NATIONAL MANUAL FOR

The Malleefowl Monitoring System

Natural Heritage Trust

Helping Communities Helping Australia

An Australian Government Initiative

STANDARDS, PROTOCOLS AND MONITORING PROCEDURES

INTRODUCTION AND ACKNOWLEDGEMENTS

The complexity of the task of producing a document of the magnitude of the Manual for the National Malleefowl Monitoring System has required extensive consultation, discussion, review and editing from numerous people across all states. The Victorian Malleefowl Recovery Group adopted a collaborative approach to bring about a document which has had direct input from more than 100 people and indirect input from many more than that. We have drawn upon the past experiences and practices of a multitude of volunteers and agency staff in all states. We have conducted extensive training and skills developments at many levels, and have implemented one of the key recommendations of the last National Malleefowl Forum.

A major recommendation from the 2004 National Malleefowl Forum was that a uniform method of monitoring Malleefowl be developed to ensure that data across Australia could be compared. The Victorian system was the starting point and the nucleus of a national approach. The central focus of the National Heritage Trust Project has been to develop, refine, train and teach the devolving system in Western Australia, South Australia and Victoria, and to keep New South Wales informed of the development.

Data from all states was gathered and analysed in 2006, and the understandings gleaned from this process informed a dynamic teaching and learning process which will continue long after the conclusion of this project.

A National Malleefowl handbook has been produced, significant numbers of people have been trained in using monitoring technology to be participants in a variety of essential tasks, and a consensus has been reached on the best way, at this time, to proceed.

The consensus of opinion is that, as not everyone involved in Malleefowl monitoring needs the complete manual (eg volunteers visiting mounds do not need detailed information on national or state data management), the manual does not need to be produced in printed form. It was agreed that printed manuals are far too costly and indeed inefficient in this format. Hence the manual will be produced in an electronic form, and distributed widely to those who need it. This will allow sections to be printed only when required, eg for re-searching and/or monitoring. The electronic format will allow for easy upgrades as needs or technology changes. It also allows for each state to have their own sections, eg contacts and safety regulations which vary from state to state.

Finally, in this introduction, it needs to be stressed that the manual is not a static document, but an evolving and dynamic document which will change over time, as it is used in the field, and as changes to management practices evolve in Malleefowl conservation.

It is not possible to acknowledge by name all of the people who have contributed to this end product, as they are too numerous to list. So to all those who have contributed in whatever way, we pass on our thanks and appreciation for your considered thoughts, your time and your goodwill. The positive approach to the project and the incredible enthusiasm to support and develop a national approach to Malleefowl conservation is remarkable.

In recent months a dedicated group of people from all states have contributed significantly to discussions, development of ideas and concepts and have been involved in widespread teaching and training activities as part of the project. Whilst not detracting from the contributions of others we acknowledge the contribution from the following people:
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Introduction

1.1 AIMS OF THE NATIONAL MONITORING SYSTEM

The general aims of the National Malleefowl Monitoring System are to:

- collect and collate Malleefowl monitoring data from sites across Australia for analysis
- interpret breeding density trends in the light of management practices and environmental variables
- produce and distribute an annual report on Malleefowl breeding density for all states
- develop a consistent monitoring system across Australia
- develop a national database
- foster on-going and self-sufficient monitoring that facilitates government, private and community monitoring programs
- refine the monitoring program so that future management actions that are most beneficial to Malleefowl conservation can be identified and demonstrated
- involve all stakeholders in the National Monitoring System
- provide advice to regional natural resource management bodies on how to best promote Malleefowl conservation within regions

1.2 MALLEEFOWL MONITORING BACKGROUND AND HISTORY

Malleefowl have declined substantially throughout Australia since European settlement. Within the past century the range of Malleefowl has contracted, particularly in arid areas and at the periphery of its former range. Population declines have occurred, particularly in southern agricultural areas due to the clearing of remnant mallee vegetation, resulting in on-going biodiversity losses as a result of salinity, stock grazing, wheat production and feral animal introduction. The fate of Malleefowl within the remaining habitat is uncertain and declines have been described in most areas in which trends in Malleefowl numbers have been documented. There is a growing concern that Malleefowl populations may be declining even within conservation reserves. The species is regarded as threatened across all remaining areas of their range in every state in which it occurs and is listed as Vulnerable nationally.

The Malleefowl monitoring program provides fundamental information on trends in Malleefowl abundance. This information is needed in order to assess the conservation status of the species across their range and to identify areas in which the species is declining. Perhaps even more importantly, monitoring provides a means of measuring the effects of naturally occurring and other events and the effectiveness of management actions on Malleefowl numbers.

Monitoring populations involves obtaining reliable and repeatable measures

of their numbers over time in order to measure changes in population size. As Malleefowl are shy and elusive birds, making counts of the birds themselves is very difficult. However, their mounds are conspicuous and provide a reliable means of measuring the abundance of breeding birds in an area.

In order to establish the abundance of breeding birds in an area, a monitoring site is established by thoroughly searching a chosen area for all Malleefowl mounds, both active and inactive. The location of every mound that is found in an area is accurately recorded. This helps to return to them for monitoring.

The monitoring of Malleefowl sites is the agreed method for determining Malleefowl breeding trends on a national scale. Traditionally, Malleefowl sites have been set up in areas where mounds have been known to exist, and/or where opportune sightings of birds have been recorded. Sites are located in Malleefowl habitat, which is largely found in the semi-arid to arid zone in shrubland or low woodlands dominated by mallee. Malleefowl require a sandy or loamy substrate and an abundance of leaf litter to construct their mounds. Sites are blocks of habitat, normally covering an area of 2–4km2, a size large enough to provide an estimate of breeding density, yet still small enough to be effectively monitored.

As Malleefowl tend to renovate old mounds rather than construct new mounds afresh each year each old mound is a potential site for breeding, and annually checking the known mounds each spring provides a good estimate of the trends in breeding numbers at each site. Nonetheless, new mounds are occasionally built by the birds and a thorough re-search of monitoring sites is required every few years to capture these to ensure accurate estimation of breeding numbers.

The primary aim of the Malleefowl monitoring program is to track changes in the number of birds inhabiting specific areas. Observers (mostly volunteers) examine and categorise all the known mounds at each site as either ‘active – currently used as an incubator’ or ‘not active’. To enable vetting of records and the detection of errors in judging the activity of the mound, the size, shape and appearance of mounds is also described each time a mound is visited. These descriptors have been defined (Benshemesh 1996), and are included in this document. The resulting protocols have been used in both Victoria and South Australia from the early 1990s and in Western Australia since 2004.

No substantive changes have been made to the Malleefowl monitoring protocols since the early 1990s. This conservatism was necessary to enable comparisons through time, although some new fields have been added and others have been more rigorously defined to reduce confusion.

As the usefulness of the data has never been assessed, some data collected every year may be unnecessary and provide little useful information. Also, new technologies over the past decade have changed the way data may be validated, have provided greater efficiency in data collection, and have reduced the need for some types of descriptive data. GPS, digital photography and digital data capture using Palm handheld computers and Cybertracker software have all been introduced to the monitoring program since 2001.

These recent changes, and the development of a unified national Malleefowl monitoring approach, have provided an opportunity to review the usefulness of monitoring data and consider improvements. Therefore the existing protocols and other associated protocols have been rigorously reviewed, through extensive consultation and scientific analysis, and all outcomes have been included in this document.

1.3 ABOUT THE MANUAL

The National Manual for the Malleefowl Monitoring System – Standards, Protocols and Monitoring Procedures is set out in eight inter-related sections (with two Appendices) to provide direction and support to the national monitoring of Malleefowl.

Section 1	Introduction
Section 2	Guidelines and Protocols
Section 3	Monitoring Procedures and Processes
Section 4	Monitoring Equipment Guidelines
Section 5	Database
Section 6	Surveys and Questionnaires
Section 7	Additional On-ground Data Collection
Section 8	Specific State by State Details
Appendix 1	Establishing and re-searching Malleefowl monitoring sites
Appendix 2	What to do with lerp

It is anticipated that all groups involved in Malleefowl conservation on public and private land will access and follow the guidelines and procedures outlined in the manual.

1.4 GUIDELINES AND PROTOCOLS

This section outlines monitoring guidelines and protocols to cover a range of operations to be considered when National Malleefowl Monitoring Program decisions are made. Details relating to monitoring sites and the processes to be used during monitoring visits are described in detail. Minimum data sets and procedures relating to adding and removing mounds from sites and processes to deal with mounds outside of designated sites are explained. The procedures for establishing new sites and re-searching existing sites, as well as monitoring in arid lands and surveying by air, are documented. The final component of this section provides an outline of programs essential for the training of volunteers who wish to undertake Malleefowl monitoring.

1.5 MONITORING PROCEDURES

The essential components of Malleefowl monitoring procedures are defined and explained in this section. All aspects of conducting and completing the Malleefowl monitoring sequence are detailed. The processes of recording data on Palm handheld computers and on paper sheets as a backup are explained, in written and diagrammatic form.

1.6 MONITORING EQUIPMENT GUIDELINES

The operations of the Palm handheld computer, the GPS and the digital camera are set out in detail and a section on trouble-shooting to address common operational problems are included to assist volunteers in the field if problems arise during the monitoring field trip.

1.7 DATABASE

The National Database is a developing project and details are not yet available for this manual at the time of publication. An outline of the scope and general operation of the database is included, but specific details of access, operation, ownership and security are still to be developed. Basic information and potential uses are listed, but not developed in this section.

1.8 SURVEYS AND QUESTIONNAIRES

The potential to access information and related data to support the Malleefowl monitoring program exists through the distribution of surveys and questionnaires to monitors and local people living close to Malleefowl habitat. Samples of surveys and questionnaires for monitors, landholders and local residents are included in Section 6.

1.9 ADDITIONAL ON-GROUND DATA COLLECTION

The manual in its current development concentrates on monitoring within sites at Malleefowl mounds. The scope to develop additional on-ground data collection is extensive, and potential areas of future investigation are listed in this section. As these areas are developed into concrete proposals in the future they will be added to this section. Guidelines will be added as they evolve.

1.10 SPECIFIC STATE BY STATE DETAILS

The final section of the manual provides some guidelines and examples for states to develop their own specific guidelines in relation to safety, support networks and state, regional and local contacts. It is anticipated that each state will have separate details for Section 8. However, where these guidelines and networks and contacts have national significance the details have been included in the National manual.

SECTION TWO

Monitoring Guidelines and Protocols

2.1 MONITORING EXISTING SITES IN ALL STATES

- All states need to determine which sites within each state are to be included in the national monitoring program.
- When considering whether existing sites ought to be included in the national monitoring program, past history of monitoring and the presence of numbers of mounds and Malleefowl need to be taken into account, but it is anticipated very few, if any, existing sites would be withdrawn.
- Once a site has been identified as part of the national system, it should be labelled with an identifying number (eg V01, S01, W01, and N01), and that identifying number should never alter unless exceptional circumstances arise (eg inadvertent doubling up of numbers).
- Once a site has been included in the national monitoring program, it should remain in the program permanently.
- Once a site has been included in the national system, it should be monitored in accordance with the details in this manual for consistency and comparability.
- Each site within the national monitoring program should be monitored annually, except where exceptional circumstances apply.
- Each site within the national monitoring program should be re-searched at least every five to ten years.
- New sites may be added to the monitoring program provided they have been established according to the protocol for new sites outlined in this manual.

2.2 SITE AND MOUND MONITORING

- All known mounds in a monitoring site will be placed on a monitoring list, and all mounds on the list should be visited every year.

- Prior to visiting the site monitors need to have received appropriate training and considered all aspects of personal safety and safety issues relevant to the site.

- Monitoring should occur in the months of October, November, December or early January.

- Monitoring should, as a general rule, not occur immediately following rainfall when prints are less obvious or completely washed away following rainfall. If possible delay monitoring for a few days.

- Different routes through the site should be selected each year to maximise chances of finding additional mounds not previously monitored.

2.3 TYPES OF MONITORING SEQUENCES

Two monitoring sequences will apply to mounds within sites.

- Full Monitoring Sequence – the full monitoring sequence will be used for mounds that are discovered opportunely or as a result of re-searching a site.
- Routine Monitoring Sequence – a shorter routine monitoring sequence will be used for mounds once they have been described using the full monitoring sequence.

Every fifth year all mounds will be monitored using the full monitoring sequence.

2.4 MINIMUM DATA SETS AT LONG UNUSED (EXTINCT) MOUNDS

- The process of determining whether long unused (extinct) mounds should be monitored annually is based on a mound being assessed against a set of scientific criteria. A long unused (extinct) mound will generally have a rim height of less than ten centimetres, and have no obvious signs of malleefowl visitation. Only mounds assessed to be long unused (extinct) by the database manager will not be monitored.

- To determine whether such a mound should continue to be monitored, a recommendation to have a mound assessed should be noted during the monitoring process.

- The database manager, using a set of scientific criteria, will determine whether to remove the mound from the monitoring list for that site. The mound will not be removed from the database.

- If a mound meets the scientific criteria, it will not be monitored for the next four years. The mound will be returned to the monitoring list in the fifth year after its removal for monitoring in that year.

- Monitors will monitor the mound in the usual way, and may again suggest that the mound be assessed against the scientific criteria to have the mound removed from the monitoring list for that site. If no recommendation is made, the mound would continue to be monitored annually.

- Long unused (extinct) mounds will be clearly designated in the database, and only those designated will be monitored every fifth year.

- Monitors may not decide in the field to determine a mound to be long unused (extinct) unless it is listed as such on the data sheets.

- Mounds found by chance during monitoring, even if deemed to be long unused (extinct) mounds, must be monitored using the full monitoring sequence. A recommendation for assessment may be made in the notes when the mounds are first monitored.

2.5 REMOVING MOUNDS FROM DATABASE

- The circumstances under which mounds may be removed from the database are restricted to:
  - mounds that are deemed not to be Malleefowl mounds
  - mounds that could not be found despite several years of attempts to locate the mound

2.6 ADDING MOUNDS TO THE MONITORING LIST FOR A SITE

- Mounds may be added to the monitoring list for a site as a result of finds during a re-search activity or by opportune finds during the monitoring of a site.

- Mounds found during re-searching will be added to the monitoring list for a site following the re-search, and will require full detailed monitoring. These mounds will need to be verified as Malleefowl mounds during the next season's monitoring by experienced monitors. Monitors may recommend, as part of the monitoring process in the notes section, that these mounds be assessed to be included in the category of long unused (extinct) mounds.

- Mounds found opportunistically will be monitored fully, using all categories from the none-some-lots table and full measurement details. Monitors may recommend in the notes section that these mounds be assessed to be included in the category of long unused (extinct) mounds.

2.7 MOUNDS OUTSIDE SITE BOUNDARIES

- Mounds that are outside the formal monitoring sites should be monitored in the same way as all mounds within existing sites.

- The details of these mounds will be stored in the national database for future reference if the mounds are monitored using the Cybertracker sequence.

- If mounds are not monitored using Cybertracker, the processes of storing records and keeping track of these mounds would be determined by each state.

- Generally these mounds will not be reported in the annual national report as they are outside the specified National Monitoring sites, but may be referred to in State reports.

2.8 SETTING UP NEW SITES (ALSO SEE APPENDIX 1)

- The basic consideration in determining whether a new site should be established is whether the area under consideration is under-represented in relation to existing sites in the surrounding area.

- Under-representation can arise:
  - if a locality has no monitoring site
  - if particular patches have special features not present in other sites
  - if particular climate conditions exist which are different to other sites
  - if particular management practices may benefit from increased knowledge of Malleefowl presence and breeding patterns

- Prior to determining whether to establish a new site, the following factors also need to be considered:
  - are Malleefowl likely to be present in the proposed site?
  - is the proposed site accessible for ease of monitoring?
  - does the proposed site fill a gap in relation to existing sites?
  - is there a sustainable commitment to monitor the site annually?
  - is there a sustainable commitment to have trained monitors available to monitor the site?
  - is there a sustainable commitment to re-search the site every five to ten years?

- The factors listed above are guidelines, and do not prohibit a monitoring site being established outside of the guidelines.

- In some circumstances establishing a site may be warranted for other reasons, such as local interest. However, the commitment to annual monitoring by trained volunteers and re-searching should apply.

- When all factors are considered, and it is agreed that a site should be established, the boundaries of the new site need to be firmly established prior to a search being undertaken, and a systematic search needs to be conducted to locate all Malleefowl mounds within the boundary of the site.

- When the new site has been searched, it should be given a site number, and mound numbers should be allocated to each of the known mounds within the site.

- On a subsequent visit all mounds should be staked and tagged with the appropriate site number and mound number (eg S 52 – 12 means South Australian site 52 and mound 12). Stakes should be placed approximately 3–5m due north of the mound.

- In some cases a site that is searched may not become an annual monitoring site. Such a site would have a site number and mound numbers but it might only be monitored periodically for specific purposes. Data would be entered on the database when monitoring occurred.

- In all circumstances, new sites must be monitored by suitably trained people.

2.9 RE-SEARCHING SITES (ALSO SEE APPENDIX 1)

2.9.1 THE BASIC IDEA

Malleefowl mounds are conspicuous and are the best indication of the birds' presence in an area. How the number of active (i.e. presently used) mounds in an area changes in time provides us with a sensitive indicator of the trends in the population. This information is obtained by thoroughly searching the chosen area for all Malleefowl mounds, both active and inactive.
We accurately describe the location of every mound that is found in an area to enable us to return to them and check whether they are being used.

As Malleefowl tend to renovate old mounds rather than construct new mounds afresh each year, each old mound is a potential site for an active mound, and annually checking the known mounds each spring provides a good estimate of the trends in breeding density.

2.9.2 WHY RE-SEARCHING MONITORING SITES IS IMPORTANT

Malleefowl occasionally choose to build new mounds rather than renovate an old mound, and so it is important to search the monitoring sites every few years to record these. Previous practice has been to re-search sites every five years. However it is now considered that a re-search should be initiated between five to ten years unless unusual circumstances are noted. Sites that have significant variation in numbers of breeding mounds over a few years, either positive or negative, and sites recovering from fire where Malleefowl are moving back into the area may need to be re-searched more regularly. Mounds that are found during these repeat searches are added to the list of mounds to be checked annually.

2.9.3 PERSON-POWER REQUIREMENTS

An ideal number for a site survey is approximately 12 people providing a 200m search width. Progress is usually about 1km/hr, though faster in open country.

The improved accuracy and ready availability of GPS units has made it much easier to navigate through the mallee scrub and revisit mounds. GPS units are also useful during a search of a site and help to maintain an even spread of people.

2.9.4 POINTS FOR THOSE INVOLVED IN RE-SEARCHING MONITORING SITES

It is important to remind people involved in a site survey that the objective of the exercise is to achieve complete coverage of the area searched.

Take responsibility for the area between yourself and your neighbours on either side. Use each neighbour as a marker of your search patch and be sure that you detect every mound that is between yourself and 2/3 the way to each neighbour. Slow down whenever necessary for complete coverage of the area.

Use your eyes! Mounds are frequently missed by people paying more attention to their GPS than the task at hand. The GPS course is a tool to achieve a thorough search, it's not the objective.

Keep track of your neighbours and slow them down if they are too fast. Do not tolerate gaps in the search line and stop the search and reorganise if gaps do appear. Be vocal to keep track of your neighbours in thick scrub.

Try to keep the line of people roughly even (this will minimise the distance between individuals and make the search easier and faster). To this end, it's useful to use handheld radios to ensure that each end of the search line is roughly the same distance through the search.

If you don't have a GPS, let those with GPS units be a few paces in front of you where you can see them more easily.

It is okay to deviate from the GPS course provided that the area between you and your neighbours is thoroughly searched. Eg should the person on one side encounter thick scrub, you can move towards them a little if your other side is more open and well covered. But move back into position as soon as you can.

Note that active mounds are often the least obvious until actually looked at.

2.9.5 WHAT TO RECORD

Each mound in the established sites has been given a unique number code composed of the site number, followed by a nest number identifying it within the site. Most mounds are permanently marked by a metal tag attached to a metal stake (galvanised fence-wire spacer) **placed about 5m due north of the mound centre.**

The following directions describe essential information for adding new mounds to our monitoring lists, and for evaluating the thoroughness of the search.

If the mound **does not** have a stake/tag:

- record its location
- tie flagging tape above or near the mound

Later when visiting this mound the tape will confirm that this is the correct location. This is especially important for very old or inconspicuous mounds.

If the mound **does** have a stake/tag:

- record the mound number and whether the mound or the stake/tag was seen first.

Of course, other interesting information can be record too, such as the shape of the mound, the occurrence of litter trails, and other signs that may indicate whether the mound is being prepared for breeding. These notes are of great interest but are optional. Trained monitoring personnel will visit all of the mounds that are recorded later in the year.

2.9.6 SAFETY

The safety of individuals involved in a site survey is a paramount concern of the person supervising the survey in the field, and the first concern should be not to lose anybody. It is prudent to occasionally check that no one has become separated from the group. Providing each person with a number is a good idea, as the group can be routinely asked to 'number off' whenever convenient. Missing people are quickly revealed by this method.

2.10 MONITORING BY AERIAL SURVEYING

2.10.1 AERIAL TRANSECTS

The density of active mounds (nests) estimated from aerial surveys in late spring is used as a measure of adult Malleefowl populations at most sites. At each of these sites, Malleefowl habitat has been partitioned into a set of equally-sized transects nominally10km X 100m. One hundred transects are selected at random for each site in each year giving a total area of 10,000ha/site. A helicopter with two observers and one person responsible for navigation and data entry is flown along each transect at approximately 80km/hr and 60m altitude. Flight time is generally scheduled between 0900hrs and 1600hrs to decrease the negative effects that shadows have in observing mounds. When a mound is sighted, the helicopter hovers overhead to allow the status of the mound to be determined by the observers. The navigator records the position and mound status on a laptop computer. Mounds are described as either **active, leaf litter present or inactive**.

Active mounds are defined as those mounds which appear to exhibit characteristics associated with normal nesting activity - i.e. nest mounded up, litter trails leading to mound, extensive soil and litter disturbance, and/or birds seen actively digging.

Leaf litter present is used to describe a mound that has been opened up and contains leaf litter but where nesting activity appears to have not taken place.

The term **inactive** is used to describe mounds where it appears no activity has taken place.

The density of active mounds is calculated as the number of active mounds observed per unit area. Surveys are conducted between late October and late November each year.

2.10.2 MOUND TO MOUND SURVEY

A second measure of adult Malleefowl populations is calculated at some sites by determining the proportion of mounds active from a fixed set of existing mounds (this is generally referred to as mound to mound surveys). Approximately 100-150 existing mounds have been identified and mapped at each site. These mounds are permanently marked with white aviation runway marker cones, which facilitate observation from the air. These mounds are observed from a helicopter between late October and late November each year and their status determined as above.

The proportion of pre-mapped mounds which are active requires much less aerial survey time and is thus much cheaper. Furthermore, this measure has been used for much longer at some sites allowing longer-term trends to be investigated. However, this measure includes the additional assumption that activity of a fixed set of mounds will be correlated with the number of active mounds across an entire site. Thus, for example, recruitment into the population will be reflected by a greater number of the existing mounds being active. This assumption will be tested at sites where the two methods are being employed simultaneously.

2.11 MONITORING IN ARID REGIONS

2.11.1 MONITORING IN AREAS WHERE MALLEEFOWL ARE SCARCE AND HIGHLY DISPERSED.

Where Malleefowl are very scarce across vast landscapes, standard area-based techniques of monitoring breeding numbers in relatively small and bounded areas are ineffective. In such situations, other techniques are required to monitor the abundance of Malleefowl. Two methods that are commonly used in arid regions of NSW, SA and WA are mound-based monitoring in which a number of known mounds scattered over a large area is routinely checked by helicopter for signs of breeding, and site-based monitoring in which the occurrence of Malleefowl at sites is routinely checked by searching for footprints and other signs.

2.11.2 AERIAL MOUND BASED MONITORING IN ARID REGIONS

In south west NSW, helicopters are routinely used to assess the breeding status of several hundred known mounds that are marked for identification from the air. Many scattered mounds can be inspected over a short period of time using a helicopter, although the technique is expensive and is neither widely available nor suitable for volunteers. These techniques are described elsewhere (2.10.1 and 2.10.2) in the Monitoring Manual. Basic standards are outlined below:

Standards

- Experienced personnel are used to assess the breeding status of mounds from the air.
- Every mound that is included in the monitoring is checked every year, or at least every time the monitoring is conducted.
- Where there is any doubt about whether a mound is being used as an incubator, the mound should subsequently be checked on the ground for confirmation. On the ground, standard mound descriptions will be used and the mound will be photographed for reference.
- If less experienced people are used as observers, it would be desirable to photograph mounds from the air for reference and for verification.

2.11.3 SITE BASED MONITORING IN ARID REGIONS/MONITORING MALLEEFOWL BY TRACKING IN ARID AREAS

The most meaningful method of monitoring Malleefowl abundance in many remote arid areas is to measure the persistence of the birds at specific locations rather than attempt to measure the number of breeding attempts. This is an advantage in arid regions for two reasons. Firstly, the birds tend to be sedentary and occur in the same general locations from year to year, but they may breed only occasionally due to low and unpredictable rainfall. Thus, measures based primarily on breeding numbers are likely to be more variable than those based on tracking. Secondly, it is generally harder to find mounds in the vast expanses of the arid habitat than it is to find Malleefowl footprints.

The following procedure and standards is recommended where conditions are suitable for tracking (i.e. open sandy areas) and where an on-ground monitoring is feasible. These methods require some training, but are suitable for land managers, Aboriginal traditional owners, and volunteers. Little equipment is required apart from a suitable vehicle for transport, a GPS, and preferably a handheld computer Cybertracker application to collect the monitoring data.

Standards

- Every site should be checked for prints and other signs of Malleefowl each year. It is the routine aspect of monitoring that enables trends to be measured.
- Sites will commonly be centred on mounds, but may also be centred on locations at which Malleefowl signs have been recorded.
- The primary objective is to determine whether Malleefowl still occur in the area. Mounds provide an excellent focus to check the occurrence of Malleefowl because the birds frequently visit old mounds and their tracks are often evident on mounds.
- Tracking requires several days of dry weather without strong winds that may remove prints. Data can be collected anytime and need not be restricted to the breeding season (although this is desirable, it is not essential)
- If prints <u>are</u> found on or near the mound, this should be recorded and the tracks and mound should be photographed. The shape and condition of the mound and date, time and GPS location should also be recorded. Any evidence of pairs of Malleefowl, as opposed to single birds, should be recorded. Malleefowl often wander around in pairs, indicated by two sets of footprints travelling in the same direction usually within 30m of each other. Paired prints are most common outside the egg incubation season (September to March).
- If prints or other recent signs are <u>not</u> found on or near the mound, a thorough local search for tracks in the vicinity of the mound should be undertaken.

- If tracks are not recorded in the vicinity of the mound, a larger walk around the site is recommended. Ideally, a radius of 500m from the mound would be searched. The easiest way to achieve this in the field is to use a GPS to navigate a square transect of 1 km sides around the mound or point of interest. The path searched for prints, date and time should be recorded, and a photograph and GPS location of every Malleefowl print encountered on the path should be recorded.
- Regardless of whether recent signs are found at mounds, the mound itself should be photographed and the shape and condition of the mound should be described along with the date, time and GPS location.
- The secondary objective is to assess whether Malleefowl are breeding or preparing to breed in the area. This data should be assessed and recorded for every mound visited.
- Where numerous Malleefowl prints are recorded over several months or years, it is likely that Malleefowl are resident and breed in suitable years. Active mounds and mounds that are being prepared for breeding are most easily found by following Malleefowl prints (tracking), especially where paired prints of birds are recorded in an area and where there is a high density of prints. Straight tracks more often lead to mounds than convoluted paths. If a path does not lead to a mound, following it in the opposite direction may be more successful.
- The collection of data using Cybertracker is recommended to simplify data collection and management.
- Centralising monitoring data from different areas in arid regions is recommended to facilitate data management and reporting. This is especially important because numerous people and agencies may be involved in the monitoring, and because trends across regions will be most reliably estimated when data are pooled.
- Samples of Malleefowl feathers are valuable as a source of genetic material. The shaft of the feather near its base is most useful and should not be directly handled to avoid DNA contamination. Samples should be air dried and stored with date and location.

2.12 LERP (ALSO SEE APPENDIX 2)

Lerp is a white waxy material produced by tiny sap-sucking scale insects called Psyllids. As lerp is an important food source for Malleefowl, and outbreaks of lerp occur occasionally, from time to time random surveys for lerp will be conducted.

The lerp surveys are conducted by generating random quadrat points (approximately 30) along a 1.5km transect within a site. The decision on where to position each quadrat point is generated at random for the sole purpose of preventing the lerp surveyor from consciously or subconsciously choosing where to count. The count is designed to arrive at an average and representative estimate of the numbers of lerp present at the time of the survey.

Lerp is counted by prescribing a one metre circle at random stopping points and counting all lerp that can be seen on the ground in the radius of the circle without scratching around. The first five lerp counted in each quadrat are collected for further analysis. The percentage cover value for sand, light litter, deep litter and triodia are also recorded for each quadrat.

Full details for conducting lerp surveys are included in Appendix 2.

2.13 TRAINING VOLUNTEERS

- An annual training program for all volunteers should be conducted.

- The training program may vary from state to state, or region to region, but it ought to cover the following sections:
  - the aims of the monitoring program
  - monitoring equipment and it uses
  - safety procedures
  - introduction to the GPS and Palm
  - navigation using GPS
  - introduction to the monitoring manual
  - site maps and location of sites
  - how to find Malleefowl mounds in the site
  - protocols at mounds
  - data recording on palms
  - observation techniques
  - scat collection
  - photographing mounds using digital camera
  - system of collecting and returning monitoring equipment
  - data management

- The training program should also include training in the field with visits to some mounds for practice data observation and data entry.

- As a general rule, no one should monitor without participating in an annual training program.

- As a general rule, it is preferable that new monitors should go into the field with experienced monitors for the first monitoring time.

- An example of the training program used by the VMRG is published in 'Around the Mounds' Vol 6, No 1, 2005.

2.14 ANNUAL MONITORING CYCLE

Training weekend – the training weekend is the most crucial element of the monitoring cycle as it is where skills are revised, and experiences are shared, to ensure that scientifically accurate and efficient monitoring occurs.

Equipment distribution – monitors need specific electronic equipment for monitoring sites, but there is a limit to the number of Palms, GPS's and digital cameras available to monitors. A distribution system is needed to ensure monitors have the equipment when they need it.

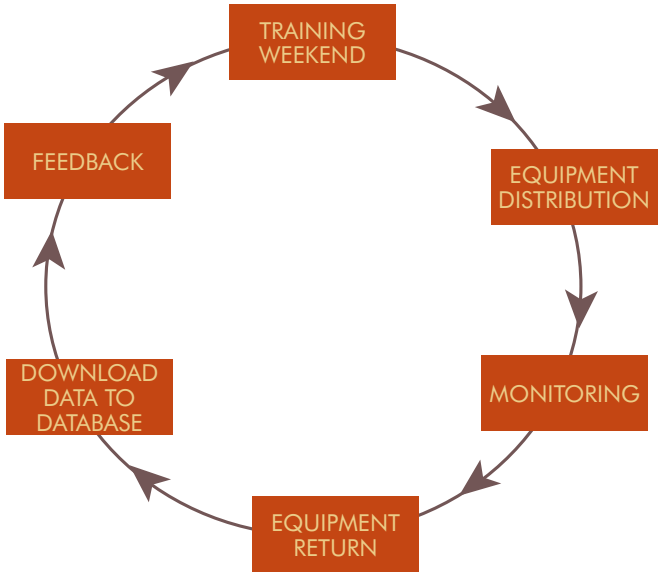
Monitoring – monitors visit assigned sites during the breeding period (October to January); locate all of the mounds and record required data at each mound using the Palm, camera and GPS.

Equipment return – once monitoring is completed, it is necessary to return equipment promptly to assist with the turn-around of equipment to other monitors. Initially the data collected needs to be transferred from the Palm to a home computer that contains the Cybertracker spreadsheet, using a cradle interface.

Data download – the data downloaded to a home computer is then transferred to the central Malleefowl database in a simple process of exporting the file by email to the central location.

Feedback – the final process in the monitoring cycle is the mutual sharing of information amongst monitors and the data analysts. This feedback is both formal through a published Annual Report and anecdotal through surveys and meetings, where everybody's opinions and observations are valued. This feedback is used to help set the agenda for the next training weekend.

DIAGRAMMATIC REPRESENTATION OF MONITORING CYCLE



SECTION THREE

Monitoring Procedures and Processes

3.1 MONITORING PROCEDURES – DEFINITIONS

INTRODUCTION

Monitoring Malleefowl mounds in sites is the process of inspecting and describing mounds on a regular basis. Monitoring provides important data on changes that may be occurring in the population.
Ideally, every mound in each site is visited annually during the breeding season and described according to a standard data set. The data set is contained in a monitoring sequence on a Palm.

The following section assumes monitors have received monitoring training, have received a Palm and other information and are involved in the monitoring effort.

The definitions and processes are set out in the manual in the following way:

- definitions are listed initially
- definitions are followed by examples of the Palm monitoring sequence together with diagrams where appropriate
- the Palm monitoring sequence is followed by examples of paper recording sheets and an explanation of how to complete the Palm sequence

DEFINITIONS

3.1.1 SITE REFERENCE

Two categories describe the position of the area to be monitored.

Site – each monitoring site has a distinct and unique site number to indicate the state and the number of the site
Mound – each mound within a site has a distinct and unique number to indicate the mound within the site

3.1.2 LOCATION OF MOUNDS

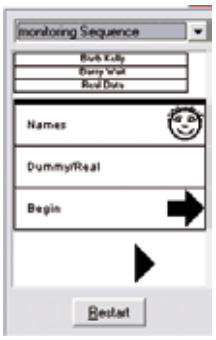
All known mounds within a site have a GPS reading recorded in WGS84 datum, and all known mounds are plotted on a map. The GPS reading refers specifically to a mound and is given the distinct and unique number of that site and mound.

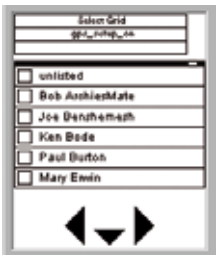
3.1.3 INITIAL ACTIONS

The following categories identify the date when the monitoring is occurring and the person monitoring, and describes the initial actions and observations of the monitor.

DATE

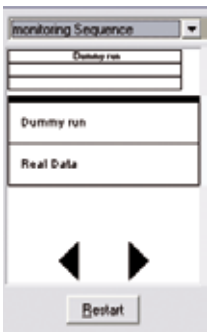
The date is automatically recorded on the Palm when the monitor logs on to the monitoring sequence.





NAMES OF MONITORS

A list of known monitors for each State is listed on the Palm. Monitors should select their name. If the name is not on the list, select 'unlisted' and make a note of the recorders name.



DUMMY RUN/REAL DATA

Once the names of the monitors have been selected, it is possible to run through the complete monitoring sequence by entering imagined data – Dummy Run. This data will then be recognised by the database as practice runs. When the sequence is being used for data at actual mounds, the real data line needs to be highlighted, and the next screen will indicate that you should begin to enter data.

SITE

The distinct State and site number is entered as the next step in the sequence.

NEST MONITORING
Once the site has been chosen, there are a number of data collection options for this site.

- nest monitoring
- sightings
- acacias – vegetation analysis

By choosing one of these a series of screens will appear in sequence requiring particular data entries. The sequence explained in this manual is for monitoring Malleefowl mounds.

MOUND
The distinct State and mound number is entered as the next step in the sequence.

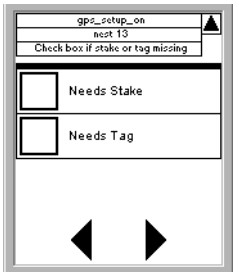
Sought and found
When a mound is sought and found, monitors select the category 'known mound revisited'.

Sought and not found
When a mound is sought but is not able to be located, monitors select the category 'mound sought and not found'.

New mound
When a previously undiscovered mound is found, monitors select 'new mound to database'.

Not sought
If a mound is not sought by deliberate action, monitors select 'not sought' and record a note describing the circumstances.

Staked
Monitors record whether or not the mound was marked with a permanent identification stake. These are galvanised wire spacers - 'droppers' - and usually are stamped with the code numbers for the grid and mound.

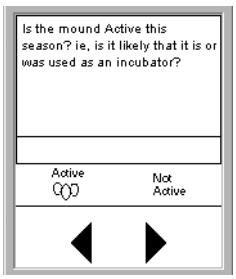


Tagged
Monitors record whether or not a permanent tag was attached to the stake showing the site and mound codes. If the tag has corroded and requires replacement highlight on the screen and the tag will be replaced.

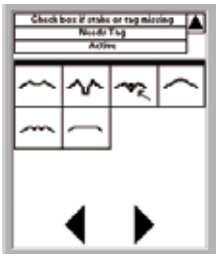
3.1.4 SIGNS

These categories describe signs of Malleefowl activity and the activity of other animals. There are seven types of signs that are recorded in the monitoring sequence.

ACTIVE
Monitors need to record whether or not the mound was considered to be active when visited. Active mounds are those that are currently being used by Malleefowl as an incubator for their eggs, and are likely to contain eggs. This is the most important category on the datasheet, and must not be confused with mounds where Malleefowl activity, eg litter trails, prints, scrapes are obvious.



Do not record a mound as active when only such Malleefowl activity is present. Only record a mound as active where obvious signs of incubation are present.



PROFILE (photos following page)
Monitors need to select the most appropriate type of profile that best describes the mound.

The likely profiles of Malleefowl mounds are numerically coded and appear as a sketch on a screen in the monitoring sequence.

1. Typical crater with raised rims
   – this is the typical shape of an inactive (dormant) mound. However, the mound may also be active and open.

2. Mound fully dug out
   – the characteristic of this profile is that the crater slopes down steeply, and at the base the sides drop vertically to form a box-like structure with sides usually 20-30cm deep. Often litter will have been raked into windrows, and may have started to enter the mound.

3. Mound with litter
   – this is the next stage after Profile 2. Litter will have been raked into the mound by Malleefowl, and thick layers of litter are evident on the surface. There may or may not be sand mixed with the litter at this stage.

4. Mound mounded up (no crater)
   – this is the typical profile of an active but unopened Malleefowl mound.

5. Mound that has a sandy crater with peak in centre
   – this is a typical profile of an active mound which is in the process of being closed by Malleefowl.

6. Mound low and flat without peak or crater
   – this is a typical profile of a very long unused (extinct) mound, or a deliberately flattened mound late in a breeding season to capture heat from the sun.

Profile 1 Mound

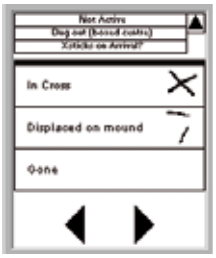
Profile 2 Mound

Profile 3 Mound

Profile 4 Mound

Profile 5 Mound

Profile 6 Mound



XSTICKS (CROSSED-STICKS) ON ARRIVAL

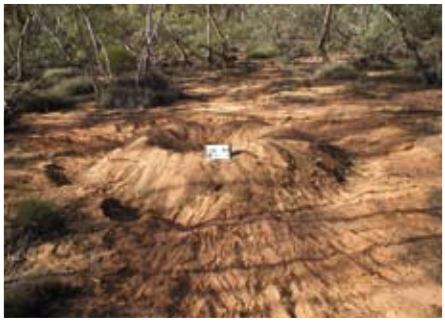
Two or three Xsticks (about 50cm long X 2cm wide) are routinely placed in a cross at the centre of inspected mounds on departure from each mound. Monitors need to decide on the status of the Xsticks from the previous year when the mound is inspected.

- If the Xsticks are present when a mound is inspected, the mound has obviously not been disturbed since it was last visited in the previous year.
- Xsticks may be disturbed, but still be present on the mound.
- Xsticks may be gone from the mound.

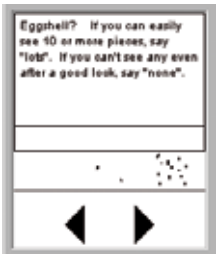
SCRAPED

Monitors need to record whether or not the surface of the mound has recently been disturbed. The critical test for this category is to disturb a small area of sand on the rim of the mound and to compare this with neighbouring undisturbed areas of sand.

- If the surface you disturbed is not visibly distinct the mound is regarded as scraped.
- If the surface you disturbed is distinct the mound is regarded as not scraped, and has probably not been worked by Malleefowl for at least a day or so (or it is very windy or wet from recent rain).



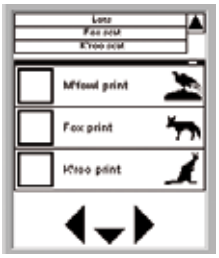
EGGSHELL



Monitors need to record how much eggshell is present on the mound. Three categories are possible:

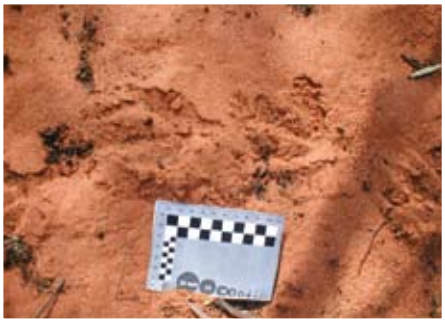
- none
- some – where one or a few fragments are visible
- lots – where more than 10 fragments are clearly visible and conspicuous

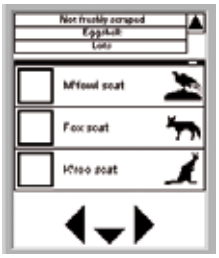
PRINTS



Prints of animals are recorded in many categories, especially for Malleefowl, fox and kangaroo. Other animals are listed on additional screens on the palm. Of all of these prints whether or not Malleefowl prints appear on the mound is the most important, and fox prints are the next in importance.

- **Malleefowl** – monitors need to decide whether or not Malleefowl footprints are evident on the surface of the mound. Malleefowl prints are usually 10-12cm in length and are more symmetrical than other birds.
- **Fox** – monitors need to decide whether or not fox footprints are evident on the surface of the mound.
- **Kangaroo** – monitors need to decide whether or not kangaroo footprints are evident on the surface of the mound.
- **Other** – monitors need to record any footprints other than Malleefowl, fox or kangaroo that are evident on the surface of the mound. Both native and introduced species are usually noted (dog, cat, rabbits, goats, human, sheep, etc). A list of possible options is found by selecting the down arrow on this screen.





SCATS

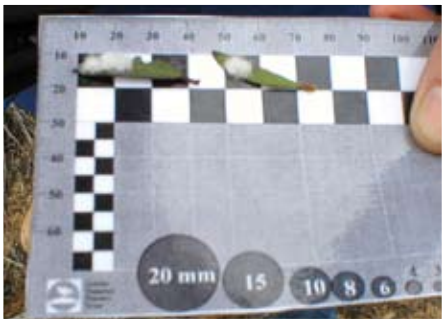
Scats of animals are recorded in many categories, especially for Malleefowl, fox, kangaroo. Other animals are listed on additional screens on the palm. Whether or not Malleefowl scats appear on the mound is the most important and fox scats are the next in importance.

- **Malleefowl** – monitors need to decide whether or not Malleefowl scats are evident on the surface of the mound. Where Malleefowl scats are collected for future analysis they are placed in a plastic bag and labelled with date, site and mound details. If required, Malleefowl feathers are also collected in an envelope and labelled with date, site and mound details. Scats and feathers are collected for DNA studies.
- **Fox** – monitors need to decide whether or not fox scats are evident on the surface of the mound. Fox scats provide an index of the abundance of this predator within the general area. It is important to thoroughly scan the nest surface for fox scats and remove all of them from the mound. However, do not handle the scat itself. If fox scats are required for further analysis collect them in a plastic bag and include a label with date, site and mound details in the plastic bag.
- **Kangaroo** – monitors need to decide whether or not kangaroo scats are evident on the surface of the mound.
- **Other** – monitors need to record any scat other than Malleefowl or fox that are evident on the surface of the mound. Both native and introduced species are usually noted (dog, cat, rabbits, goats, human, sheep, etc). A list of possible options is found by selecting the down arrow on this screen.

LERP

Monitors need to count any lerp that are evident on the mound.

- If none can be seen record 'none'.
- If a few, but less than 10 can be seen record 'some'.
- If 10 or more can be seen record 'lots'.



3.1.5 'NONE-SOME-LOTS' TABLE – FOR OUTER AND INNER RIM OF THE MOUND

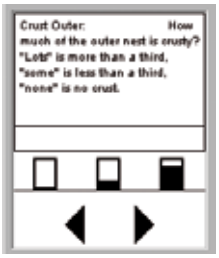
The 'none some lots' table is used in two distinct ways, either the Full Monitoring Sequence or the Routine Monitoring sequence.

The Full Monitoring Sequence table is outlined and defined in this section. All new mounds yet to be included on the database are monitored using the full sequence when monitored for the first time. All mounds already on the database are monitored using the full set of criteria only every five years.

The Routine Monitoring Sequence is the more common sequence, used for all mounds currently on the monitoring list. This sequence records a partial list of the none-some-lots table every other year but the fifth year. The partial list includes the inner crust, the inner herbs and the inner scraped categories.

This table provides a fast way of describing the mound surface features. Ten categories describe the surface of the mound:

- five features are described - crust, moss/lichen, herbs, shrubs and trees. The abundance of these is estimated for the inner and outer zones of the mound
- the inner zone is the crater
- the outer zone extends from the top of the rim to the perimeter of the mound
- the required input is explained below for each of the categories



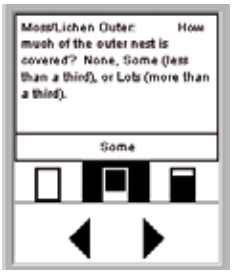
CRUST OUT

Monitors need to assess how much of the outer surface of the mound is crusty. Crust forms over the mound surface if the mound is undisturbed for a long time and after rain. The critical test is to lift a bit of sand from underneath and see if it has a well defined crust. However, whether or not a mound surface is crusty is usually obvious without this test.

- If no crust is present record 'none'.
- If there is a well defined crust over less than one third of the outer mound surface record 'some'.
- If there is a heavy crust over more than one third of the outer mound surface record 'lots'.

CRUST IN

- Monitors need to assess how much of the inner surface of the mound is crusty. Crust forms over the mound surface if the mound is undisturbed for a long time and after rain. The critical test is to lift a bit of sand from underneath and see if it has a well defined crust. However, whether or not a mound surface is crusty is usually obvious without this test.
- If no crust is present record 'none'.
- If there is a well defined crust over less than one third of the inner mound surface record 'some'.
- If there is a heavy crust over more than one third of the inner mound surface record 'lots'.



MOSS OUT

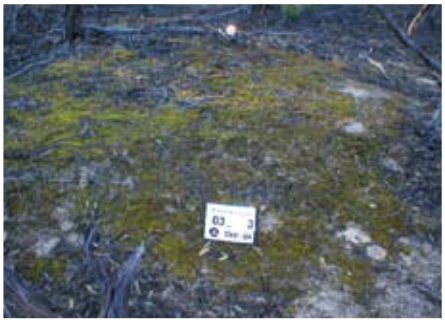
Monitors need to assess how much of the outer surface of the mound is covered with moss and lichen.

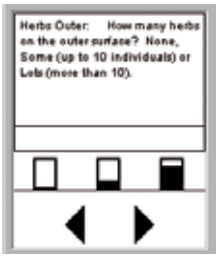
- If no moss or lichen is present record 'none'.
- If there is moss and lichen over less than one third of the outer mound surface record 'some'.
- If there is moss and lichen over more than one third of the outer mound surface record 'lots'.

MOSS IN

Monitors need to assess how much of the inner surface of the mound is covered with moss and lichen.

- If no moss and lichen is present record 'none'.
- If there is moss and lichen over less than one third of the inner mound surface record 'some'.
- If there is a moss and lichen over more than one third of the inner mound surface record 'lots'.





HERB OUT

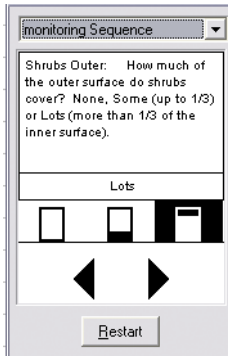
Monitors need to assess how much of the outer surface of the mound is covered with herbs.

- If no herbs are present record 'none'.
- If there is less than 10 individual herbs over the outer mound surface record 'some'.
- If there are more than 10 individuals over the outer mound surface record 'lots'.

HERB IN

Monitors need to assess how much of the inner surface of the mound is covered with herbs.

- If no herbs are present record 'none'.
- If there is less than 10 individual herbs over the inner mound surface record 'some'.
- If there are more than 10 individuals over the inner mound surface record 'lots'.



SHRUB OUT

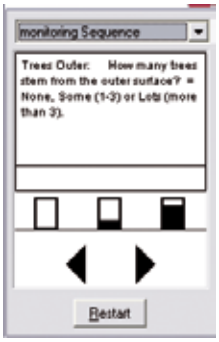
Monitors need to assess how much of the outer surface of the mound is covered with shrubs or Triodia (Spinifex or Porcupine Grass).

- If no shrubs or Triodia is present record 'none'.
- If there is less than one third of the outer mound surface covered with shrubs or Triodia record 'some'.
- If there is more than one third of the outer mound surface covered with shrubs or Triodia record 'lots'.

SHRUB IN

Monitors need to assess how much of the inner surface of the mound is covered with shrubs or Triodia (Spinifex or Porcupine Grass).

- If no shrubs or Triodia is present record 'none'.
- If there is less than one third of the inner mound surface covered with shrubs or triodia record 'some'.
- If there is more than one third of the inner mound surface covered with shrubs or triodia record 'lots'.



TREE OUT

Monitors need to assess how much of the outer surface of the mound is covered with tree stems (>2m).

- If no trees are present record 'none'.
- If there up to three trees (>2m high) growing on the outer mound surface record 'some'.
- If there are more than three trees (>2m high) growing on the outer mound surface record 'lots'.

TREE IN

Monitors need to assess how much of the inner surface of the mound is covered with tree stems (>2m).

- If no trees are present record 'none'.
- If there is up to three trees (>2m high) growing on the inner mound surface record 'some'.
- If there are more three trees (>2m high) growing on the inner mound surface record 'lots'.

3.1.6 DIMENSIONS

There is a provision to record the dimensions of the mound. The 'mound dimension measurements' are used in two distinct ways:

Full Monitoring Sequence – the dimension measurements set for the full monitoring sequence is outlined below. All mounds on the database are monitored using the full set of criteria when first added to the database and every fifth year thereafter, and for all mounds not yet recorded on the database.

Routine Monitoring Sequence – the second and more common approach is to record the height dimension as the only measurement, except in the fifth year when all dimension measurements will be taken.

The mound measurements are less important, but nonetheless suggest changes that have occurred, and are useful for checking records, comparing sites, and monitoring change. The mound can be measured with a tape measure, but the fastest and easiest way is to use a mound pole device and a tape measure. The mound-pole comprises a pole marked off in 10cm intervals with a non-stretching cord (yellow plastic clothes line cord is good) attached to its base. The cord should be marked off every 20cm, with different marks to indicate metres, over a total length of about six metres.

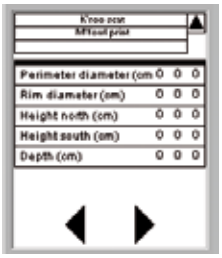
TO MEASURE A MOUND

- The pole is first inserted at the northern edge of the outer perimeter of the mound and the cord stretched across to the southern side of the mound. The perimeter diameter can then be measured with the cord.
- The height of the mound can be deduced by averaging two measures taken from the southern side of the mound. The first, height north, is measured by sighting across the mound along the tops of both rims to the pole and reading this height. The second, height south, is measured by holding the cord so that it is straight and touches both rims, and measuring the vertical distance between the cord and the ground at the southern perimeter of the mound. Both the north and south heights are recorded.
- The depth of the crater can be measured as the vertical distance from the base of the crater to the cord when it is held straight across both rims.
- The rim diameter can be measured either along the cord, or with a tape measure.

The following four categories describe the dimensions of the mound. By convention, mounds are always measured in a north/south line across the mound.

PERIMETER DIAMETER (CM)

The perimeter is the most outer limit of the mound; the distance across the mound from the northern outer edge to the southern outer edge. It is measured in centimetres. Sometimes a mound will have two perimeters where a mound has been built upon an older and larger mound. In this case, measure the larger. On occasions the perimeter is so difficult to distinguish that the measurement may not be repeatable. The best way to estimate an indistinct perimeter is to follow the general outline of the mound from a standing position.

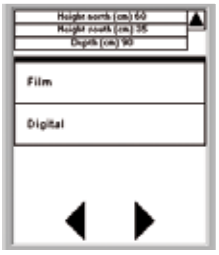


RIM DIAMETER (CM)

The rim diameter is the distance across the mound from the top of the northern rim to the southern rim. It is measured in centimetres. On occasions the rim is so difficult to distinguish that the measurement may not be repeatable. If a rim is flat, so that its top is not easily distinguished, measure from the inner edge of the top of the rim.

HEIGHT (CM)
The measure taken is the height of the mound above the ground. Two boxes on the datasheet are provided for this measure. The Height North (Ht N) and Height South (Ht S) are both measured. For mounds with no discernible crater, only one reading needs to be taken of the measured height of the mound above ground level at the perimeter of the mound. For mounds with a crater, the height measures are actually those between the ground level at the perimeter and the line formed by sighting along the top of the rim on weither side of the mound. As with other dimensions, these measures are obtained along a north-south line across the mound.

DEPTH (CM)
The measure taken is the depth of the crater in relation to the rim. It is measured in centimetres.



3.1.7 PHOTOGRAPHS

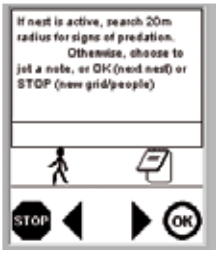
Photographs of mounds provide an important reference that summarises several features and provide a means of checking suspect mound descriptions. Photographs are taken using a digital camera.

- The photo-point for each mound is described as a bearing from the photo-point to the mound, and the entire mound should be represented in the photograph. The photo is usually taken from the north point of the mound.
- If a bearing is not able to be taken from the north point, the photograph should be taken from a clear vantage point and the bearing to the mound recorded on the notes page.
- A card clearly showing the grid number, mound number, month and year should be placed on the mound in the foreground of the photograph (these 'mound identification kits' will be supplied along with a digital camera).

3.1.8 NOTES

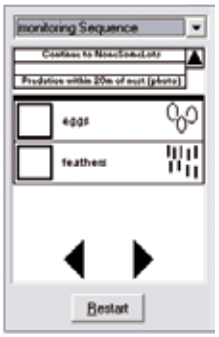
Two types of notes may be recorded:

- location notes that relate to the location of the mound and may help others to find the mound
- general notes regarding the mound itself



When a mound is assessed as active, monitors should conduct a search in a 20m radius around the mound looking for signs of predation:

- evidence of eggs or eggshell and feathers should be recorded
- additional observational notes could be recorded on the notes page

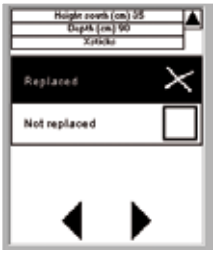


Notes are recorded on the palm screen from an inbuilt keyboard. The keyboard is accessed by placing the cursor on the small abc or 123 in the green rectangle at the bottom of the screen. By highlighting abc the alphabet is displayed, and by highlighting the 123 numbers are displayed. Operate the keyboard by touching the required letters or numbers with the cursor. It is possible to toggle between letters and numbers by highlighting the required format at the base of the keyboard. As details are typed they appear in the notes screen. The notes are able to be edited easily by positioning the cursor in places where corrections are required.

XSTICKS (CROSSED-STICKS) (ON DEPARTURE)

Monitors are to ensure that Xsticks are in place at the end of the monitoring sequence. Two or three Xsticks (about 50cm long by 2cm wide) are routinely placed at the centre of inspected mounds on departure from each mound. If Xsticks are already present, they ought to be rearranged to ensure they are firmly in place.

Monitors need to record whether Xsticks were replaced or still present when the recorder left the mound site. These provide a quick indication as to whether the mound has been disturbed since the mound was last monitored.



3.1.9 GPS READINGS – WGS 84

Note – WGS 84 is the accepted datum. This datum relates almost precisely to AGD 94. No other datum should be used.

At the end of each monitoring sequence, the GPS position for each mound is automatically recorded by selecting OK on the Palm screen once the GPS screen appears. GPS readings are taken from a position at the centre of the mound, usually after replacing the Xsticks. GPS readings are recorded using Datum WGS 84, and the zone, easting and northing locations for the particular nest just monitored are recorded. If necessary, the GPS recording can be aborted by holding the stylus on the square shape on the palm screen. Once the GPS location is recorded, the sequence returns to the beginning of the nest monitoring sequence.

3.2 MONITORING PROCEDURES - PROCESSES

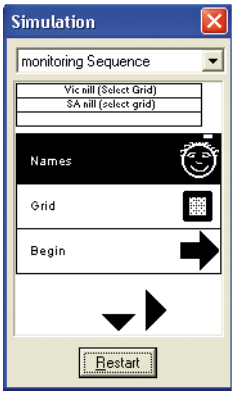
3.2.1 PALM PILOT / CYBER TRACKER INSTRUCTIONS

Start the Palm Pilot by pressing the **S** button. Start the Cyber Tracker program by selecting the Cyber Tracker icon.

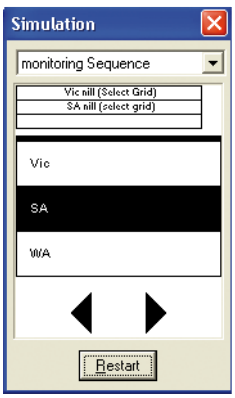
To navigate, select the appropriate button at the bottom of the screen.
- ▶ to move forward a screen
- ◀ to go back a screen
- ▼ to select further options
- ▲ to go up a screen

These selections can be made by touching the stylus on the buttons on the screen or by pressing the appropriate button at the bottom of the Palm.

All four buttons are **NOT AVAILABLE** for each screen, only the buttons that are relevant to that screen.
On some screens a selection will need to be made before the sequence will move on, on other screens no selection is required.

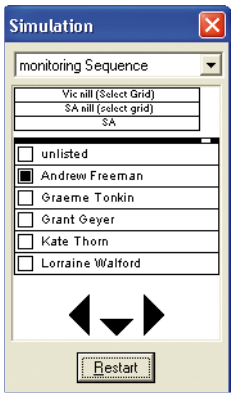


SELECT NAME/S
Select '**Names**' then ▶

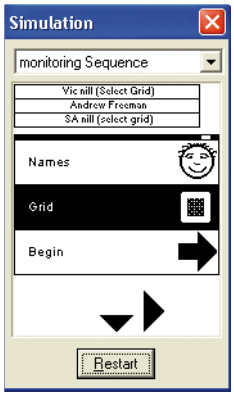


Select '**SA**' then ▶

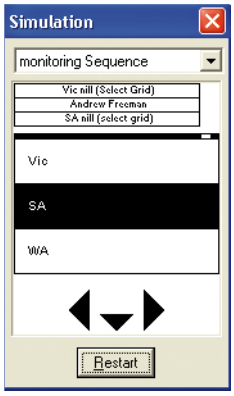
Select a name or names from the list or use the '**Unlisted**' option



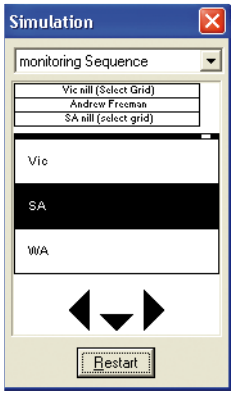
SELECT GRID/SITE
Select '**Grid/Site**'

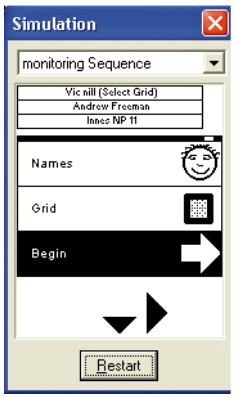


Select '**SA**'

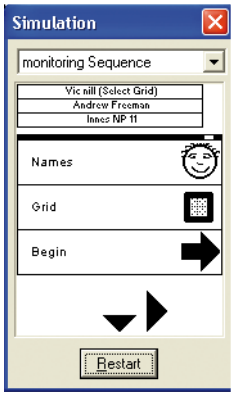


Select the required Grid/Site number





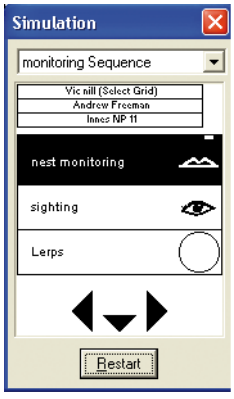
The selected monitors Name/s & Grid/Site name and number now appear at the top of the screen and the sequence returns to the opening screen.



Select '**Begin**'

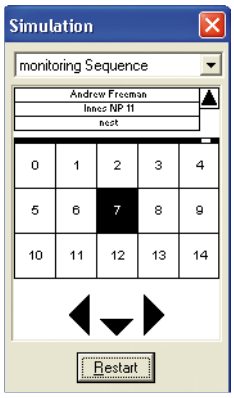
The steps listed above only need to be entered at the beginning of the days monitoring on a particular grid/site or when changing the monitors name/s and/or grids/sites.

The following sequence will be used to record each mound visited. When completing the sequence by selecting the '**OK**' button on the final screen, the sequence will cycle back to this screen ready for the next mound to be recorded.



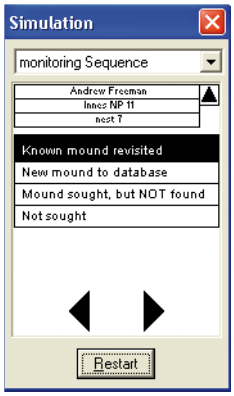
Select '**nest monitoring**'

NEST/MOUND NUMBER
Select the required Nest/Mound number

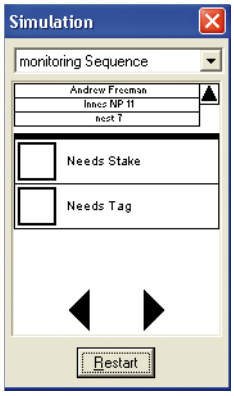


Select one of the following options.

- **'Known mound revisited'**
  for any mound that has been recorded in previous years
- **'New mound to database'**
  for any new mounds located
- **'Mound sought, but not found'**
  for any known mounds that are searched for but not located
- **'Not sought'**
  for any nest that you choose not to monitor that year for any reason

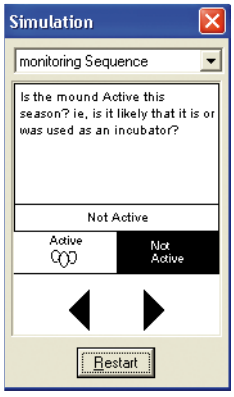


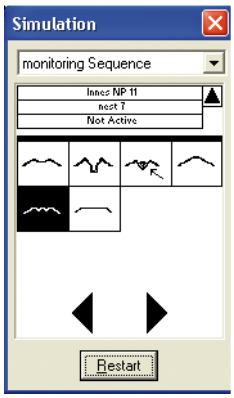
STAKE / TAG
If the mound needs a stake and/or tag select the appropriate option, otherwise leave them blank



ACTIVE
Select whether the mound is
'**Active**' or '**Not Active**'.

Active mounds are those that are worked by the Malleefowl (i.e. being used as an incubator) and are likely to contain eggs.





PROFILE
Select the mound profile

The likely profiles of Malleefowl mounds are:

1. **Typical crater with raised rims.** This is a typical shape of an inactive mound. However the mound may also be active & open.

2. **Mound fully dugout.** The characteristic of this profile is that the crater slopes down steeply and at the base the sides drop vertically to form a box-like structure with sides usually 20 to 30 cm deep. Often litter will have been raked into windrows and may have started to enter the mound.

3. **Mound with litter.** This is the next stage after profile 2. Litter will have been raked into the mound by Malleefowl and thick layers of litter are evident on the surface. There may or may not be sand mixed with the litter at this stage.

4. **Mound mounded up but no crater.** This is the typical profile of an active but unopened Malleefowl mound.

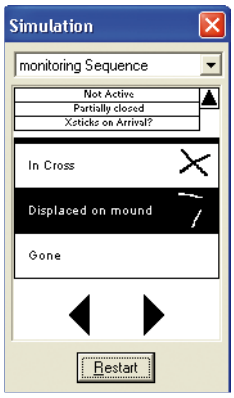
5. **Mound forms a sandy crater with peak in centre.** This is a typical profile of an active mound which is in the process of being closed by Malleefowl.

6. **Mound low & flat without peak or crater.**

For mounds that are not raised above the level of the surrounding earth but have a depression at the centre, use profile 1

X_STICKS

Select whether the X sticks on arrival are:
'**In Cross**'
'**Displaced on mound**'
'**Gone**'

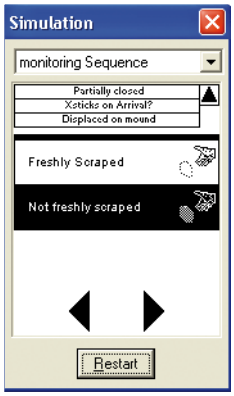


Two or three X sticks, about 50 cm long by 2 cm wide are routinely placed at the centre of inspected mounds once monitoring is complete and photos have been taken.

If they are present when the mound is visited next, the mound has obviously not been disturbed since it was visited the previous year.

SCRAPED

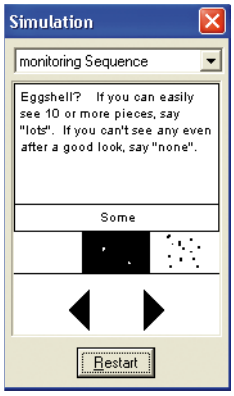
Select whether the mound is '**Freshly Scraped**' or '**Not freshly scraped**'



The critical test for this category is to disturb a small area of sand on the rim of the mound and compare this with neighbouring undisturbed areas of sand. If the disturbed are is NOT visibly distinct the mound is regarded as freshly scraped. If the disturbed area is distinct the mound is regarded as not freshly scraped, and has probably not been worked by Malleefowl for the last day or so (or it is very windy)

EGGSHELL

Select whether or not there is eggshell on the mound by selecting the icons toward the bottom of the screen indicating '**None**', '**Some**' or '**Lots**'

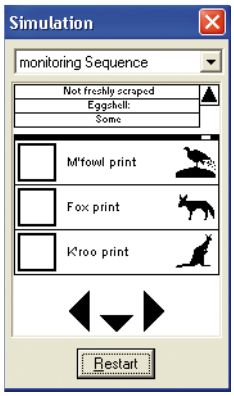


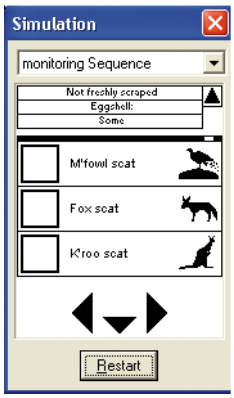
This indicates how much of the surface of the mound is covered with Malleefowl eggshell.

- **None** – indicates None
- **Some** – indicates one or a few fragments visible
- **Lots** – indicates more than 10 fragments are clearly visible and conspicuous

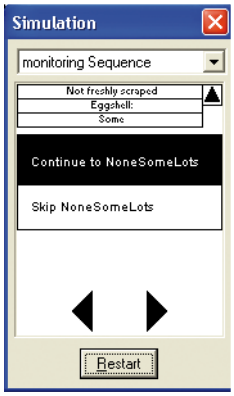
PRINTS

Select whether or not there are Prints on the surface of the mound by selecting the appropriate box/s. Use the ▼ button to select more options. If there are no prints leave box/s blank.



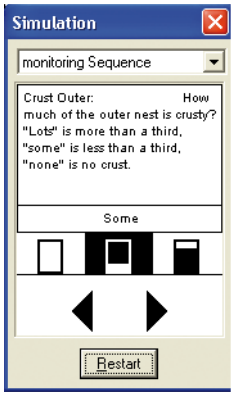


SCATS
Select whether or not there are Scats on the surface of the mound by selecting the appropriate box/s. Use the ▼ button to select more options. If there are no prints leave box/s blank.



Select '**Continue to NoneSomeLots**' or
'**Skip NoneSomeLots**'

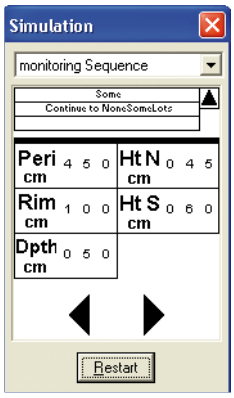
This screen gives a chance to skip the NoneSomeLots table; however it is strongly recommended that the NoneSomeLots data is entered for each mound visited



NONE-SOME-LOTS TABLE
The following 5 categories describe the surface of the mound. The abundance of these is estimated for both the inner and outer zones of the mound. (The inner zone is the crater, whereas the outer zone extends from the rim to the perimeter of the mound).

Crust, Moss/Lichen, Herbs, Shrubs, Trees

The required input is either '**None**', '**Some**' or '**Lots**', which describes the abundance of the particular feature. A description for each option is given on the Palm screen.



DIMENSIONS
The following 4 categories describe the dimensions of the mound.
By convention, mounds are always measured in a north/south line across the mound.

Peri – The perimeter is the most outer limit of the mound; the distance across the mound from the northern outer edge to the southern outer edge measured in centimetres. Sometimes a mound will have two perimeters where a mound has been built upon an older and larger mound. In this case, measure the larger. The best way to estimate an indistinct perimeter is to follow the general outline of the mound from a standing position.

Rim – The distance across the mound from the top of the northern rim to the southern rim. Measured in centimetres. If a rim is flat so that its top is not easily distinguished, measure from the inner edge of the top of the rim.

Depth – The depth of the crater in relation to the rim. Measured in centimetres.

Height – The height of the mound above the ground. Two boxes are provided for this measure, Ht N (North) and Ht S (South).
For mounds with no discernible crater, only the first box need be filled with the measured height of the mound above ground level at the perimeter of the mound. For mounds with a crater, the height measures are actually those between the ground level at the perimeter and the line formed by sighting along the top of the rim on either side of the mound.
As with other dimensions, these measures are obtained along a north – south line across the mound, measured in centimetres.

Each digit can be changed by touching the stylus above the digit to increase its value, or below the digit to decrease its value.

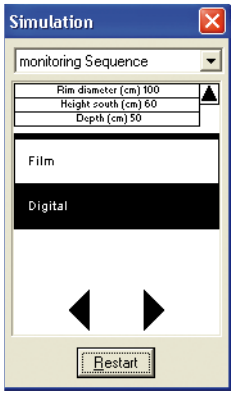
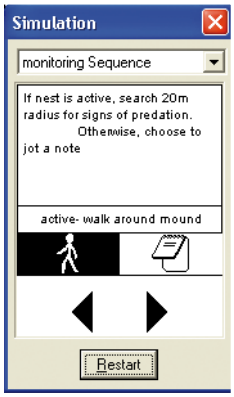


IMAGE
Select whether the image (photo) taken of the mound is on film or a digital camera is used.

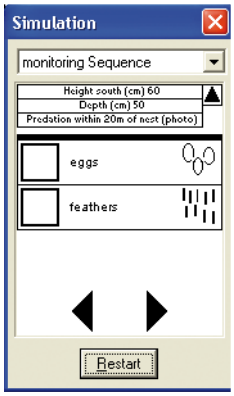
If Film is selected the next screen allows the **Film #** and **New Item #** (photo #) to be entered.

The bearing from the photo point to the centre of the mound should also be recorded.



If the mound is active, select the person figure and conduct a through search covering an area of 20 metres radius from the mound.

If the mound is not active, select the Notebook icon, select ▶ and then enter any further notes of interest.



If '**eggs**' or '**feathers**' are found during the search select the appropriate box/s otherwise leave them blank and select ▶ .

The following screen gives an opportunity to make any further notes of interest.

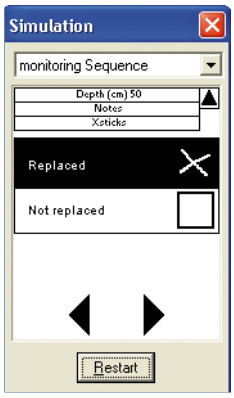
Notes are recorded on the Palm screen from a keyboard at the bottom of the screen. By highlighting 'ABC' the alphabet is displayed, and by highlighting '123' numbers are displayed.

Typed notes appear in the notes screen and are able to be edited easily by positioning the cursor in the appropriate places.

X_STICKS REPLACED
Select '**Replaced**' if X sticks are replaced on the mound at the completion of the monitoring for that mound.

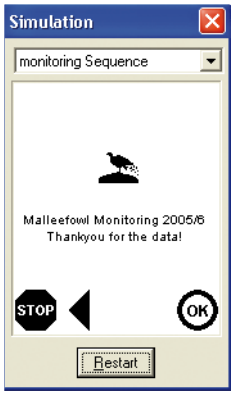
Otherwise select '**Not replaced**'.

It is recommended that where possible,
X sticks are replaced on the mounds.



This is the final screen. Select '**OK**' to save the data entered for that mound and return to the Nest Monitoring screen, ready to enter the next mound data.

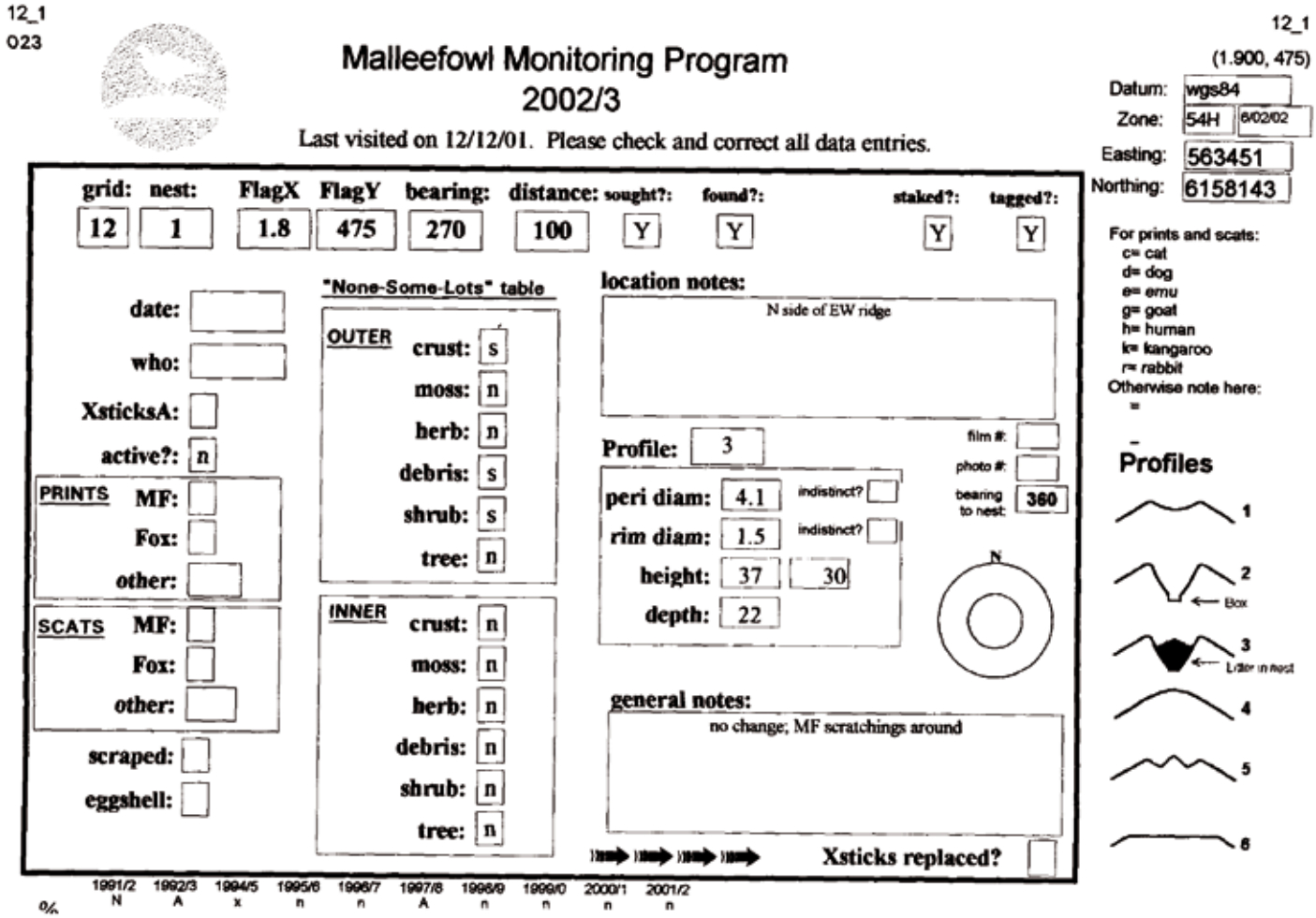
If there is a GPS coupled to the Palm the relevant position data will be automatically recorded for the current mound. If there is no GPS attached the system will hang at the next screen. To override the screen, hold the stylus in the square shape on the right of the screen. The '**Please wait…**' will change to '**ABORT?**' then to '**ABORTING**'. When it has changed to '**ABORTING**' lift the stylus and it will say '**GPS Completed**' and the system will go back to the start ready for a new record.



If '**STOP**' is selected, the data is recorded but the sequence will start from the very beginning and all the relevant Name & Grid/Site data will need to be entered again.

3.2.2 RECORDING INFORMATION ON PAPER SHEETS

INDIVIDUAL NEST SHEET AND MULTIPLE NEST SHEETS



12_1
023

Malleefowl Monitoring Program
2002/3

Last visited on 12/12/01. Please check and correct all data entries.

grid:	nest:	FlagX	FlagY	bearing:	distance:	sought?:	found?:	staked?:	tagged?:
12	1	1.8	475	270	100	Y	Y	Y	Y

12_1
(1.900, 475)
Datum: wgs84
Zone: 54H 6/02/02
Easting: 563451
Northing: 6158143

For prints and scats:
c= cat
d= dog
e= emu
g= goat
h= human
k= kangaroo
r= rabbit
Otherwise note here:
=

date:
who:
XsticksA:
active?: n

PRINTS MF:
Fox:
other:

SCATS MF:
Fox:
other:

scraped:
eggshell:

"None-Some-Lots" table

OUTER
crust: s
moss: n
herb: n
debris: s
shrub: s
tree: n

INNER
crust: n
moss: n
herb: n
debris: n
shrub: n
tree: n

location notes:
N side of EW ridge

Profile: 3
film #:
photo #:
bearing to nest: 360

peri diam: 4.1 indistinct?
rim diam: 1.5 indistinct?
height: 37 30
depth: 22

N

general notes:
no change; MF scratchings around

Xsticks replaced?

1991/2	1992/3	1994/5	1995/6	1996/7	1997/8	1998/9	1999/0	2000/1	2001/2
N	A	x	n	n	A	n	n	n	n

%

Profiles
1
2 Box
3 Litter in nest
4
5
6

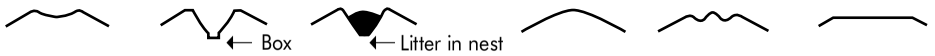
DATE: GRID: NAME(S) Page of

Nest	Sought (v/x)	Found (v/x)	Staked (v/x)	Tagged (v/x)	Active (Y/N)	Profile (see below)	X sticks (see below)	Scraped (Y/N)	Eggshell (n/s/l)	Prints (v/x)				Scats (v/x)				Outer nest surface (n/s/l)					Inner nest surface (n/s/l)					Dimensions (cms)					Photo (v/x)	X Sticks Replaced (v/x)	Notes
										MF	Fox	Roo	Oth (specify)	MF	Fox	Roo	Oth (specify)	crust	moss	herb	shrub	tree	crust	moss	herb	shrub	tree	Perimeter	Rim	Depth	Ht N	Ht S			(if you require more room use the back of this data sheet.)
26	v	v	v	v	N	1	G	N	S	x	x	v	ec	x	v	v	r	S	N	S	S	N	N	N	S	N	N	410	320	20	30	25	D		Example

For prints & scats:
c=cat e=emu
d=dog ec=echidna
r=rabbit Otherwise note here:

x-sticks:
I=In cross
D= displaced on mound
G=gone

Profiles: 1 2 3 4 5 6



SECTION THREE

Monitoring Procedures and Processes

THE DATASHEETS

- There is a datasheet for each mound in each site. If the site has been monitored in the past, these datasheets will be partly filled out with data collected previously. In the process of monitoring, these sheets are corrected as required.

- All the categories on the datasheet are defined in this manual and on the Palm in the order in which they appear on the datasheet. The datasheet is a short hand method of describing a mound quickly. However, it is important that recorders abide by the standard definitions of the short hand categories as listed in this manual and on the Palm

- Although the datasheet is detailed, with practice it should not take more than three or four minutes to complete. This is a small time investment compared with the time involved in getting to a site and walking to mounds.

The following sections provide general comments on groups of categories that appear on the datasheet.

The datasheets follow the sequence of the Palm and need little further explanation

Some categories will need to be completed that appear on the Palm in a different way:

- **Date and who** – record the date and who collected the data

- **Site and mound** – check the site number and the mound number

- **Sought and found** – indicate whether the mound was actually searched for during the current monitoring, and whether it was actually found. These categories are important for record keeping identifying problems

- **Staked and tagged** – state whether it was permanently marked (staked and tagged). Mounds are permanently marked by a metal tag attached to a metal stake (galvanised fence-wire spacer) placed about 5m due north of the nest centre

- **Signs, none-some-lots tables, dimensions and photographs** – all other features of the datasheets are recorded as per Palm

- **Notes** – two types of notes may be recorded on the individual datasheet. Those that relate to the location of the mound and may help others to find the mound, and general notes regarding the mound itself. Notes from previous seasons are reproduced and may be added to or corrected as appropriate. Notes that are no longer applicable should be crossed out.

- **GPS** – GPS coordinates may be recorded in the top right corner of the individual datasheet or recorded in the notes section of the multiple sheet

SECTION FOUR

Monitoring Equipment Guidelines

SECTION FOUR

Monitoring Equipment Guidelines

4.1 GUIDELINES FOR THE USE OF THE PALM

- **Cybertracker** – press the **Start/ST** button on the bottom buttons (covered with white tape) to start or return to Cybertracker. The Palm will power off automatically if not used for 60 seconds or so. The GPS should also be connected and turned on.

- **Screen contrast** – the contrast control wheel is on the middle of the back right-hand side of the Palm. If the Palm screen is difficult to read, adjust the contrast. Heat at various times can cause the screen to become difficult to see, so putting the Palm in the shade or in a backpack often rectifies the problem.

- **Backup** – press the **calculator** icon on the far right of the Palm screen to start JBBackup. Tap within the **Backup now** square to perform backup. You can perform backups as often as you like, and you should backup at least every few hours. If there is a Palm failure, data that has been backed up can be retrieved back in the office, but data that has been entered after the last backup will be lost.

- **Batteries** – there must be batteries in the Palm at all times. Always carry spare batteries (2*AAA), and replace as needed. Batteries need to be changed promptly if flat. The most common cause of lost data and the loss of the Cybertracker program are flat batteries. The Cybertracker program can be restored in the field, however it is not recommended to continue to use a Palm that has failed for any reason. The Palm should be returned to the office where data can be restored from backup and in the field data should be recorded on paper.

- **Battery level** – the battery level may be checked by tapping the **Home** icon on the far left of the Palm screen. A battery level indicator is displayed on the top left side of the menu screen.

- **Posting or transporting Palm** – when it is necessary to post or transport the Palm to other monitors or the administrator, check that there is sufficient battery charge before posting/transporting. If the battery level is low, install fully charged batteries so that data is not lost during transit.

- **Reset** – should the Palm not respond to buttons or screen, a thin blunt tip (eg. unfolded paper clip) can be inserted in the reset hole at the back of the unit.

- **Main menu** – tap the **Home** icon on the far left of the Palm screen to go to the main Palm menu. (not usually needed). The main menu may be needed to check if all programs are installed, to check battery levels, to change the time and date, and to rectify problems if they occur.

- **Set time** – press the **Home** icon, then the ◄ button (or choose **BigClock** on the home menu) to open **BigClock**. Select **Time** on the bottom row, and then press on the menu icon (below the Home icon) to display the drop down menus. Select Options, then Set Time and tap to correct the time to that on the GPS. Press OK.

Note – it is important that simultaneous times are set on the GPS, the Palm, and the camera so that data can be matched according to the time on each of the units.

4.2 GUIDELINES FOR THE USE OF THE GPS

GPS units are used to assist in locating Malleefowl mounds in sites across Australia. It is essential to connect the GPS to the Palm, which contains the Cybertracker monitoring sequence, so that precise GPS data is recorded for each of the mounds that are monitored. The following guidelines apply to both the Garmin Etrex and Garmin Geko. These are robust and small and the most commonly used GPS units. The control buttons for the Etrex are on the sides of the unit, whereas the Geko buttons are on the face of the unit. There are a number of screens which are described in the manual, but only the screens essential to monitoring are described here.

- **Turn on** – press and hold **PWR** button for one second. The **PWR** button is lower right on the Etrex, and top right on the face of the Geko.

- **Scroll to new pages** – to scroll to required pages, press the top right button on the Etrex, and the lower right button on the face of the Geko.

- **Go to waypoint** – press **Page** (top right Etrex, lower right Geko) until the menu page appears, then scroll to **waypoints**, press **Enter** or **OK**, scroll to '0-9', press **Enter** or **OK**, then scroll to grid + nest number. Press **Enter** or **OK** twice.

- **Mark waypoint** – scroll through pages until the menu page appears. Highlight **mark** by pressing either of the top left or middle left buttons on the Etrex , or the up/down arrows on the face of the Geko
  Press and hold **enter** for one second. The **enter** button is bottom left on the Etrex, and the OK button on the face of the Geko.

- Batteries – battery level is indicated at the bottom of the menu page on both GPS units (press **page**). Change batteries by removing back cover (2*AA for Etrex and 2*AAA for Geko) when the batteries are flat (i.e. when the unit turns itself off). Unlike the Palm units, GPS units do not need to have continuous battery power to maintain data and may be stored without batteries.

Note – Interface and Datum will be pre-set for each GPS and should not be changed unless an error is evident.

- **To set interface** – Interface must be NMEA OUT for the Etrex and Geko to interact with Cybertracker. To check/change, press **page** until menu page, scroll to setup, press **Enter/OK**, scroll to Interface, press **Enter/OK**. If I/O FORMAT is not NMEA, press **Enter** and scroll to NMEA OUT, press **Enter**, and then **page**.

- To **set datum** – **All GPS must use the WGS84 datum**. To check/correct datum, press **Page** until the menu page appears, scroll to setup, press **Enter/OK**, scroll to Units, press **Enter/OK**. **Position FRMT** should be UTM/UPS, and **map datum** must be WGS84. To change, press **Enter** and scroll to correct entry, and then press **Enter/OK**. Press **Page** to leave this menu.

4.3 GUIDELINES FOR THE USE OF THE DIGITAL CAMERA

All cameras are slightly different, but generally Olympus cameras with minimum mega pixels have been more than adequate to take photos of mounds. Guidelines will vary and an example for an Olympus is included in this section.

FOR THE OLYMPUS C-120

- **Take photos** – slide cover right, frame image in monitor (press **screen** for on/off), press shutter button.
- **Review** – close cover, press **screen**, and scroll with back or forward buttons.
- **Set time** – use GPS local time. To change camera, press **OK**, forward button, up button, forward button, up button, and forward arrow. Select digits with forward and back buttons, and change with up and down buttons.
- **Image size** – should be SQ1. To change, open cover, press **OK**, back button, select SQ1 with up and down buttons, then press **OK**.
- **Batteries** – change batteries by sliding plastic cover under the camera (4*AA).

4.4 GUIDELINES FOR THE USE OF CYBERTRACKER

4.4.1 GENERAL NAVIGATING IN CYBERTRACKER

- **Select** choices by highlighting with touch. Touching above or below digits will change number in measurements.
- **Scroll** up/down with central button on Palm. If choices continue down the screen, ▼ will appear at bottom centre of the screen.
- **Proceed** to next screen by pressing the forward button ▶ or tapping the forward icon at base of screen.
- **Retreat** to previous screens/choices by pressing the back button ◀ or tapping back icon on screen. Note that data is erased as you retreat, and will have to be re-entered.
- **Finish entry by pressing OK or STOP** buttons or icons on screen (these icons will only appear when the choice is valid). The OK button will allow you to choose a new mound, whereas the STOP button will allow you to change to a new site number and new people.

START SCREEN

- Select **name** to change the names of recorders.
- Select **dummy** or **real** to indicate whether practice or actual data is being entered.
- Select **begin** to proceed to monitoring/sighting screen, and then proceed to nest monitoring screen.
- To view records that have been entered, on the **start** screen press the ◀ icon (or button). The number of records is displayed in the top left corner of the screen together with the time and data of the last records. Scrolling down will display the record, while pressing ◀ ▶ icons (or buttons) will display all records on the Palm.

NOTES SCREEN AND WRITING

- Notes can be written in Cybertracker by using either the screen keyboard (tap the **ABC** at bottom left of graffiti area or the **123** at the bottom right of the graffiti area) or by drawing letters/numbers in graffiti area. The notes page has ruled lines, and appears at the end of records.

GPS SCREEN

- The **final screen** in the monitoring sequence is reached by selecting OK or STOP. Satellites are shown in the circles, and there is a triangle and square on the right side of the screen.
- GPS communication can be **aborted** by pressing within the square for one second until **aborting** appears. No GPS data will be recorded. Aborting the GPS process may be necessary if communication between the units is interrupted.

OTHER CYBERTRACKER FUNCTIONS

It is possible to access the past active/inactive history of all mounds and maps of each site from the Palm, but the process is complicated, and not easy to read. It is far easier to access these records from the National database (once operational) in paper format.

The records will be supplied to monitors in paper format until the database is operational. The following Cybertracker instructions will enable you to access the site and mound histories on the Palm.

TABLE OF THE INACTIVE/ACTIVE HISTORY OF ALL NESTS - *JFILE

JFile is a database program that shows a table of all the active/inactive histories for every site and mound. To access this database.

1. Go to the **Home** icon to display Home Menu.
2. Check the button in the top right hand of the screen, and highlight all if not displayed.
3. Select **JFile** then OK.
4. Press the database name **MasterShort** to open the table of historical site and mound activity records.
5. Scroll to the mound in question by dragging the scroll bar (right edge of screen) down to display the state, site and mound in question. Apart from state, site and mound, the table is arranged with years as columns (years by last 2 digits, eg 97=1997, 01=2001). An **n** indicates the nest was not active during a year, whereas an **A** indicates that it was active.
6. The ◀ ▶ icons in the top right of the screen scroll the year's columns to the left and right respectively.
7. This list can also be filtered to show only one grid/site. Press the filter icon (bottom on screen second from right), choose **define a filter**, choose **grid** as field to search, and enter the grid number for **filter what string in the database?** Then press **filter**.

4.4.2 CYBERTRACKER TROUBLESHOOTING

Palm does not operate at all

- The most likely cause is flat batteries. Go to the back of the Palm, remove the battery cover, and replace the flat batteries with two AAA batteries. (Do not leave the Palm without battery power for any longer than is necessary to swap batteries.).

- If the Palm logo appears followed by a welcome message when new batteries are inserted, the unit has reverted to factory setting and Cybertracker and other programs will have been lost from the Palm memory. This happens when the old batteries were completely flat.

- If nothing happens, even when the **Start/ST** button is pressed, try a **soft reset**. Push a small blunt object into the **reset** hole in the back of the Palm (right hand side). A paper clip is recommended, or if you have a metal stylus you can unscrew the base to reveal a plastic point. A soft reset may ***wake up*** a confused Palm in which case the Palm logo will appear followed by a screen asking you to tap a target. Follow the instructions and when the Digifix screen appears press the **Start/ST** button again and Cybertracker should start.

- If the Palm is still not operational, contact your coordinator.

- If the Palm is operational but Cybertracker did not start after trying the above, it may be possible to rectify the problem by going through the steps set out below in the section *Cybertracker does not appear when start button is pressed*. This is not an easy task and may be better left to an administrator.

Palm freezes

- On the back of the Palm on the right hand side around the middle, you will find a small hole which is the **soft reset** button. By pushing a small blunt object into the hole (paper clip recommended) the reset process begins.

- A screen should appear asking you to **Start Digifix**. Choose one of the options. Then tap 'Set Calibration'. (Note that in Launch Option – Launch Digifix on "Soft Reset" – should be ticked). Follow the calibration instructions by tapping the target until the **Digifix** screen re-appears. Then press the **Start/ST** button. Cybertracker should return to the screen you were working on before the Palm froze.

Palm coordination problems or stylus not responsive to screen

- If the Palm loses its coordination, the actions you select with the stylus may be slow to respond or you may get a different response than the one you highlighted. This is particularly evident when using the Palm face buttons and in the measurement section and when using the keyboard.

- To restore coordination, perform a **soft reset** (see Palm freezes above) and complete the calibration procedure. The Palm should now be better coordinated.

Screen hard to read

- It is often difficult to read the Cybertracker screens during glary and hot conditions, especially later in the day. There is a contrast wheel located on the middle back part of the Palm on the left hand side. By rotating the wheel the screen can often become clearer.

- Carefully clean the Palm face of dirt, dust and sweat. This also helps all situations including when the screen is difficult to read. Wiping the face of the Palm with a damp cloth also helps.

- In extreme conditions, it may be necessary to put the Palm out of the heat in a cooler shaded place for some minutes, or put the Palm in a backpack in the shade for a few minutes.

Incorrect date

- An incorrect date on the Palm can be corrected by locating **Prefs** in the Palm menu.

- To locate the menu, highlight **Home** on the Palm screen, and then highlight **Prefs**.

- The Preferences screen will be displayed. In the extreme top right hand corner of the screen, **general** should be listed. If not, tap the small black down button and then highlight **general**. This should display the **Set Date** line.

- Tap on the date, and a calendar will be displayed. The correct year is selected by tapping on the forward or back buttons, and the correct month and day should be highlighted. Tap on a date to return to preferences screen. Check that the correct date is now displayed.

Incorrect time

Note: The time to be entered on the Palm is the time displayed on the GPS, which may differ from the time on your watch.

- An incorrect time on the Palm can be corrected by locating **Prefs** in the Palm menu.

- To locate the menu, highlight **home** on the Palm screen, and then highlight **Prefs**.

- The preferences screen will be displayed. In the extreme top right hand corner of the screen, **general** should be listed. If not, tap the small black down button and then highlight **General**. This should display the **Set Time** line.

- Tap on the time, and a **Set Time** screen will be displayed. The correct time is selected by tapping on the hour square and each of the minute squares and using the up and down buttons to select time. Make sure that you highlight either **am** or **pm**, and then **OK** to return to preferences screen. Check that the correct time is now displayed.

Note: It is also possible to change the time by following the instructions in the section **Guidelines for the use of the Palm**.

GPS data not transferring to Palm

- The most likely reason for the GPS data not transferring to Cybertracker is a loose connection due to plugs not being firmly in place. Check both ends of the cable at the Palm and the GPS and ensure they are fully slotted in and correctly in place. Remove them if necessary and replace them. (Warning: See note on cables and plugs below).

- If this does not rectify the problem, gentle and not so gentle squeezing and wriggling of the connection at the Palm end often creates a connection sufficient to transfer the data. If this happens more than once, make sure the administrator is informed when you return the equipment.

- Note that the cable plugs from the GPS to the Palm need to be handled very carefully when pushing them into place. The pins are very sensitive to pressure if they are slightly raised from their normal flat position, and they could catch and bend, and even break off if pushed too hard if in an elevated position. If they break, no connection will be possible, and the plug will need to be replaced by the administrator.

- The second most common cause of data not transferring to Cybertracker is an incorrect setting on the GPS. If the interface setting on the GPS is not set on NMEA, then data will not be transferred. The instructions to set the GPS on NMEA are listed in the **Guidelines for the use of the Palm** in the section **to set interface**.

- Note that GPS data will not be transferred to the Palm if the GPS has been unsuccessful in obtaining an accurate location. If this is the case, some satellite information will be displayed on Cybertracker and you may have to wait for the GPS to finish obtaining the location (or abort the process if necessary).

Buttons sticking

- On occasions one or more of the buttons at the bottom of the Palm may stick or not operate at all. The most likely cause is sand or grit lodged in or around the button, and the cover of the Palm will need to be removed to clean the insides of the Palm. This is best left to the administrator. It may be possible to continue by using the icons on the Palm screen itself. It is mainly the start button that is crucial. If all else fails data should be entered on paper for later manual entry.

Cybertracker does not appear when start button is pressed.
This process may be difficult for inexperienced Palm users.

- If the custom setting of the Palm has been lost (usually due to battery failure), you may get the datebook screen when you press the start button. You should contact your coordinator immediately and arrange for a replacement Palm. However, if this is not an option it is possible that the error is minor and correctable, provided Cybertracker and JBBackup are installed.

- If this happens, go to the menu page by highlighting the **home** icon on the lower left face of the screen. This should reveal a complete menu list in which applications are listed alphabetically. If Cybertracker is not displayed, go to the extreme top right hand corner of the screen, and tap the small black button (triangle), and highlight **All**. This should bring the full menu onto the screen. Some items on the menu may not be displayed on the initial screen. To scroll down, either press the ▼ button or use the scroll bar down the right hand side of the screen (by placing the cursor on the black bar, you can pull the black bar down or up to reveal other items in the menu).

- Check that **Cybertracker** and **JBBackup** are on the list. If they are both listed, press on the JBBackup icon and start the application. Under the heading Backup (top left of screen), the box text should read **selected** – **not scheduled**. Press on this box, and then press on the **select** box that appears in order to view the files that are selected for backup.

- There are six files that need to be selected to backup the Cybertracker data and these are identified by their creator **CYBT**. If, on the first line, **creator** does not appear opposite **name** (size and type are other possibilities), press on the top ▼ icon and select **creator**. Press on ***creator*** to sort the list and scroll down to find the 6 CYBT files. These must all be marked as **selected** rather than **skip**. Be sure to select all 6 CYBT files or the backup will be useless.

- Select OK (twice) and return to the Home menu. Scroll down and press on the Prefs application and press on the top right corner and select 'Buttons'. Select Cybertracker for the date/time button (showing clock/calendar icon), and JBBackup should be selected for the calculator icon (last of icon list).

- If **Cybertracker** or **JBBackup** are not listed, or JBBackup displays error messages, contact your coordinator to arrange a replacement Palm or record your data on paper.

Mistake in entering data on Cybertracker screens

- It is possible to correct any entry in the Cybertracker sequence up to the time of recording the GPS location. This can arise from finding new prints or scats that were missed in the initial search or simply remembering that a wrong data entry was made.

- Corrections can be made by going back to the appropriate screen and re-entering the data, but all data subsequent to the corrected data will have to be re-entered as well.

- Alternatively, note the correction in the final notes screen, prefaced by **XX** and the data will be corrected on the database. For example, if a fox scat is found after initially recording that none occurred, the note may read **XX fox scat found**.

Lost data entered by monitors

- Data may be lost if the Palm malfunctions or batteries become flat. All data that has not been backed up will be lost. If data has been backed up, it will be easily recovered by the administrator. If not backed up, a return visit to the site will be necessary, or data can be entered manually from paper datasheets if records were entered on them.

SECTION FIVE
Database

The Database is still in the planning stages, and may take some time before it is finalised.

The Manual only gives a broad outline of the potential operations of a National Database.

The National Database needs to serve several purposes from volunteers to regional, state and national organisations as well as provide some level of public access.

A series of issues relating to Access, Information and Process are outlined below. These issues will be addressed if and when finances are available to develop a National database.

5.1 THE OPERATION OF THE NATIONAL WEBSITE DATABASE

The phase one model will establish core information and output, and will be modified further as it develops. The database will do everything that the current database can now do, but it will need to develop other functions. Data from the Cybertracker program, the GPS and paper system will continue to be gathered in the field, and then collected centrally within each state, and then downloaded directly into the National database. The data, once verified, will then become available for extraction.

The phase one model will use the internet to enter and extract data, through a database server provider and a website. The website needs to be a functional site maintained by a website manager at a minimal cost of $1,500 to hire a server. The location of the website is not so important (eg a commercial provider or Birds Australia or a similar body).

The current database is essentially for searches and monitoring on the ground. This database will be moved to the new database. All knowledge from the old will be incorporated into the new.

The National Malleefowl Recovery Team needs to have input into the formation of the database system.

5.2 THE MANAGEMENT OF THE NATIONAL WEBSITE DATABASE

There are **three essential tasks** required to make the system work:

- a coordinator to enter/update Cybertracker
- verification of data to eliminate inconsistencies and ensure data is clean
- the production of an analysis report. This could be the responsibility of one person, or a different person for each task.

The National Malleefowl Recovery Team needs to have input into the on-going management of the database. Ownership of data need detailed discussion with representative groups, and their opinions need to be considered. Progress on the development and operations of the database will need to be referred regularly to the National Recovery Team.

A licence will need to be set up which will establish user rights and limitations to access and use data.

Public information and public education also need to be considered.

There is agreement that a committee of representatives should be formed to sort out all issues associated with the concept. The State data coordinators from New South Wales, South Australia, Victoria and Western Australia should meet on a regular basis to discuss the development and management aspects of the National website database.

5.3 THE ESSENTIAL MONITORING SUPPORT REQUIREMENTS OF THE NATIONAL WEBSITE

- Data needs to be able to be transferred from the website database to individual Palms for monitoring.
- Data needs to be able to be transferred from the Palms, post monitoring to the website database.
- The system needs to be flexible to enable individual monitors, regional coordinators and state coordinators to load data directly to and from the website database depending upon the needs, appropriateness and efficiency of each group.

5.4 THE SECURITY ISSUES OF THE NATIONAL WEBSITE DATABASE

The issues of intellectual property, ownership of data, protocols of access, authorisation and principles of operation will need to be addressed.
Each state's data collection person will need involvement, and maybe there will be a need to form a committee to oversee the data website. Data security, data access and data ownership issues need to be resolved. Trust of all stakeholders needs to be assured through database security and support and appreciation of volunteer effort.

5.5 THE ESTABLISHMENT OF LEVELS OF ACCESS OF THE NATIONAL WEBSITE DATABASE

Levels of access will need to be established for the following groups:

- General public for general information.
- State organisations (eg WAMN, VMRG, DEH (SA)) for more specific information.
- Regional land managers (eg Mallee CMA, Park rangers) for on-ground works.
- Individual monitors – own site monitoring, maps etc.
- Recovery Team executive – national and state information.
- State/Regional coordinators – state and regional information.
- Approved researchers – as appropriate.
- Database manager – all levels.

5.6 THE TYPES OF INFORMATION REQUIRED FROM THE NATIONAL WEBSITE DATABASE

Different levels of information would be useful for each of the groups listed in 5.5. Detailed discussions with these groups will be required in the process of establishing the functions and operations of the database.

Information useful for individual monitors as currently supplied will need to be provided by the database, including pre-monitoring and post monitoring information:

- pre monitoring information – site history, files to be loaded onto Palm, photos, maps and safety details
- post monitoring information – feedback on monitoring effort, including full data details, mounds that are active, mounds missed and mounds needing stakes and tags

5.7 FUNDING OPTIONS

There will be a need to explore options of how to fund the database establishment, through grants, benefactor/philanthropic and/or voluntary funds. Investment from the Federal Government and through regional and local NRM conservation funds will also be required.

SECTION SIX
Surveys and Questionnaires

1.1 AN ANNUAL MONITORS QUESTIONNAIRE

THIS IS AN ANNUAL VICTORIAN MONITOR'S SURVEY.

MONITORING REPORT:

Which site did you monitor?

Who monitored?
(1)

(2)

(3)

(4)

Time taken/distance travelled

- When did you monitor (date/s)?

- Please give an estimate of the number of hours taken to complete the monitoring of the site (do not include travel)

- What is your estimated total travelling distance from home to the site and return?

Weather report

- Describe the weather conditions during your monitoring, (eg temperature, rain, wind, changes from day to day)

- What were the weather conditions at the site in the weeks prior to your visit (if known)?

- Were the mounds affected by the weather conditions at the time of monitoring (eg windswept, rain on mound, etc)?

MONITORING EQUIPMENT:

The equipment

- What was the number of the GPS you used?

- What was the number of the Palm you used?

- What was the number of the digital camera you used?

- Did you need to change the batteries on any of these items?

Please specify:

The Palm

Did you experience any difficulties with the Palm at any stage? **Yes** / **No** (please circle)
Comments: Please explain in detail what occurred

Did you try to resolve the problem? **Yes** / **No** (please circle)
Comments: Please explain what you did, and how difficult did you find the process, and was it successful?

The GPS

Did you experience any difficulties with the GPS at any stage? **Yes** / **No** (please circle)
Comments: Please explain in detail what occurred

Did you try to resolve the problem? **Yes** / **No** (please circle)
Comments: Please explain what you did, and how difficult did you find the process, and was it successful?

SECTION SIX

Surveys and Questionnaires

The Digital Camera

Did you experience any difficulties with the digital camera at any stage? **Yes** / **No** (please circle)

Comments: Please explain in detail what occurred

Did you try to resolve the problem? **Yes** / **No** (please circle)

Comments: Please explain what you did, and how difficult did you find the process, and was it successful?

Trunking radio and satellite phone

Did you experience any difficulties with the trunking radio and/or satellite phone at any stage?

Yes / **No** (please circle)

Comments: Please explain in detail what occurred

Did you try to resolve the problem? **Yes** / **No** (please circle)

Comments: Please explain what you did, and how difficult did you find the process, and was it successful?

Please complete this chart

Item	Used – none/some/lots (n s l)	Useful – yes/no
New GPS maps of sites and mound location		
Safety management plan with directions to site and safety contact details		
Job safety analysis worksheet		
Monitoring manual		
Track and scat manual		

6.2 ANNUAL SURVEYS OF LOCAL LANDHOLDERS AND LAND MANAGERS

SURVEY 1
PREDATOR SURVEY FOR LOCAL LANDHOLDERS AND LAND MANAGERS

This survey has recently been trialled in the Victorian Mallee on a limited basis, without sufficient feedback as to its effectiveness at this early stage.

Malleefowl Monitoring Site	Eg V23 Moonah
Malleefowl Monitoring Site	
Monitor	
Contact	
Position	
Location	

Question	Year	Response
Has there been **fox control** in the site this year?		
Has there been fox control within 5km of the site this year?		
Type of control (baiting; shooting)		
What was the area targeted?		
Who undertook the control? (eg, department, Parks, private etc)		
Frequency – how often		
Intensity – baits per ha or km2		
Types of baits – 1080 in foxoff, liver, other		
Did foxes decline and what pre and post monitoring was conducted?		
Rabbit control in area this year		
Who undertook control?		
Effectiveness		
Kangaroo control in area this year		
Who undertook control?		
Effectiveness		
Goat control in area this year		
Who undertook control?		
Effectiveness		

SECTION SIX

Surveys and Questionnaires

Question	Year	Response
Other predator control in area this year		
Who undertook control?		
Effectiveness		
Rainfall amount – summer		
Rainfall amount – autumn		
Rainfall amount – winter		
Rainfall amount – spring		
Unusual weather event/s and dates (eg extreme frost)		
Unusual pest event and dates (eg locusts)		

SURVEY 2
CROPPING AND WEATHER SURVEY FOR LOCAL LANDHOLDERS

Malleefowl monitoring site	Eg V23 Moonah
Malleefowl monitoring site	
Monitor	
Contact	
Position	
Location of paddock in relation to monitoring site	

Question	Year	Response
What is the current land use of this paddock?		
Is the paddock cropped?		
What type of crop?		
Summer/autumn grain available		
Malleefowl seen in crop		
Months/seasons		
Other Malleefowl observations		
Rainfall amount – summer		
Rainfall amount – autumn		
Rainfall amount – winter		
Rainfall amount – spring		
Unusual weather event/s eg extreme frost		
Unusual pest event (eg locusts)		
Abundance of foxes (H/M/L)*		
Abundance of rabbits (H/M/L)*		
Abundance of cats (H/M/L)*		
Abundance of kangaroos (H/M/L)*		
Other animals sighted (H/M/L)*		

* Note: (H/M/L) = High/Medium/Low

If possible, please supply a sketch drawing of the paddocks covered in this survey in relation to other paddocks and the monitoring site.

6.3 AN ANNUAL WEATHER CONDITIONS SURVEY

SURVEY 3
WEATHER CONDITIONS

Malleefowl monitoring site	Eg V23 Moonah
Malleefowl monitoring site	
Monitor	
Contact	
Position	
Location	

Question	Year/ time of year	Response
Annual rainfall compared to average		
Rainfall amount – summer		
Rainfall amount – autumn		
Rainfall amount – winter		
Rainfall amount – spring		
Winter temperature		
Summer temperature		
Days of extreme heat		
Days of extreme cold		
Days of extreme wind		
Unusual weather event/s (eg extreme frost)		

SECTION SEVEN

Additional On-Ground Data Collection

SECTION SEVEN

Additional On-Ground Data Collection

SECTION 7 WILL BE DEVELOPED AS THE IMPLEMENTATION OF THE NATIONAL MALLEEFOWL MONITORING PROGRAM PROGRESSES.

Five additional on-ground data collection possibilities have been identified. Strategies to collect valid scientific data will be proposed as recommendations to relevant agencies are developed. As most, if not all, of the additional data collection items are on a broader scale than the monitoring of Malleefowl mounds in selected sites across Australia, significantly different strategies will need to be employed.

The five identified data collection items are:
1. food and food pulses
2. annual herbs
3. shrubs
4. sand pad for foxes
5. kangaroo and other herbivores

Other items may be added to this list as further work is completed and as recommendations and proposals are developed.

When appropriate processes covering the five items above are identified and implementation strategies are documented, they will be added to the monitoring manual.

SECTION EIGHT

Specific State by State Detail

8.1 SAFETY

Each state will have their own requirements and legislation regarding volunteers working on public and private land. Therefore what is presented here is a guide based on the Victorian (VMRG) and the Western Australian (MPG) experience. Only headings and topics are listed, but a full description is available for others to read and use to suit their needs.

8.1.1 VICTORIAN MALLEEFOWL RECOVERY GROUP (VMRG) VOLUNTEER SAFETY PROCEDURES

1. Background to safety requirement

2. Preplanning before monitoring
   - Equipment
   - Familiarity with maps and communications procedures

3. Training is conducted annually, and all monitors are expected to attend annually
   - Individual capabilities
   - Records and data
   - Resources for monitors
   - Field work
   - Communications in the field

4. Additional resources
   - Instructions on the use of trunking portable radios
   - Designated VMRG safety officers, current monitoring season
   - Parks Victoria contacts for emergency escalation
   - Landline and trunk radio contacts for rangers in charge of all reserves
   - Field intentions logbook
   - Nominated remote sites

5. Additional documents
   - Basic first aid
   - How to use a compass.
   - Hints for driving off the beaten track
   - Bush fire safety precautions
   - Safe bush camping
   - Recommended safety supplies

8.1.2 PARKS VICTORIA VOLUNTEER SAFETY PROCEDURES

JOB SAFETY ANALYSIS WORKSHEET FORM C-0130

Parks Victoria requires all Victorian volunteer groups to complete a Job Safety Analysis Worksheet and have the document approved before any activity can be undertaken. The following is a summary of the headings that need to be addressed and approved.

Activity description

- activity outline
- indicate worst hazards

Hazards to be considered in the analysis

- personal safety
- safety of others
- plant
- chemicals – hazardous substances and dangerous goods

Activity in detail

- activity tasks – list the tasks required to perform the activity in the sequence they are carried out
- hazards – against each task list the hazards that could cause injury when the task is performed
- risk control measures – list the control measures required to eliminate or minimise the risk of injury arising from the identified hazard
- who is responsible? Write the name of the person responsible (supervisor or above) to implement the control measure identified

Post Activity Report

- any changes or additions recommended after the job have been completed

8.1.3 MALLEEFOWL PRESERVATION GROUP (MPG) IN-FIELD SAFETY PROCEDURES

In Field Safety

Should you become separated from the team:

- **admit** to being lost when you don't know which way to return to others
- **stay put until found** – if you have a mirror, it can be used to attract attention in the direction of the search group by reflecting sunlight
- stay alert and listen for others (someone will be searching for you)
- if you are not located within hours, you may elect to move to high point within 50m
- last resort – light a **safe** fire to attract attention (smoke during day from burning green leaves, fire light at night)

In Field Check List

You will leave the camp approximately 8.00am and return approximately 4.00pm. The following check list is provided for your comfort.

PERSONAL CHECKLIST

Compulsory

- orange safety jacket**
- water
- hat
- safety or sun glasses**
- lunch and snack food
- sunscreen
- note pad and pencil
- optional
- lip salve and bandaids
- compass*
- toilet paper
- matches
- rain coat
- pieces of flagging tape**
- GPS and batteries**
- digital camera and batteries
- binoculars

** supplied by MPG
* limited supply by MPG

Mound Survey Check List

- CB radio/satellite phone
- GPS and spare batteries
- survey forms and pencil
- Palm
- clipboard and pencils
- watch
- tape measure/flagging tape
- compass

Team Equipment

- first aid kit (kept in vehicle)
- digital camera
- CB radio

Optional

- leg gaiters*
- gloves*
- small mirror

8.2 SUPPORT NETWORKS AND CONTACTS

8.2.1 MALLEEFOWL WEBPAGE LINKS

Victorian Mallleefowl Recovery Group website
http://www.malleefowlvictoria.org.au/

Malleefowl Preservation Group website
http://www.malleefowl.com.au

8.2.2 MALLEEFOWL VOLUNTEER GROUPS CONTACTS

VICTORIA
Victorian Malleefowl Recovery Group
25 Belfast Street, Newtown, Vic. 3220
email: annos@iprimus.com.au

Wedderburn Conservation Management Network
Wedderburn, Vic. 3518
email: pmorieson@dse.vic.gov.au
website: http://www.wedderburnonline.net/wcmn

SOUTH AUSTRALIA
Friends of Kimba District Parks
PO Box 72, Kimba SA 5641

Friends of Streaky Bay District Parks
6 Feltus Street, Streaky Bay SA 5680
Phone: (08) 8626 1272

Friends of Riverland Parks
PO Box 831, Berri SA 5343.
Secretary Kevin Smith
Phone: (08) 8583 5430
email: aquila@riverland.net.au

Gluepot Reserve
PO Box 345, Waikerie SA 5330
Phone (08) 8892 8600,
email: gluepotreserve@bigpond.com
website: www.riverland.net.au
Malleefowl survey coordinator: Kevin Smith
Phone: (08) 8583 5430,
email: aquila@riverland.net.au

WESTERN AUSTRALIA
Malleefowl Preservation Group
PO Box 29, Ongerup, WA 6336
email: malleefowl.wa@wn.com.au

North Central Malleefowl Preservation Group
PO Box 58, Dalwallinu.
Fax: 08 9655 1832
email: sallycail@westnet.com.au
Friends of North East Malleefowl (FONEM)
Contact Mick Davis
Mobile: 0429 473 467

8.2.3 ENVIRONMENT GROUPS

World Wide Fund for Nature
http://wwf.org.au

Birds Australia
http://www.birdsaustralia.com.au

The Wilderness Society
http://www.wilderness.org.au

Australian Conservation Foundation
http://acfonline.org.au

Bush Heritage Australia
http://www.bushheritage.com

8.2.4 GOVERNMENT ENVIRONMENT DEPARTMENTS

COMMONWEALTH
Department of Environment and Water Resources
http://www.environment.gov.au/index.html

Department of Environment and Water Resources/Biodiversity
http://www.environment.gov.au/biodiversity/index.html

Department of Environment and Water Resources/Parks and Reserves
http://www.environment.gov.au/parks/index.html

Natural Heritage Trust
http://www.nht.gov.au

VICTORIA
Department of Sustainability and Environment:
http://www.dse.vic.gov.au

Parks Victoria
http://www.parkweb.vic.gov.au

NEW SOUTH WALES
Department of Environment and Climate Change
http://www.environment.nsw.gov.au/index.html

SOUTH AUSTRALIA
Department for Environment and Heritage
http://www.deh.sa.gov.au

Eyre Peninsula Natural Resources Management Board (EPNRM)
Andrew Freeman, NRM Officer, Southern Eyre
PO Box 2916, 36 Napolean Street, Port Lincoln SA 5606.
Phone: (08) 8682 5655, Mobile: 0429.673123, Fax: (08) 8682 6219
email: andrew.freeman@epnrm.com.au

Department for Environment and Heritage, Port Lincoln
PO Box 22, Port Lincoln, SA 5606.
Phone: (08) 8688 3111.
Contact Sarah Way
email: way.sarah@saugov.sa.gov.au

SA Murray Darling Basin
Dave and Heidi Setchell, Mallee Eco Services
PO Box 1649, Loxton. SA 5333
Mobile: 0428 873 090, email: heidi.dave@bigpond.com

South Australian Malleefowl monitoring contact sheet

Region	Contact	Work Phone	Mobile Phone	Email
Murraylands/ Riverland	David & Heidi Setchell		0428 873 090	heidi.dave@bigpond.com
Murraylands/ Riverland	Jody Gates	08 8595 2204	0428 892 751	gates.jody@saugov.sa.gov.au
Murraylands – Calperum/ Taylorville Stations	Grant Geyer		0429 694 187	clm@communitylandmanagement.org.au
Eyre Peninsula	Andrew Freeman	08 8682 5655	0429 673 123	andrew.freeman@epnrm.com.au
South East	Vicki Natt		0428 673 273	whynunga@seol.net.au
South East	Dan Harley	08 8735 1172	0428 101 184	harley.daniel@saugov.sa.gov.au
Yorke Peninsula	John Gitsham	08 8854 3200	0408 824 546	gitsham.john@saugov.sa.gov.au

Note:
For sites in SA Heritage Agreements contact the coordinator in that region.
For Gluepot sites, contact Murraylands coordinators

WESTERN AUSTRALIA
Department of Environment and Conservation
http://www.dec.wa.gov.au

8.2.5 OTHER ORGANISATIONS

Western Australian Malleefowl Network (WAMN)
Contact details and information are available about the Malleefowl project in WA from the following sites: www.wwf.org.au and www.avonnrm.org.au

Yongergnow Malleefowl Centre
Jaekel St, Ongerup. WA 6336.
Phone: (08) 9828 2325 website: http://www.yongergnow.com.au

Conservation Council of WA
http://www.conservationwa.asn.au

8.2.6 WEATHER AND FIRE INFORMATION

Bureau of Meteorology
http://www.bom.gov.au

Victorian Department of Sustainability and Environment
Statewide fire situation:
http://www.dse.vic.gov.au/fires/updates/report

8.2.7 TELEPHONE INFORMATION – MOBILE COVERAGE

Optus Mobile Coverage maps (GSM only)
http://www.optus.com.au

Telstra mobile coverage maps (GSM & CDMA)
http://www.telstra.com.au

Vodafone mobile coverage maps (GSM & Satellite)
http://www.vodafone.com.au

SECTION EIGHT

Specific State by State Detail

NOTE: If there are organisations that wish to be added to this contact list, or if the details are incorrect, please contact Ann Stokie from the Victorian Malleefowl Recovery Group,
25 Belfast Street, Newtown, Vic. 3220
or annos@iprimus.com.au

APPENDIX ONE

Establishing and Re-searching Malleefowl monitoring Sites

APPENDIX ONE

Establishing and Re-searching Malleefowl monitoring sites



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APPENDIX ONE

Establishing and Re-searching Malleefowl monitoring sites

1. INTRODUCTION

Malleefowl have declined substantially throughout Australia since European settlement, and are now considered threatened across all remaining areas of their range. While this decline has mostly been due to the clearing, grazing, and burning of the Mallee for agriculture, there is a growing concern that Malleefowl populations may be declining even within conservation reserves. To answer this crucial question regarding the stability of Malleefowl populations, the number of breeding Malleefowl is regularly monitored at a series of sites throughout their range in Victoria, South Australia, New South Wales and Western Australia.

Malleefowl mounds are reasonably conspicuous and are a good indication of the birds' presence in an area. The number of active (i.e. presently used) mounds in an area fluctuates over time, providing us with an indication of trends in reproductive output. This information is obtained by thoroughly searching the chosen area for all Malleefowl mounds, both active and inactive. The location of every mound that is found in an area is accurately recorded, to enable us to return to them to check whether they are being used. This area, if established as a permanent monitoring plot, is referred to as a site. It must be stated that searching sites and monitoring mounds refer to two different procedures:

a) searching a site refers to thoroughly searching an area to locate and record all Malleefowl mounds, and
b) monitoring mounds refers to gathering data on every mound already located, within a site. Protocols for monitoring mounds are included in the national monitoring system manual.

This document is designed to be used by staff and volunteers involved in establishing and/or searching Malleefowl sites. It also provides criteria for establishing a mound monitoring site, describes how to set up a site, describes the methods to be used in the initial and subsequent searches of the site, and makes suggestions as to how various tasks can be best accomplished. It is important that standard methods are used for the establishment and monitoring of sites so that monitoring results from different regions are directly comparable.

APPENDIX ONE

Establishing and Re-searching Malleefowl monitoring sites

2. MONITORING MALLEEFOWL SITES

The monitoring of Malleefowl sites is the primary method for determining Malleefowl breeding trends on a national scale. Traditionally, Malleefowl sites have been set up in areas where mounds have been known to exist, and/or opportune sightings of birds have been recorded. Sites are located in Malleefowl habitat, which is largely found in the semi-arid to arid zone in shrub land or low woodlands dominated by Mallee. Malleefowl require a sandy or loamy substrate and an abundance of leaf litter to construct their nests. Sites are blocks of habitat, normally covering an area of 2–4km2, a size large enough to provide an estimate of breeding density, yet still small enough to manage. As at January 2007, around 30 sites were operational in northwest Victoria, with around 40 sites established throughout South Australia and 17 sites in Western Australia.

2.1 CRITERIA TO ESTABLISH A MALLEEFOWL MONITORING SITE

When proposing to establish a new site, the following points need to be considered.

- The site is established to provide data for State and National databases, in order to further the recovery objectives for the Malleefowl, as outlined in the National Recovery Plan for the Malleefowl 2005–2010 by Joe Benshemesh.
- As sites are designed to evaluate breeding activity, they should only be positioned in habitats that birds would be expected to nest in (eg exclude wetlands, salt-lakes, paddocks, where possible).
- The site should not occur in an area that is already well represented by existing sites (eg we only need to determine trends, not exact numbers). For example, a new site could incorporate previously unrecorded habitat, soil type or topography associations.
- The initial and subsequent searches of the area need to be thorough, and coordinated and attended by persons experienced in site searching.
- Enough volunteers (10–12) are on hand to participate in an initial, and any subsequent, thorough searches of the selected area.
- Volunteers (preferably more than one) are available to conduct ongoing annual monitoring of the site.
- Volunteers must undergo training in the standard monitoring techniques.
- A thorough repeat search of the site needs to occur at least every five years (involving 10–12 people again), and be coordinated and attended by persons experienced in grid searching.

If any of the above points cannot be adequately fulfilled, then reasons for establishing a new site must be re-evaluated.

There are some instances where sites are regularly surveyed; however, they are not actual sites that are part of the national monitoring system (see 6 – Alternatives to the establishment of a site).

Establishing and Re-searching Malleefowl monitoring sites

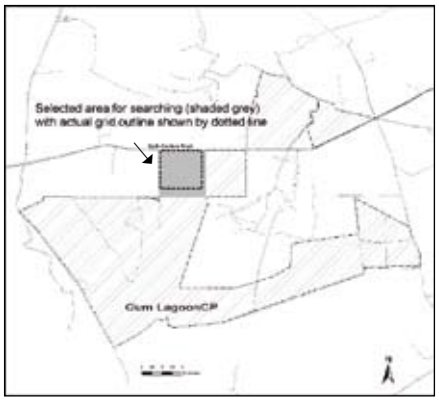

Fig 1

Fig 1 An area of Mallee woodland known to contain Malleefowl mounds within Gum Lagoon CP, south east SA, was selected as a proposed grid site (grey shaded area). The area measured 2.3 X 2.2km, with a road marking the northern boundary, and a dirt track marking the western boundary. The grid area subsequently selected is shown by dotted line over the searched area.

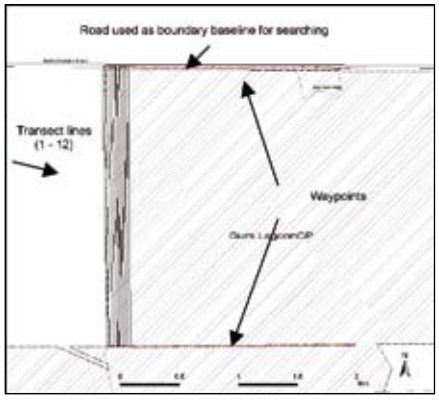

Fig 2

Fig 2 The road on the northern boundary was used as the baseline from which to begin searching the area. Waypoints were established every 20m, starting from the road junction in the north-west corner of the search area, and running 2km east along the northern boundary road. Equivalent points were established along another dirt track 2.3km south of the northern boundary, also extending 2km east. The first 12 transect lines used by the search team are marked on the map.

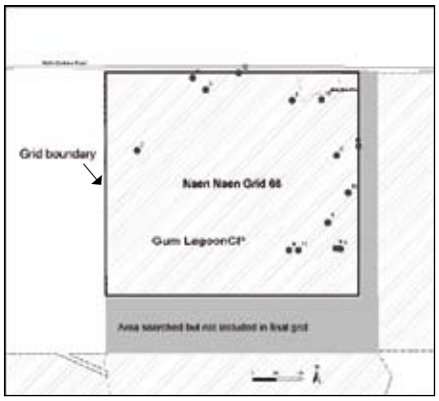

Fig 3

Fig 3 After the area was completely searched, all identified mounds were mapped, and a grid boundary established measuring 2 x 2km. The boundary was carefully chosen to include the roads (north and west boundaries); to include all mounds; and to exclude unsuitable habitat (melaleuca sand plains) along the southern boundary. This was then allocated the name and number of Naen Naen Grid 66. Each mound and the grid corners were duly staked, tagged and GPS points recorded for future identification and monitoring. Black dots show mounds.

APPENDIX ONE

Establishing and Re-searching Malleefowl monitoring sites

3. SEARCHING FOR MOUNDS IN THE SELECTED SITE AREA

3.1 INTRODUCTION

The first task in establishing a new monitoring site is to select an area of suitable Malleefowl habitat where mounds are known to occur (and preferably include signs of recent activity). The boundary of the site area is then clearly defined to enable the site area to be searched (see Figs 1, 2, 3 for example).

A team of around 10–12 people is then organised to undertake a broad search of the area, which is typically two to four km2 in size (or sometimes larger). The locations of all Malleefowl mounds that are found are recorded by GPS.

Surveying mounds provides the most accurate indicator of change in Malleefowl breeding densities and is one of the major research and monitoring priorities for the recovery of the species. It is therefore essential that the surveys are conducted accurately and that the following standardised techniques are used during each site survey.

3.2 SEARCHING AN AREA FOR MOUNDS

This is a major task in setting up a new site for long-term monitoring. In general, 2km X 2km is a realistic area to target in most cases. The aim of the search is to achieve **complete coverage** of the area, and this point is worth emphasising to all those involved. Inactive mounds are often conspicuous enough to be detected with peripheral vision, however active mounds are often inconspicuous until actually looked at (i.e. using central vision).

3.2.1 ROLES AND RESPONSIBILITIES OF TEAM LEADERS

A search is most easily conducted if 10–12 people are involved. The team should comprise of between one and three team leaders, and around 10 searchers.

At least one team leader should have previously been involved in the establishment of a new site or the re-searching of an existing site. This person should also be responsible for the collection of all data. It will be the team leader's responsibility to coordinate and organise the survey, be responsible for assessing the activity of all Malleefowl mounds, and record data on each mound. They should remain with the survey until it has been completed. Ideally three experienced team leaders will participate in each survey.

Team leaders should carry a hand-held radio, a whistle and GPS unit. The team leader keeps the line straight by making sure searchers along the line are not moving ahead too quickly or lagging behind.

The team leaders should decide on a system of signals to facilitate stopping and starting the survey (eg one whistle to stop when a mound is located and two whistles to resume the search after data is collected).
The survey is conducted by making consecutive sweeps through the search area, to locate and map all active and non-active mounds. Team leaders must have previous experience in the use of a GPS unit and in collecting data.

Team leaders are responsible for making sure the search team is keeping sharp attention on searching for mounds. They must be mindful that searchers are not getting too tired, thirsty or hot. Most importantly, mounds may be missed when searchers get tired. It is better to call it quits for the day rather than have casualties. Surveys should be fun and not an endurance trial.

On completion of a survey, the team leader should make sure that all searchers are accounted for, collect all equipment (eg radios, whistles, GPS units) and be responsible for returning it, and make sure that all data collected is delivered to the appropriate coordinating officer.

3.2.2 CONDUCTING A SEARCH

The team is generally spread out over a distance of 200m, so that each person is about 20m (maximum) from their neighbours. This may need to be closer (10–15m) in dense scrub, where visibility is diminished. Note: if people are spaced too far apart, mounds could be missed, especially in dense vegetation. Progress is usually about 1km/hr, though faster in open country, and searches usually take a number of days to complete. A road or track provides an ideal boundary or baseline for the search, from which to start and finish search transects.

The latest method used to search a proposed site is via GPS units, such that the lines or transects that people are supposed to walk appear on the GPS and help with navigation. Predetermined transect lines which are usually 20m apart are uploaded onto the GPS. GPS units are held by the persons/team leaders coordinating the search (usually at either end and in the middle of the search line), and more experienced people, if there are enough units to go around. If a mound is found, the location is recorded by GPS (by the person with the nearest GPS unit). Any other information that identifies the mound and describes its location may be recorded as notes. One full pass through the search area is termed a sweep.

3.2.3 TIPS ON CONDUCTING A SEARCH

A means of keeping the search orderly – search lines have a tendency to stretch out as one end of the line proceeds faster than the other. This can be prevented if those holding GPS units communicate their positions to each other (i.e. their distance along the transect). This is achieved either by sending a message down the line of people, by calling out, by using portable radios at the ends of the search line or by using whistles. It is recommended each person has a whistle for communication. The faster end of the line can then slow down, maintaining an efficient and orderly search. Sending messages up and down the search line has the added advantage of helping to maintain an orderly search because people are regularly reminded of where their neighbours are.

In WA, Susanne Dennings uses an angled system, where the search line is staggered, and each searcher is responsible for only one other team member 10-15m away and slightly in front (Fig 4). Advantages in this method are:

a. team leader maintains the sweep GPS position
b. it is easier for team members to maintain correct position by communicating forward rather than back to their team member, especially in thick vegetation
c. ensures individual responsibility for team efficiency (particularly line gaps)
d. it is easier to keep one person at the right distance and angle, rather than trying to decide which way to go when the person either side has veered off course

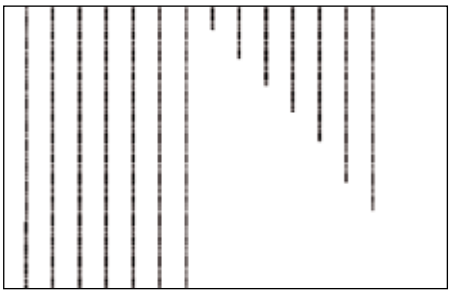

Fig 4

Fig 4 Example of the staggered line search method used in WA (diagram provided by Susanne Dennings).

Establishing and Re-searching Malleefowl monitoring sites

Number of people in the search line – numbering the people involved in the survey is a useful practice that enables a more efficient survey and has clear safety advantages (see below). Numbering should start with zero at the first transect line and increase up the search line. This can help when a mound is found and the searcher shouts out "new mound at 14" or blows their whistle. In this way it is quickly evident to the team leaders at which end of the line the mound is, and facilitates the nearest person with GPS unit in locating the mound. At the end of each site sweep the team moves across to the next 200m transect line, maintaining their original order in line.
Before commencing the return sweep, the line numbers off again.
That is, each person calls out their number, from zero upwards.
In this way it will be clear that no-one is left behind.

Evenly spacing people in the search line – it is important to start off with even spacing between people in the search, especially when using novices, as it establishes an ideal spacing. This is made easier with the use of GPS units.

Obtaining complete coverage – the purpose of a search is to find all Malleefowl mounds including old mounds. This will be achieved if everyone keeps in mind they are responsible for the area between themselves and two thirds the way to their immediate neighbours.

Uneven habitats, uneven searches – insofar that a habitat may be of even thickness throughout, an even spacing of the search line is best. However, even spacing is not as important as complete coverage. If one half of the search line encounters open habitat, and the other half thick habitat, it makes sense to have more people in the thick half or for the open end of the line to slow down to allow effective searching in the thicker habitat. The guiding principle is that everyone in the search line should be confident they are covering the ground between themselves and their neighbours.

Search leaders – it is often useful with novice groups to have one person walking up and down the search line reminding people to be mindful of the position of their neighbours and of the objectives of the search, and correcting problems as they occur.

Safety – the safety of individuals involved in a survey is of paramount concern to the person(s) supervising the survey in the field. The first concern should be not to lose anybody. It is thus prudent to occasionally check that no one has become separated from the group. When people are numbered this is easily accomplished by suggesting they **number off** whenever convenient (such as at the end of each sweep). Missing people are quickly revealed by this method. Orange safety vests are essential – an amazing help in seeing each other in the bush. In the event of a team member becoming lost, it is important to stress the need for that person to **remain where they are** until located rather than panic and move quickly in the wrong direction.

3.2.4 WHAT TO RECORD

The purpose of a search is to find and record the location of all mounds.
On finding a mound:

- record its location using a GPS unit (preferably on WGS84 Datum)
- tie flagging tape or other coloured tag above or near the nest. Later when this nest is visited the tape/tag will confirm that we are at the correct location. This is especially important for very old or inconspicuous nests.

Of course, you can record other interesting information too, such as the shape of the nest, the occurrence of litter trails, and other signs that may indicate whether the mound is being prepared for breeding. These notes are of great interest but are optional; trained monitoring personnel will visit all of the mounds that you record later in the year.

3.2.5 POINTS FOR THOSE INVOLVED IN A MOUND SURVEY

Everyone should have the following:

1. basic compass
2. clear directions of what to do if separated from the group
3. whistle
4. water
5. flagging tape to mark nests
6. notebook and pencil
7. bright coloured clothing, such as fluorescent safety vests
8. safety glasses or wrap-around sun glasses
9. back pack carrying water, bandaids, sunburn cream, snack food
10. be appropriately dressed – walking boots, wide brimmed hat, cotton long sleeved shirt and protective long pants

It is important to remind people involved in a site survey to:

- "use your eyes!" Mounds are frequently missed by people paying more attention to their GPS than the task at hand. The GPS is a tool used to achieve a thorough search, it is not the objective.
- use your voice! Keep track of your neighbours and slow them down if they are too fast. Do not tolerate gaps in the search line and stop the search and reorganise if gaps do appear. Be vocal to keep track of your neighbours in thick scrub.
- try to keep the line of people roughly even (this will minimise the distance between individuals and make the search easier and faster). To this end, it is useful to use handheld radios to ensure that each end of the search line is roughly the same distance through the search. Note: This does not apply to the 'angled' survey system.
- if you don't have a GPS, let those with GPS units be a few paces in front of you where you can see them more easily.
- it is okay to deviate from the GPS course, provided that the area between you and your neighbours is thoroughly searched. Eg should the person on one side encounter thick scrub, you can move towards them a little if your other side is more open and well covered. However, move back into position as soon as you can.

Establishing and Re-searching Malleefowl monitoring sites

4. DEFINING THE BOUNDARY OF THE SITE

4.1 SITE STRUCTURE AND MARKING

The site provides detailed information on Malleefowl mounds that occur in a clearly defined area. Site boundaries are generally determined prior to sites being generally searched in an area where Malleefowl are known to be present. Mounds found are recorded by use of GPS and then mapped within the site boundary determined on a map. Part of the site boundary may be denoted by an existing road, dirt track, fire track, etc., on one or more sides if possible, for ease of access and easier for team positioning if the starting boundary runs in a north-south or east-west alignment.

The actual site boundary should be marked by corner posts (eg metal star-droppers) together with GPS coordinates, recorded in WGS 84 Datum. Reflectors may be put on corner posts or in trees, to help with navigation.

4.2 MEASURING A SITE

Sites are generally rectangular or square in shape. The best size of a site depends on the objectives of the study, the size of the habitat patch, and the density of breeding Malleefowl; ideally a site should contain several active nests. Most sites in north west Victoria and South Australia are about 400ha (2km X 2km) – this is a convenient size for most purposes. Stakes/posts may then be placed to signify the corners of the site on the ground.
It is still advisable to decide on a boundary baseline (i.e. one side of the site boundary that preferably aligns north-south or east-west forms the baseline), from which all future site searches should be conducted.

4.3 MARKING MOUNDS

Each mound in the established site is given a unique number code comprising the site number, followed by a mound number identifying it within the site. Mound\s are permanently marked by a metal tag attached to a metal stake (galvanised fence-wire spacer). Both tags and stakes are placed about 5m due north of the mound centre. All mounds found within the sites should be permanently marked with a unique number code at the first available opportunity (generally on the next visit to the site). The metal tag should be stamped with the site number followed by the nest number, i.e. S13_24 = South Australia Site 13, Mound 24.

The accurate locations of nests are described by means of GPS coordinates, using eastings and northings and always using WSG84 Datum.

5. RE-SEARCHING A SITE

5.1 GUIDELINES

As Malleefowl tend to renovate old mounds rather than construct new mounds each year, each old mound has the potential to be active in the following breeding season. This makes it important that old mounds are revisited. It is still important to search the established sites reasonably regularly, as Malleefowl do occasionally build new mounds rather than renovate an old mound. Any new mounds that are found during these repeat searches are added to the list of mounds to check annually.

Ideally sites should be re-searched between five and ten years of the last search. This is sometimes difficult considering the number of people required to conduct a search and the inaccessibility of some sites. It is, however, especially important to re-search a site when:

- a major landscape change occurs in the vicinity of sites, particularly fire or land clearing, and also when malleefowl appear to be moving back into a site previously burned
- a significant decline or increase in breeding numbers has been recorded, especially if this decline or increase has been evident over a number of seasons; or
- the site has not been re-searched for more than five/ten years

It is also recommended that any initial and subsequent site searches be conducted in the cooler months, firstly, because the Malleefowl are not in the breeding phase; secondly, to avoid the discomfort of undertaking a site search in the heat of summer; and thirdly, to avoid possibly disturbing breeding birds with large numbers of people. This is not to be confused with mound monitoring, which occurs in the breeding season (generally October to December).

The process for re-searching a site follows the same guidelines as when conducting the initial search for mounds (see **3.2 'Searching an area for mounds'** in this Appendix), except that mounds previously found should already be staked and tagged. Note: if known (staked and tagged) mounds are missed during a re-search exercise, this provides some indication that the re-search exercise has not been thorough. One problem could be that people are spaced too far apart.

Once the search has been completed, all newly found mounds should be staked and tagged as soon as practicable, perhaps during the following monitoring season. Mound numbers should follow the next in the sequence.

5.2 WHAT TO RECORD

The following directions describe essential information for adding new mounds to our monitoring lists, and for evaluating the thoroughness of the search.

On finding a mound that does **not** have a stake/tag, you should:

- record its location using a GPS unit (preferably on WGS84 Datum)
- tie flagging tape or tag above or near the mound. (Later when this mound is visited the tape/tag will confirm that the correct location has been reached. This is especially important for very old or inconspicuous mounds.)

On finding a mound that **does** have a stake/tag, you should:

- record the mound number. This ensures that there will be a complete record of mounds in the site, including new and existing mounds.

Once again, other interesting information can be recorded, such as the shape of the mound, the occurrence of litter trails, and other signs that may indicate whether the mound is being prepared for breeding. These notes are of great interest but are optional; trained monitoring personnel will visit all of the mounds that you record later in the year. It is also a good idea to check tags when at a mound: check that the number corresponds to the GPS number, and check that it is in good condition. A note can then be made to replace it on the next survey, if needed. Also, if the mound is difficult to locate, a reflector could be put on the nearest tree to aid navigation.

6. ALTERNATIVES TO THE ESTABLISHMENT OF A SITE

While sites provide a sample area for monitoring purposes, there are many known mounds that are located in areas that are perhaps not suitable for setting up a site. Examples include patches of habitat that are too small, or where it is not possible to follow the necessary guidelines in monitoring a site (eg regular monitoring and re-searching). In such circumstances, there are alternatives to setting up a site.

Data on mounds not within sites may be collected and still form part of the state and national database, providing further information on Malleefowl and their breeding activity. An example of such 'opportune' data includes a number of mounds visited in the Gawler Ranges on northern Eyre Peninsula, SA. Around eight mounds have been monitored annually for a number of years by a local and keen enthusiast, and the data passed on for inclusion in the SA DEH state database. Because Malleefowl mounds in these arid areas are very low in density and hence scattered over a wide area, it is not practical to set up a site. At Yeelirrie Station in central WA, the Malleefowl Preservation Group organises systematic tracking every 2–3 years, which works on a transect system, not grids. Another example is a single mound monitored annually in Lincoln National Park, SA. This mound was found after the release of four Malleefowl into the park in 2001. Malleefowl had not been seen in this park since 1972, therefore the location of one active mound was a significant event, warranting further monitoring.

APPENDIX TWO

What to do with lerp

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What to do with lerp

1. GETTING TO THE INITIAL SPOT

1 (A) GPS SPECIFIC METHOD FOR FINDING PREDETERMINED STOPS

Site specific directions can be provided with a map, a set starting point and GPS waypoints where lerp counts should be taken. A typical lerp search map is included below.

SITE V04 BRONZEWING LERP COUNT

Rather than have one 2km transect, these directions describe two 1km transects on either side of, and parallel to, the track that bisects the Bronzewing site:

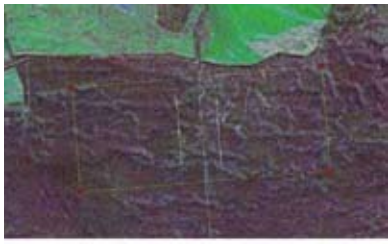
Starts and ends

Wpt	zone	easting	northing
04ST1	54h	622917	6102985
04END1	54h	622987	6101992
04ST2	54h	623480	6103042
04END2	54h	623550	6102049

Stops (15 stops times 2 lines each 1km)

88	618
151	712
261	751
309	772
326	799
411	881
515	982
591	

What it looks like



1 (B) GPS METHOD FOR FINDING PREDETERMINED STOPS

Lerpers should organise/select a waypoint at one side of the grid that they can walk back to, and mark it on the GPS (i.e. a vehicle; a point on a track or nearby nest).

Then, simply select a start point on the far side of the grid that is more than 1,500m from the selected waypoint, and such that the line to this waypoint sort-of bisects the grid (rather than sampling just one side).

On the GPS 'goto' the selected waypoint, and stop whenever the distance to the waypoint is shown on the table below.

To show the distance to the waypoint, you have to select the navigation screen (the one with the compass circle).

Try not to select the path. Follow the GPS guide, especially over the last few metres, to the stop.

The stopping points – stop at the following GPS distances in metres from the waypoint – 1500, 1480, 1371, 1361, 1333, 1325, 1294, 1227, 1197, 1083, 1065, 1044, 1012, 904, 874, 864, 735, 671, 656, 638, 625, 592, 494, 451, 317, 260, 170, 122, 83, 35.

2. COUNTING LERP

Lerp is a white waxy material produced by tiny sap-sucking scale insects called Psyllids. As lerp is an important food source for Malleefowl, and outbreaks of lerp occur occasionally, from time to time random surveys for lerp will be conducted.

To count lerp, use a screwdriver or similar implement with a 0.564m cord attached to prescribe a circle. At each stop the monitor throws the screwdriver over their shoulder behind them so there is no choice where it lands (i.e. let chance decide)! Wherever the point of the screwdriver lands is where the centre of the circle is situated. Obviously knock the darn thing out of the foliage if it gets stuck!

Simply count all lerp (even small ones) that are seen on the ground in this radius without scratching around. If several are stuck together, count them as one. If there are no lerp (look carefully), record as explained below, then move on. If there are hundreds, divide the circle into halves, quadrants or octants (or whatever) and count in a representative one of these, noting what the count should be multiplied by (2, 4, 8, etc).

APPENDIX TWO
What to do with lerp

3. COLLECTING LERP

The first five lerp are counted in each quadrat and placed in a single envelope. Thus, if there are lots of lerp in every quadrat a total of 150 lerp could be collected, although this is highly unlikely. The collected lerp samples are weighed and the numbers will be converted to kilograms of lerp per hectare. It is important **not** to choose lerp on the basis of size or colour or whatever; just collect the first ones counted (i.e. the first ones that the cord passes over as you prescribe the circle, starting from north and moving clockwise).

Place the lerp into an envelope, label it **lerps**, and record the grid number, date, and number of lerp in the envelope.

4. RECORDING ON CYBERTRACKER

Cybertracker will ask for a quadrat number (tap above to increment), the lerp count, and the multiplying factor (if appropriate) on the first screen.

The next screen will ask for some cover values for each circle (quadrat). This is not intended to be an exact measure but simply an opportunity to state the conditions on the ground; eg 20% sand and 80% light litter (leaves), or 70% deep litter and 30% to be an exact measure, but simply an opportunity to state the conditions on the Triodia (Spinifex).
It is intended to be fast and approximate, eg:

% sand	0	7	0
% light litter	0	0	0
% deep litter	0	2	0
% Triodia	0	1	0
% other	0	0	0

= 70% sand, 20% deep litter, and 10% Triodia

Most of the detail here is about processes that take away the decision of where to conduct a count. This is the crucial point; the process in itself is not important, its sole purpose is just to prevent conscious or subconscious choice of where to count. To get an average and representative estimate of what is out there randomisation is essential.

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