survey:

To conduct fauna survey, on and off reserve, permits will similarly be required. Indigenous and migratory mammals, birds and reptiles are protected throughout the state. In addition all fauna including amphibians and invertebrates are protected on NPW reserves.

In addition to meeting the requirements of the NPW Act, survey coordinators must obtain animal experimentation ethics approval under the Prevention of Cruelty to Animals Act. This can only be obtained by submitting an application detailing survey aims and procedures to an official Animal Ethics Committee. The DENR, SA Museum and Royal Zoological Society run a joint committee specialising in wildlife related research. This committee has developed guidelines for conducting biological surveys which, if adhered to, will assist in obtaining approval.

APPENDIX 6

SURVEY SUMMARY PROFORMA

Date .....

(Header form completed)

PLEASE NOTE : Do not leave any section blank - if a section is not applicable to your survey then fill field with N/A . If processes not yet complete detail status in comments.

1.0 SURVEY BACKGROUND Survey No..... Survey Name .....

.....

1.1 Survey Type (please tick)

Vegetation Only ☐

Fauna Only ☐

Vegetation and Fauna ☐

1.2 Custodian (ie Dept of Housing and Urban Development, Dept of Environment and Natural Resources etc.)

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1.3 Permission for Use Required from..(branch/organisation/department, any other restrictions)

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1.4 Status of data (ie not edited, partially edited etc.).

Vegetation.....

Fauna.....

1.5 Study Area Description (ie overview of landforms, average rainfall, general vegetation description etc.)

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1.6 Project Basis (See Table on page 47 of Section 3 for appropriate category code, eg. BS - Biological Survey of South Australia , CM - Catchment Management etc.)

(Vegetation) ☐

(Fauna) ☐

1.7 Project Funding Source and dates of funding (ie internal funding - Dept Housing and Urban Development and external funding $64,000 from Australian Nature Conservation Agency 1991/92 - 93/94)

Vegetation.....

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Fauna.....

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1.8 Objectives (Vegetation / Fauna).....

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1.9 Site Naming System (Y/N)

SID - Site Identifier ☐ (principally used within the Agricultural Region). Map/site/quadrat methodology based on a 3 character abbreviation of the 1:50,000 mapsheet name, followed by the number of the selected block of remnant native vegetation (site) and then by the number given to the homogeneous community (quadrat) selected within the site.

CQP - Camp Quadrat Patch ☐ (principally in the Arid/Semi-arid Regions). Camp/quadrat/patch methodology based on a character abbreviation of nearest geographical location found on the 1:100,000 or 1:250,000 map, followed by the number given to a selected area of continuous vegetation (quadrat) and then by the number given to a homogeneous community (patch) selected within the quadrat.

1.10 Co-ordinator Details - Vegetation (Organisational Contact at the time of survey)

	CO-ORDINATOR 1	CO-ORDINATOR 2
Name		
Organisation		
Contact Address		
Phone Number		

1.11 Co-ordinator Details - Fauna (Organisational Contact at the time of survey)

	CO-ORDINATOR 1	CO-ORDINATOR 2
Name		
Organisation		
Contact Address		
Phone Number		

1.12 Location of Original Field Data (eg. Data sheets, Aerial Photos & Slides are with the Geographic Analysis and Research Unit of the Department of Housing and Urban Development)

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1.13 Location of Data Sheet Copies

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NOTE: copies of data sheets must be produced and housed with either Dept Environment and Natural Resources Survey and Research Unit or Dept Housing and Urban Development's Geographic Analysis and Research Unit.

1.14 Study Area Boundary. Brief Verbal Description (eg. Area south of 36° Latitude and bounded by the coast and border-complete appropriate attached map - ie. 1:50,000 in Agricultural Regions , 1:100,000 in arid/semi arid regions)

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Has survey boundary been digitised? Y/N ☐

Size of Area if known (km^2) ..... (if unknown explain ie to be confirmed following digitising of attached map)

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Lats/Longs NE corner .... Lats/Longs SW corner ....

Map Scale 1: ..... Number of Mapsheets Involved (eg. 40) .....

GIS Graphic Coverage of sites Y/N ☐

Pathway (eg. Sun Server - ARC/INFO /prj/se/sites) .....

1.15 Source of AMG's (Australian Map Grid Co-ordinates) (Vegetation/Fauna) (ie. how were AMG's generated)

METHOD	VEGETATION	FAUNA
Digitised pin pricks from aerial photos		
Read from maps		
Global Positioning System (GPS)		

Comments (Vegetation / Fauna) (Note here if original veg. site AMG's have been slightly corrected / altered following a fauna survey).....

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1.16 Original Source of Grid References (please tick)

Lats/Longs ☐

AMG's ☐

1.17 Permanent Photographic Monitoring Points Erected Y/N ☐

Details (ie. at fauna sites only or selected sites only - indicate how selected sites were determined)

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1.18 Visit Details

Survey Type (VE -Veg or FA - Fauna)	Visit Start Date	Visit End Date	No. of Sites (surveyed each visit)

1.19 Publications / Reports arising from survey .....

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2.0 VEGETATION DETAILS

2.1 Site Selection Methodology and Nomenclature (ie. how sites or Camp Quadrat Patch's were selected and named)

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2.2 Methodology Used (eg. Complete list of plant species per 30 x 30m quadrat using Braun / Blanquet cover abundance scores)

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2.3 Survey Constraints (ie. Survey focussed on forest and woodland areas, limited wetlands and grasslands sampled)

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2.4 Taxonomist Details

Taxonomist 1..... Contact Address (ie. contactable through State Herbarium)

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Taxonomist 2..... Contact Address (ie. contactable through State Herbarium)

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2.5 Identification

Date or time period of determination.....

Are vouchers registered with the herbarium? Y/N ☐ Herbarium acronym for survey .....

Did herbarium provide identification? Y/N ☐

If so what key was used for main determinations .....

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What key/keys were used for problem species .....

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2.6 Date of integration of Herbarium identifications into data base .....

2.7 Herbarium identifications extrapolated through data? (extent, protocol)

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2.8 What taxonomic problems were encountered in the survey and what decisions were made regarding these? (eg. field problem in distinguishing *Eucalyptus arenacea* from *Eucalyptus baxteri* thus *E.arenacea/baxteri* was entered where no voucher material was available) (attach extra page if necessary)

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2.9 Quadrat Size (General size survey was based on) ..... (m) x ..... (m)

Smallest Sample Unit Size (if not equal to quadrat size) ..... (m) x ..... (m)

(ie. general size of smallest unit of measure - if patch size is variable (not standard) please detail method of data capture in comments below - ie. patches within quadrat varied in size and were traversed until all representative vegetation had been sampled)

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2.10 Floristic analysis Y/N ☐ Analysis Date (month) ..... (year) .....

Analysis Comments (ie. present stage of analysis - complete, partially complete)

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2.11 Vegetation Mapping Y/N ☐ Completed area mapped. Y/N ☐

Partial area mapped Y/N ☐ Mapping Scale 1: ... ...

Comments (ie. scale of aerial photographs, extent, area mapped etc.)

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Principle Vegetation Mapper .....

3.0 FAUNA DETAILS

3.1 Site Selection Methodology and Nomenclature (ie. how sites or CQP were selected and named)

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3.2 Methodology Used (eg. area of sites, number of traplines per site, bird observation times etc.)

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NOTE: for trapping effort details see Survey Data Base.

3.3 Taxonomist Details

Taxonomist 1. *(mammals)* Name ..... Title .....

Organisation (ie. South Australian Museum) .....

Taxonomist 2. *(birds)* Name ..... Title .....

Organisation .....

Taxonomist 3. *(reptiles/amphibians)* Name ..... Title .....

Organisation .....

3.4 What taxonomic problems were encountered during the survey and what decisions were made regarding these?

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3.5 Are specimens registered with the museum? Y/N ☐

3.6 Vertebrate Analysis Y/N ☐ Analysis Date (month) ..... (year) .....

Analysis Comments (ie. present stage of analysis - complete, partially complete) .....

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4.0 DATA ENTRY NOTES

4.1 Person Responsible for Header information:

Vegetation ..... Contact .....

Fauna ..... Contact .....

4.2 Person/s Responsible for Editing and Updating Data:

Vegetation ..... Contact .....

Vegetation ..... Contact .....

Fauna ..... Contact .....

Fauna ..... Contact .....

4.3 Editing and Cross Checks

Computer printout (validation reports) checked against data sheets Y/N ☐

Use of frequency reports to check inconsistencies (plant species/lifeform reports) Y/N ☐

Comments.....

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4.4 Abbreviations/Standards Used (eg. Road R = Road Reserve, DRT = Department of Road Transport etc.).

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4.5 Have individual site reports been sent to landholders (Y/N) ☐

Other comments .....

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4.6 Location of historical data and other relevant information (ie. pathname to location of planning/landholder address data, survey manual, location of floristic analysis etc.)

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4.7 Back-up tape reference number .....

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4.8 Historical use of survey data (ie. changes made to survey system since data entry, eg. comments regarding other vertebrates will be found in comments section under *DIS or *VIM)

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4.9 Other Relevant Information .....

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TABLE OF POSSIBLE BASIS FOR PROJECTS

PROJECT CODE	DESCRIPTION OF PROJECT CODE
BS	Biological Survey of South Australia
NH	Natural Hazard Protection - flood and bushfire mapping and fire behaviour assessment
CP	Coastal Protection and Management
NV	Native Vegetation Mapping and Assessment Program
RH	Reserves and Heritage Agreements
PM	Pastoral Management
CS	Conservation Significance Analysis and Mapping in Council Areas
RT	Rare and Threatened Species Protection Strategies
CM	Catchment Management

APPENDIX 7

CHECKLIST OF EQUIPMENT REQUIRED FOR THE FIELD SURVEY

(as used by GAR Unit, modify items as appropriate)

GENERAL ITEMS

Field copy of Site Allocations
Field Map Tube (with 1:50000 maps enclosed)
Mylar Map Tube (to stay at the base camp - for evening use only)
Information Kits for interested Landholders
Prompt Sheet (Phonecalls to landholders)
GPS Instruction Sheet
RAA Location Maps SA,
sets of 1:40000 Aerial Photos (available Sunday evening)
Coloured Omnichrome Pencils (for aerial photo mapping)
Data Recording Sheets (3 types - Physical, Vegetation & Voucher List)
Vehicle Warning Sign

PHYSICAL DATA COLLECTION

Plastic Ruler
Graticule for determining AMGs
Laminated set of Landform Pattern Definitions
Laminated set of Landform Element Definitions/Soil Texture Class & Field Texture Grade
Laminated set of Tracks & Traces
set of Native Animals ID Sheets
Mounted Needles for pricking photos
Bottle of HCl in beaker
Range Pole
Compass
Clinometer
Camera
Tripod
Prenumbered (ie. 1A etc) Slide Film + 1 spare film
Whiteboard
Whiteboard Marker
Whiteboard rag eraser
Preprinted site identity sheets for photoboard
Water Bottle (for Soil Texture
Laminated Set of Butterfly ID
Rock Identification Key
Medium 'Bum' bag

PLANT COLLECTION EQUIPMENT

Folder + Plastic Photo Pocket Sheets (portable field herbarium)
Laminated set of Canopy Types
Laminated set of Muirs Code & Cover/Abundance
Hand Trowel
Pair Secateurs
Plastic Bags: range of sizes
Seed No. 7 Envelopes
Sticky Voucher Labels (for Specimens - preprinted)
Plant Press
Plant Press Straps
Boxes Newspaper
Cardboard Plant Press Dividers
"Mallee in Flower" Book
Plant Keys and References
Laminated List of Species to Always be collected
Large 'bum' bag

STATIONERY

Clipboards
Lever Arch Folder for Completed Data Sheets
HB Pencils
Fastrack pencils (B)
Pencil Sharpener
Erasers
Paper Clips - Small + Large
Roll of Masking Tape
Rubber Bands
Spiral Notepad
Stapler
Box of Staples
Large Bulldog Clips
Small Bulldog Clips
Liquid Paper Pen
Highlighter Pens
Chuxes
Hole Punch
small 'Post-it' Labels

SURVIVAL KIT

Torch with working battery
First aid kit
Shovel
Toilet Paper
Rubber Mats (for getting out of bogs)
Tent Pegs For securing Rubber Mat
5 Litre Insulated Water Container with water
Insect Repellent
Suntan Lotion with Dispenser