NATIONAL MALLEEFOWL

Monitoring Manual

NATIONAL Malleefowl RECOVERY TEAM

STANDARDS, PROTOCOLS AND MONITORING PROCEDURES

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INTRODUCTION AND ACKNOWLEDGMENTS

This revised edition (2016) of the National Malleefowl Monitoring Manual has been adapted largely from the 2008 edition with the inclusion of the recent changes in technology and the introduction and operation of the National Malleefowl Monitoring Database (NMMD).

The complexity of the task of producing a document of the magnitude of this Manual has required extensive consultation, discussion, review and editing from numerous people across all states. The Victorian Malleefowl Recovery Group adopted a collaborative approach in the development of the first document 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 2004 National Malleefowl Forum.

A major recommendation from the 2004 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 project (originally funded by the National Heritage Trust) was to develop, refine, train and teach the evolving system in Western Australia, South Australia, Victoria and New South Wales.

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.

This National Malleefowl Monitoring Manual has been produced in its second edition. 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 (e.g. 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 has been 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, e.g. 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, e.g. contacts and safety regulations which vary from state to state.

Finally, 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 in Malleefowl conservation evolve.

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 this revised edition, a dedicated group of people from all states have contributed significantly to discussions, development of ideas and concepts as part of the review process. We acknowledge their contributions.

The tremendous effort put in by Ann & Peter Stokie and their team in the production of the first edition of this manual is acknowledged. Their work and dedication is a lasting legacy in our ongoing effort in Malleefowl conservation across Australia for future generations.

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SECTION ONE
Introduction

1.1 AIMS OF THE NATIONAL MONITORING PROGRAM

The general aims of the National Malleefowl Monitoring 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 and maintain consistent monitoring across Australia
- refine the monitoring program so that future management actions that are most beneficial to Malleefowl conservation can be identified and demonstrated

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.

There is concern that Malleefowl will be unable to adapt to the threats of climate change because of their specific habitat requirements and their inability to move any great distance to a more suitable environment. The expected increase in temperature and decrease in winter rainfall are likely to result in decreased breeding activity and increase the frequency and severity of bush fires, leading to subsequent declines in population and local extinctions are likely to occur in some areas. If these predictions are correct, and if the changes are not arrested, substantial declines in Malleefowl populations are highly likely.

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 (EPBC Act 1999).

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 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 and distribution.

Malleefowl are shy and elusive birds, making counts of the birds themselves 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, thereby enabling monitors to return to the mounds for annual monitoring.

The monitoring of Malleefowl sites is the agreed method for determining Malleefowl breeding trends on a national scale. Historically, 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 to 4km², a size large enough to provide an estimate of breeding density, yet still small enough to be effectively monitored. Sites surveyed by air are generally much bigger and may be in the order of 10km² to 20km².

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/summer 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 at least every 5 to 10 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 breeding birds inhabiting specific areas. Observers (mostly volunteers) examine and categorise all the known mounds at each site as either active i.e. 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, in Western Australia since 2004 and NSW since 2014.

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, others have been more rigorously defined to reduce confusion, and a few data fields have been deleted as experience and analysis has shown they added little information.

New technologies over the past decade have changed the way data may be validated and have provided greater efficiency in data collection, and also reduced the need for some types of descriptive data. GPS, digital photography and digital data capture using handheld computers and CyberTracker software were introduced to the monitoring program in 2001. Android smartphones with inbuilt GPS and digital camera running CyberTracker software were introduced for the 2013 monitoring season.

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 Malleefowl Monitoring Manual – 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	Monitoring Guidelines and Protocols
Section 3	Monitoring Procedures and Processes
Section 4	Monitoring Equipment Guidelines
Section 5	National Database
Section 6	Specific State by State Details
Appendix 1	Establishing and re-searching Malleefowl monitoring sites

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 Section 2: GUIDELINES & 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 monitoring sites are explained. The procedures for establishing new sites and re-searching existing sites 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 Section 3: MONITORING PROCEDURES & PROCESSES

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 Android smartphones and on paper sheets as a backup are explained in written and diagrammatic form.

1.6 Section 4: MONITORING EQUIPMENT GUIDELINES

The operation of Android smartphones and CyberTracker software is set out in detail and a section on trouble-shooting to address common operational problems is included to assist volunteers in the field. The operation of the stand alone GPS and the digital camera is also described in the event that the Android smartphone fails whilst in the field.

1.7 Section 5: DATABASE

This section details the scope and general operation of the National Malleefowl Monitoring Database (NMMD), listing Operation, Management, Data ownership, Access & Security.

1.8 Section 6: 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 this Section. However, where these guidelines and networks and contacts have national significance the details have been included under the National heading.

1.9 **Appendix 1:** ESTABLISHING & RE-SEARCHING MONITORING SITES

This appendix outlines the criteria used to establish a new Malleefowl monitoring site and how to organise and conduct an initial search of that site. It discusses how to define the boundary of the site and the subsequent re-searching of monitoring sites. The final point discusses alternatives to the establishment of a site.

SECTION TWO
Monitoring Guidelines & Protocols

2.1 MONITORING EXISTING SITES IN ALL STATES

- Once a site has been identified as part of the national monitoring program:

    a) it will be labelled with a permanent national identification code (eg v01, s01, w01, or n01)

    b) 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:

    a) monitored annually, except where exceptional circumstances apply.

    b) Re-searched every five to ten years.

- New sites may be added to the monitoring program provided they have been established in accordance with 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, with the exception of optional 5 year mounds that will at least be monitored every fifth year but may be monitored annually if desired.

- Prior to visiting the site monitors need appropriate training, especially in regard to safety issues and requirements relevant to the site.

- It is preferable that monitoring occurs in the months of October, November, December or early January, however, if there are extenuating circumstances monitoring may start as early as September and finish beyond mid January.

2.3 MINIMUM DATA SETS AT LONG UNUSED (5 YEAR) MOUNDS

- Long unused (5 year) mounds are those that are very degraded and unlikely to be used again by Malleefowl; they are regarded as optional for monitoring most years, but are expected to be monitored every 5th year in the same way as regular mounds.

- Monitors may nominate a mound to be assessed for '5 year' status, preferably after the mound has been measured and photographed which will provide information that is important for assessment.

- Only database Ecologists can change the status of a mound to 5 year optional.

- The site ecologist, using a set of scientific criteria, will determine whether a nominated mound should henceforth be regarded as 5 year optional. The mound will not be removed from the database, and its status will be reverted to regular annual monitoring if it is ever renovated by Malleefowl.

  A long unused (5 year) mound will generally have the following attributes:
  1. An average rim height of 10 centimetres or less
  2. Have no obvious signs of Malleefowl visitation
  3. Have no history of ever being active
  4. Have had a photo and measurements recorded

- Long unused (5 year) mounds will be clearly designated in the database with the suffix ‘5yr’. Only those designated as such will be monitored every 5th year.

- Mounds found by chance during monitoring, even if deemed to be long unused (5 year) mounds, must be monitored using the full monitoring criteria. A recommendation for assessment may be made in the notes when the mounds are first monitored.

2.4 REMOVING MOUNDS FROM DATABASE

Data is generally not removed from the database, but under some circumstances records may be omitted from future monitoring lists if:

- they are deemed not to be Malleefowl mounds
- they could not be found despite several attempts over 2 to 3 seasons to locate the mound
- they are known to have been completely destroyed due to land disturbance e.g. mining, land clearing, road making.

These mounds will be marked in the database as 'Omit' and will no longer be included in any monitoring, either annual or 5 yearly.

2.5 ADDING MOUNDS TO THE MONITORING LIST FOR A SITE

- Mounds may be added to the monitoring list for a site if found during a re-search activity or incidentally during the monitoring of a site.
- Mounds found Incidentally during the monitoring should be monitored fully.
- Mounds found during re-searching of a site will be added to the monitoring list for the following season.

2.6 MOUNDS OUTSIDE MONITORING SITE BOUNDARIES

- Mounds that are outside the formal monitoring sites boundaries 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.
- 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.

2.7 SETTING UP NEW SITES (ALSO SEE APPENDIX 1)

- The basic consideration in determining whether a new site should be established is whether the area 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 climatic 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 have trained people monitor the site annually?

- In some circumstances establishing a site may be warranted for other reasons, such as local interest. The commitment to annual monitoring by trained volunteers and re-searching should still 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 described 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 needs to be given a nationally unique site number and mound numbers need to be allocated to each of the known mounds within the site. Site numbers should be allocated by the NMMD ecologist responsible for that area.
- On a subsequent visit all mounds should be staked and tagged with the appropriate site number and mound number (e.g. s52_12 means South Australian site 52 and mound 12).
  Stakes should be placed approximately 3–5m due north of the mound or the closest point not hindered by vegetation or other obstructions.
- In some cases a site that is searched may not become an annual monitoring site. Such a site would still 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.

2.8 RE-SEARCHING SITES (ALSO SEE APPENDIX 1)

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 over 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.

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. Re-searches should be initiated every five to ten years or more frequently if recovering from fire and Malleefowl are thought to be moving back into the area. Mounds that are found during these repeat searches are added to the list of mounds to be checked annually.

For further details on re-searching sites see appendix 1.

2.9 TRAINING VOLUNTEERS

- An annual training program for all volunteers is advisable in order to instruct newcomers, to maintain standards amongst old hands, and to facilitate contact amongst monitoring people.

- The training program may vary from state to state, or region to region, but should cover the following sections:
  - the aims of the monitoring program
  - monitoring equipment and it uses
  - safety procedures
  - introduction to the monitoring manual
  - site maps and location of sites
  - data and equipment management

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

- It is preferable that new monitors on their first visit to a site for monitoring should be accompanied by an experienced monitor.

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

2.10 ANNUAL MONITORING CYCLE

Monitor Training – monitor training is a crucial element of the monitoring cycle as it is where skills are revised, changes to monitoring systems and equipment are explained and experiences are shared. Regular attendance at training events is important to ensure scientifically reliable and efficient monitoring.

Equipment distribution – monitors need a specific Android device & a GPS for monitoring sites, but there is a limit to the number available. A distribution process is often used 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 CyberTracker and GPS running on an Android device.

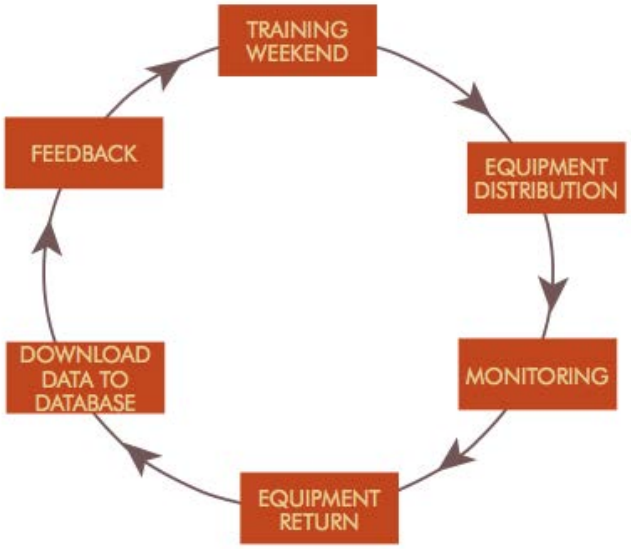
Equipment return – once monitoring is completed, equipment is returned promptly to assist with the turn-around of equipment to other monitors.

Data upload – the collected data is uploaded to a computer and then transferred to the National Malleefowl Monitoring Database (NMMD) electronically where it is checked, validated, annotated and stored.

Data validation – once the data has been uploaded to the NMMD, an ecologist checks and validates the data.

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, Definitions and Instructions

3 MONITORING PROCEDURES, DEFINITIONS AND INSTRUCTIONS

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 an Android device running the CyberTracker application.

The following sections assumes monitors have received monitoring training, have an Android device with CyberTracker installed and have access to other necessary information e.g. safety procedures, maps etc, and are involved in the monitoring effort.

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

- definitions are listed initially
- definitions are followed by detailed step by step instructions of how to complete the CyberTracker monitoring sequence, together with diagrams where appropriate
- the CyberTracker monitoring sequence is followed by an explanation of the paper data recording sheet and a copy of the sheet

3.1 DEFINITIONS

3.1.1 SITE / MOUND REFERENCE

Two categories describe the location of the site and mounds to be monitored:

Site – each monitoring site has a distinct and unique site number to indicate the state and the number of the site E.g. n01 refers to NSW site 01.

Mound – each mound within a site has a distinct and unique 3 digit number to identify the mound within the site. E.g. w02_003 refers to WA site 2, mound 3.

3.1.2 LOCATION OF MOUNDS

All known mounds within a site have a GPS location, recorded in WGS84 datum, and are plotted on a site map. The GPS location refers specifically to a mound.

3.1.3 DATE & TIME

The date and time is automatically attached to each record in CyberTracker and requires no input from the user.

3.1.4 NAMES / STATE

A list of registered monitors for each state is listed in the Monitoring sequence.

3.1.5 NEW / KNOWN MOUND

'Known mound' is a mound that has previously been recorded and is 'known' to the NMMD

'New mound' is a previously undiscovered mound that has been found during the routine monitoring process

3.1.6 MOUND NUMBER
Each mound within a site has a unique three digit number to identify it within that site.

NOTE: If monitoring a new mound to the site, use the number 0 and make a note on the notes screen.

3.1.7 REVISITED OK
A known mound is 'Revisited'

3.1.8 SOUGHT, NOT FOUND
A mound is sought but is not able to be located,

3.1.9 NOT SOUGHT
A mound that is not sought for any reason. It may be a new mound to the site or a known mound that has been found during monitoring.

3.1.10 STAKE / TAG

STAKE - Mounds are marked with a permanent identification stake. These are usually galvanised wire spacers – 'droppers' – and are usually driven into the ground around 3 to 5 metres north of the mound.

TAG – A permanent metal tag with the site and mound number stamped onto it is attached to the top of the stake.

3.1.11 PROFILES (photos of profiles are shown on the following page)

Monitors need to select the most appropriate profile that best resembles the mound.

1. Typical crater with raised rim
this is the typical shape of an inactive (dormant) mound.

2. Mound fully dug out
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 some sand mixed with the litter at this stage.

4. Mound mounded up (no crater)
an active but unopened Malleefowl mound.

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

6. Mound low and flat without peak or crater
a very long unused mound, or a deliberately flattened mound late in a breeding season to capture heat from the sun.

7. Very large flat mound
very broad and flat and will generally measure in excess of 10m in diameter. These mounds are thought to have been made by a species of mega fauna, a bird similar to Malleefowl but much larger. The mega mound may have a more recent mound on top of it.

Mound Profiles

Profile 1 mound

Profile 2 mound

Profile 3 mound

Profile 4 mound

Profile 5 mound

Profile 6 mound

3.1.12 IS THE MOUND ACTIVE?

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 in the sequence, and must not be confused with mounds where Malleefowl activity, e.g. litter trails, prints, scrapes are obvious. Do not record a mound as active when only such Malleefowl activity is present

3.1.13 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 inactive mounds on departure from the mound. Monitors need to decide on the status of the Xsticks placed during monitoring the previous year.

- **In Cross** - If the Xsticks still form a X when a mound is inspected, the mound has obviously not been disturbed since it was last visited in the previous year
- **Displaced on mound** - Xsticks may still be present on the mound, but have been disturbed and no longer form a X
- **Gone** - Xsticks may be gone from the mound

XSticks on a mound

3.1.14 SCRAPED

Whether or not the surface of the mound has recently been disturbed and refers to the entire surface of the mound and not isolated diggings or scretchings. 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.

- **Freshly Scraped** - the disturbed surface is not visibly distinct: the mound is regarded as scraped
- **Not freshly scraped** - the disturbed surface is distinct: the mound has probably not been worked by Malleefowl for at least a day or so (or it is very windy or wet from recent rain)

3.1.15 EGGSHELL

Three categories represent the abundance of eggshell fragments on the mound:

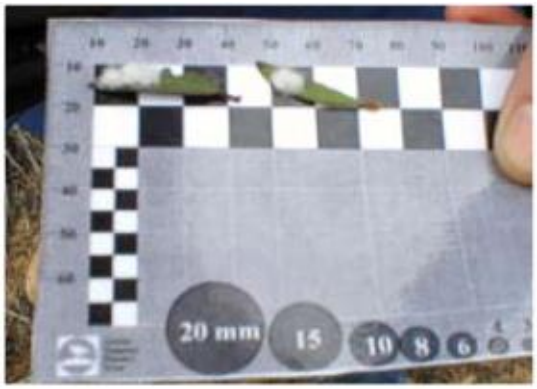
- **Lots** – 10 or more pieces are clearly visible
- **Some** – 1 to 10 pieces are visible
- **None** – No eggshell is visible after a good look

3.1.16 LERP ON MOUND

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.

Monitors count any lerp that are evident on the mound:

- **Lots** – 10 or more lerp on the mound
- **Some** – 1 to 10 lerp on the mound
- **None** – No lerp are visible on the mound after a good look



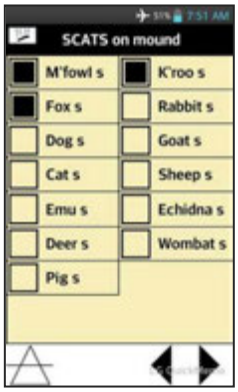
3.1.17 PRINTS

Prints of animals on the sandy surface of the mound (not nearby) are recorded, especially those of Malleefowl, fox and kangaroo. Other animals are also listed but if there are prints on the mound that are not listed, make a note on the Notes screen. Whether or not Malleefowl prints appear on the mound is the most important, and fox prints are the next in importance.

- **Malleefowl** – 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** – whether or not fox footprints are evident on the surface of the mound.
- **Other** - whether or not other footprints are evident on the surface of the mound.

Malleefowl Print

3.1.18 SCATS



Animal scats that are on the sandy surface of the mound (not nearby), especially those of Malleefowl, Fox and kangaroo. Other animals are listed but if there are scats on the mound of animals that are not listed, make a note on the Notes screen. Whether or not fox scats occur on the mound is of particular importance.

- **Malleefowl** – whether or not Malleefowl scats are evident on the surface of the mound. Where Malleefowl scats are collected for analysis they are placed in a paper bag and labelled with date, site, mound details & collector's name.

  NOTE: If required, Malleefowl feathers are also collected in an envelope and labelled with date, site and mound details. Feathers are collected for DNA studies. DNA is collected from the shaft of the feather and this area should not be touched directly with fingers as the DNA may be contaminated by the monitor's DNA.

- **Fox** – whether or not fox scats are evident abundance of this predator within the general area. **It is important to thoroughly scan the 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 bag.

- **Other** - whether or not other scats are evident on the surface of the mound

Malleefowl Scat

INNER SURFACE - 'NONE - SOME - LOTS' CATEGORIES

The next three catagories apply to the inner part of the mound only i.e. The surface of the mound inside the rim or roughly 2 metre diameter circle at the centre of the mound if there is no rim.

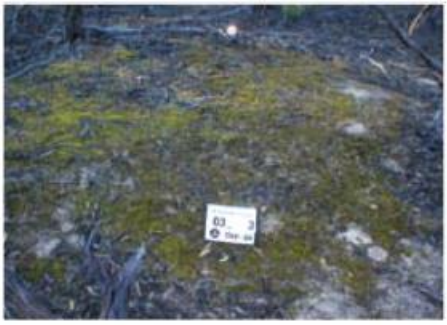
3.1.19 INNER CRUST

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.

- **Lots** – a heavy crust over more than one third of the inner mound surface
- **Some** – a well defined crust over less than one third of the inner mound surface
- **None** – no crust is present

3.1.20 INNER MOSS / LICHEN
How much of the inner surface of the mound is covered with moss and/or lichen:

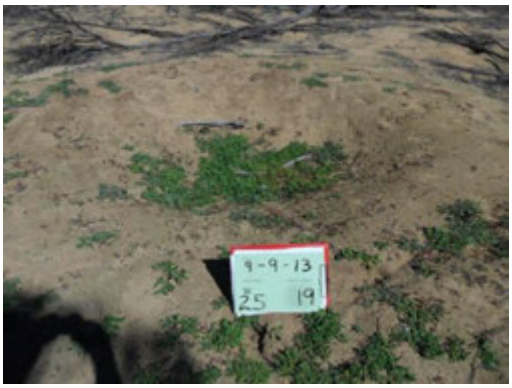
- **Lots** – moss and/or lichen covers more than one third of the inner mound surface
- **Some** – moss and/or lichen covers less than one third of the inner mound surface
- **None** – no moss and/or lichen is present



3.1.21 INNER HERBS

How many herbs are present on the inner surface of the mound:

- **Lots** – there are more than 10 individual herbs over the inner surface of the mound
- **Some** – there is less than 10 individual herbs over the Inner surface of the mound
- **None** – no herbs are present



3.1.22 DIMENSIONS

The mound dimensions can be measured using a tape measure, but the fastest and easiest way is to use a mound measuring pole and a tape measure.

MOUND MEASURING POLE

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 eight 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 using the cord.
- The height of the mound can be deduced by averaging two measures. The first, height north, is measured by sighting across the mound across 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 touching both sides of the rim.
- The rim diameter can be measured either along the cord, or with a tape measure.

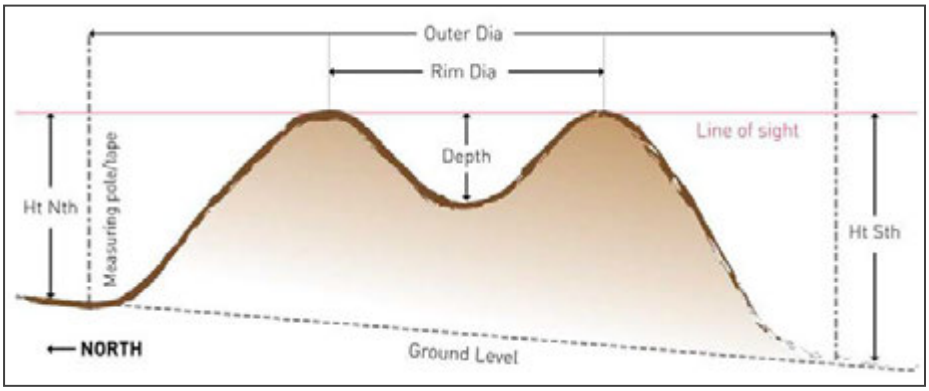
The following four categories describe the dimensions of the mound. By convention**, mounds are always measured in a north/south line across the mound.**

HEIGHT (Centimetres)
The height of the mound above the ground. Two boxes on the sequence are provided for this measure. The Height North (Ht Nth) and Height South (Ht Sth) are both measured.. For mounds with a crater, the height measures are 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

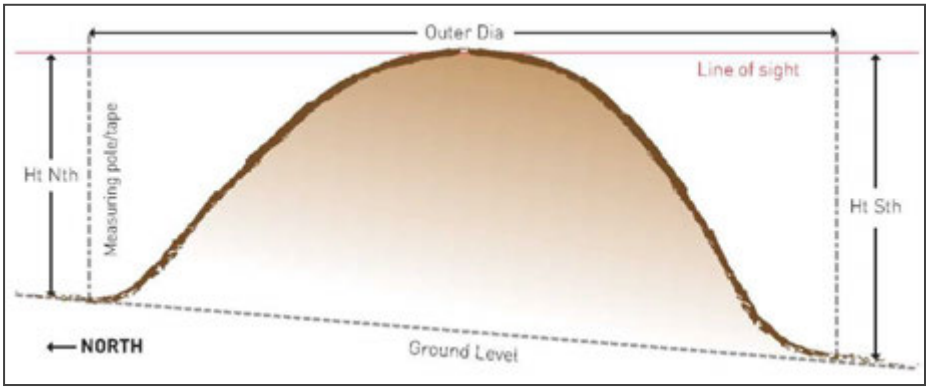
DEPTH (Centimetres)
The measure taken is the vertical distance from the base of the crater to a horizontal line drawn from the top of the rim on the north side to the top of the rim on the south.

OUTER DIAMETER (Centimetres)
The outer diameter is the outer most limit of the mound; the distance across the mound from the northern outer edge to the southern outer edge. Sometimes a mound will have two outer diameters, 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 DIAMETER (Centimetres)
The rim diameter is the distance across the mound from the top of the northern rim to the southern rim.



Profile 1 Measurements



Profile 4 Measurements

3.2 MONITORING PROCEDURES - INSTRUCTIONS

3.2.1 ANDROID DEVICE / CYBERTRACKER INSTRUCTIONS

This section describes the step by step process required to complete the CyberTracker sequence using an Android device.

HOME SCREEN

1) Start the Android device by pressing and holding the Power/Lock key for around 1 second (see **Section 4.1**, **Page 53**).
2) Swipe the screen to unlock it.
3) Open the CyberTracker (CT) screen by tapping the CyberTracker icon on the home screen.

2) Tap the sequence name to start the CT sequence. The sequence name will change each year to reflect the current season e.g. **MF2015**

CyberTracker Controls:

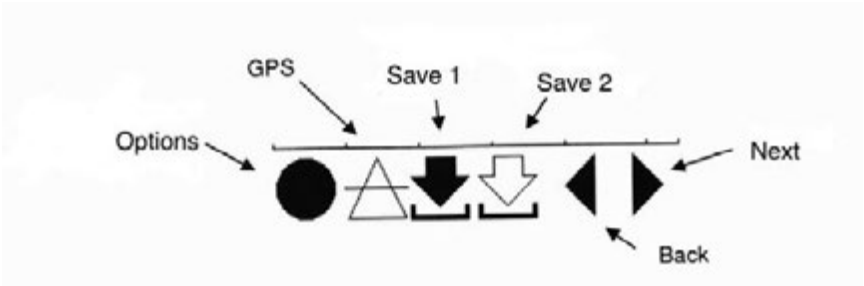
GPS: Takes you to the GPS function – (See **Section 3.2.2**, **Page 49**)

Save 1: This function takes a GPS fix, then returns the sequence to the ***Start Android*** screen

Save 2: Records a GPS fix and saves the current record, then returns the sequence to the ***DoWhat*** screen ready to record the next mound

Back: Returns the sequence to the previous screen

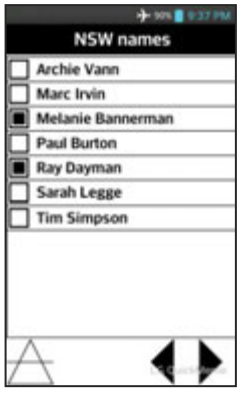
Next: Moves to the next screen in the sequence (may require data input first)



NOTE: Not all controls are available on all screens, only the relevant controls for that screen will appear

3) Tap on **Names** and CT moves to the ***'Names – select a state'*** screen

4) Tap on a state and CT moves to that State's **Names** selection screen



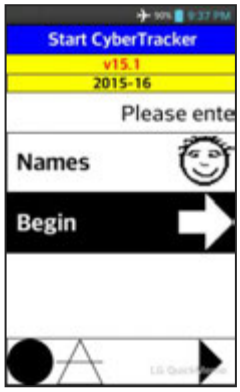
5) Select the name/s of the monitors by tapping on their names. One or more names can be selected. Once selected, the box to the left of the name will have a black centre.

If your name/s do not appear on the list use **'Unlisted (Add name to Notes)'** and enter your names when you get to the **'Notes'** screen.

Note: If not all names are visible, navigate down the list of names by using the scroll bar on the right.

Tap ***Next***.

These names will appear on all subsequent records until they are changed or the data is uploaded.



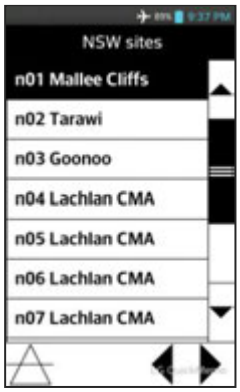
6) Tap **Begin** and CT moves to the **Site-State** selection screen

7) Tap on a state and the sequence moves to the **State Site** selection screen for that state

8) Select the site

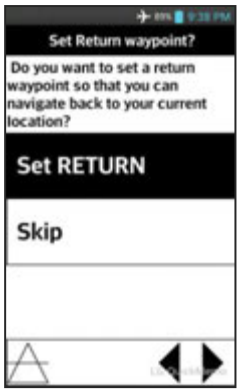
Note: Navigate down the list of site names by using the scroll bar on the right.

Tap ***Next***



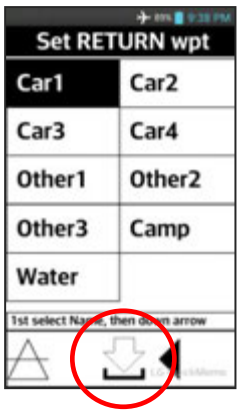
9) Select ***Set RETURN***, then tap ***Next***

If you do not wish to set a return waypoint, select ***Skip***, then tap ***Next***



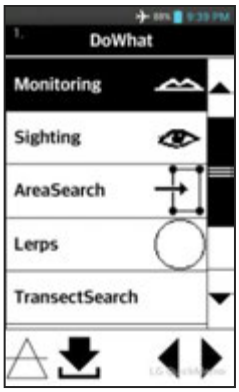
The set return waypoint is used to record a waypoint prior to heading into the field to enable the monitor to return to that location. This waypoint is stored at the top of the **'GOTO'** list.

10) Select a return waypoint name and then tap the down arrow



This saves the waypoint to the top of the **GOTO** list to enable you to navigate back to this location.

NOTE: The sequence up to this screen need only be completed once at the commencement of monitoring on each grid. If you change grids the sequence will need to be started again from the ***Start CyberTracker*** screen and the new grid details selected. Use the CT back button to cycle back the ***Start CyberTracker*** screen.



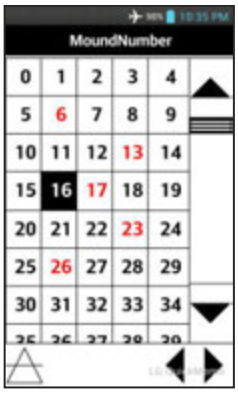
11) Select Monitoring, then tap ***Next***

NOTE: At the completion of monitoring each mound, the sequence will return to this screen ready to record the next mound.

12) Select ***Known mound*** if you are monitoring a mound already known to the grid.

Select ***'New' mound*** if you find a new mound to the grid.

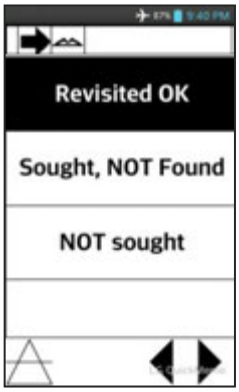
Tap ***Next***



13) Select the mound number to be monitored, then tap ***Next***

- The mound number of mounds already monitored will be **RED**.
- If monitoring a new mound to the grid, use the number 0 and make a note on the notes screen.

NOTE: If you change grids before the device has been uploaded to a PC some of the numbers will be **RED** from the first grid/s. If this is the case the **RED** numbers can be used again.



14) If you are visiting a known mound and have found it, select ***Revisited OK***, then tap ***Next***

If you search for a known mound but are unsuccessful in locating it, select ***Sought, NOT Found***, then tap ***Next*** and enter a note on the next ***Notes*** screen.

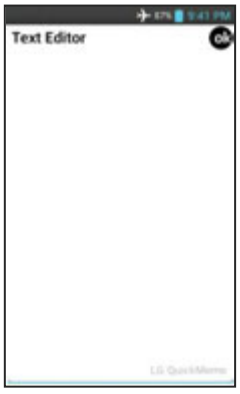
If you deliberately do not search for a mound, e.g. a 5 year mound, select ***NOT sought***, then tap ***Next*** and enter a note on the next ***Notes*** screen.

If you select **Sought, Not Found** or **NOT sought** the sequence will follow a shortened sub-sequence & the step will be point **14a** below.

If you select **Revisited OK** the next step in the sequence is point **15**.

14A) Tap the ***Notes*** screen ***(Tap to edit)*** to open the Text Editor

14B) Tap the ***Text Editor*** screen to open the on-screen keyboard



14C) Enter a note by tapping the keys on the on-screen keyboard, then tap ***ok*** in the top right corner

- Toggle between letters and numbers by highlighting the required format at the bottom left of the keyboard.
- As details are typed they appear in the ***Text Editor*** screen.
- The notes can be edited easily by tapping in places where corrections are required.

14D) The note now appears on the '**Notes'** screen

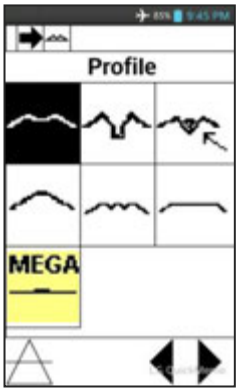
Tap ***Next***

14E) Tap the ***down arrow*** to return to the ***DoWhat*** screen ready to record the next mound

15) If the mound requires a Stake and/or Tag, select either or both

If the mound already has a Stake & Tag, leave the boxes blank.

Tap ***Next***



16) Select the profile that best resembles the mound

Tap ***Next***

MOUND PHOTOS

Photographs of mounds provide an important reference that summarises several features and provides a means of checking suspect mound descriptions. Photographs are taken from within the sequence using the camera in the Android device.

Mound Photos

Photos of mounds should be taken:

- from within the CT sequence in landscape orientation i.e. device on its side.
- from the direction of the stake/tag looking toward the mound
- from a standing position as close to the mound as possible but ensuring the full width of the mound and some background is captured
- with a photo board displaying correct details in the foreground: **'Site Number_Mound Number'** on the top row & **'Day_Month_Year'** on the bottom row.

Photo Board

17) To take a photo of the mound, tap the screen (***Tap to capture***) to open the camera

18) Frame the image in **Landscape** format **i.e. Device on its side,** then tap the camera icon at the side of the screen

- Photos should show the entire mound and include some of the background

19) Once the photo appears on the screen and you are happy with it, tap ***OK***

If you are not happy with the photo and do not wish to save it, tap ***Cancel*** and retake the photo. Once ***OK*** has been selected the photo is embedded into the mound record and a copy is also saved onto the device memory.

20) Make sure the photo appears on the **'Camera:mound'** screen
If it doesn't, tap the screen to re-open the camera and re-take the photo.

If the photo appears on the screen, tap ***Next***

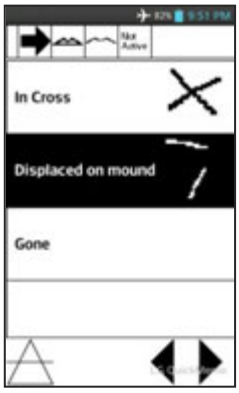
21) If the mound is active, select ***Active***

If the mound is not active, select ***Not Active.***

Tap ***Next***

<u>Active mounds are those that are currently being used by Malleefowl as an incubator for their eggs, and are likely to contain eggs.</u>

This is the most important category in the sequence, 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.



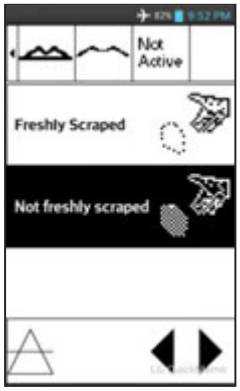
22) If the cross sticks still form a X on the mound, select ***In Cross***

If the cross sticks are still present on the mound but no longer form a X, select ***Displaced on mound***.

If the cross sticks are no longer on the mound, select ***Gone.***

Tap ***Next***

23) If the mound has been freshly scraped, select ***Freshly Scraped.*** If the mound has not been freshly scraped, select ***Not freshly scraped***



Tap ***Next***

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.

- **Freshly Scraped** - If the surface you disturbed is not visibly distinct the mound is regarded as scraped.
- **Not freshly 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).

24) EGGSHELL - select ***None***, ***Some*** or ***Lots*** as determined by the on screen description

- **Lots** – 10 or more pieces of eggshell are visible
- **Some** – 1 to 10 pieces of eggshell are visible
- **None** – no eggshell is visible after a good look

Tap ***Next***

25) LERP - select **None, Some** or **Lots** as determined by the on screen description

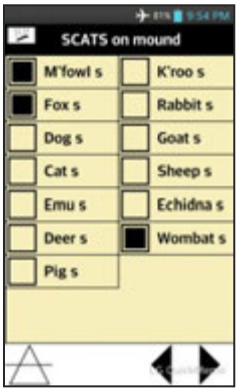
- **Lots** – 10 or more lerp are visible
- **Some** – 1 to 10 lerp are visible
- **None** – no lerp are visible after a good look

Tap ***Next***

26) PRINTS - select any prints you have identified on the mound by tapping on them on the screen

If no prints have been found, leave all the boxes blank and tap ***Next***.

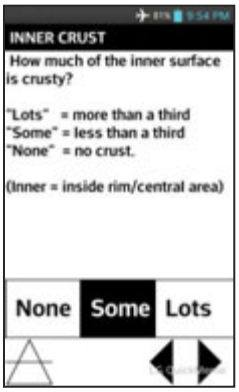
If you find prints that are not listed, make a note when you get to the **Notes** screen.



27) SCATS - select any scats you have identified on the mound by tapping on them on the screen

If no scats have been found, leave all the boxes blank and tap ***Next.***

If you find scats that are not listed, make a note when you get to the **Notes** screen.

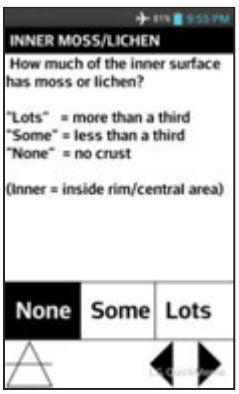


28) *INNER CRUST* - select ***None***, ***Some*** or ***Lots*** as determined by the on screen description

- **Lots** – A heavy crust over more than one third of the inner mound surface
- **Some** – A well defined crust over less than one third of the inner mound surface
- **None** – No crust is present

Tap ***Next***

NOTE: 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.



29) *INNER MOSS/LICHEN* - select ***None***, ***Some*** or ***Lots*** as determined by the on screen description

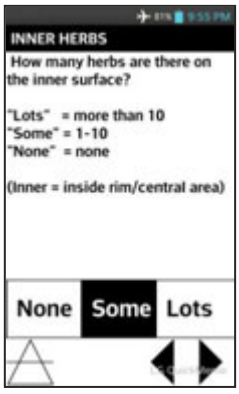
Tap ***Next***

- **Lots** – Moss and/or lichen covers more than one third of the inner mound surface
- **Some** – Moss and/or lichen covers less than one third of the inner mound surface
- **None** – No moss and/or lichen is present

30) ***INNER HERBS*** - select ***None***, ***Some*** or ***Lots*** as determined by the on screen description

Tap ***Next***

- **Lots** – There are more than 10 individual herbs (alive or dead) over the inner surface of the mound
- **Some** – There are less than 10 individual herbs over the Inner surface of the mound
- **None** – No herbs are present



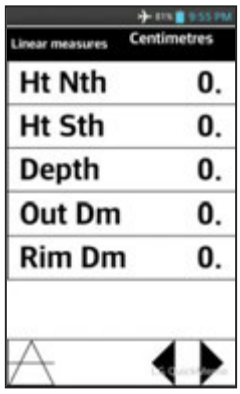
31) ***Linear Measures***

Tap on the measurement you wish to enter e.g. Tap on ***Ht Nth.***

This will automatically take you to the ***Number keypad*** screen.

NOTE: If a Profile 4 mound is being measured, leave the Depth and Rim Dm as 0.

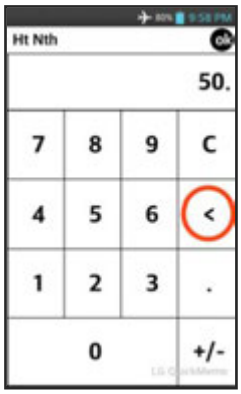
NOTE: If you are not going to take measurements of the mound, just tap ***Next*** and the sequence will progress to the ***If Active*** screen.



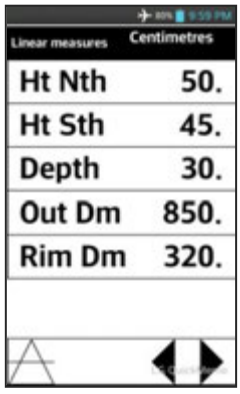
31a) Enter the required digits by tapping them on the keypad then tap the ***OK*** button in the top right corner

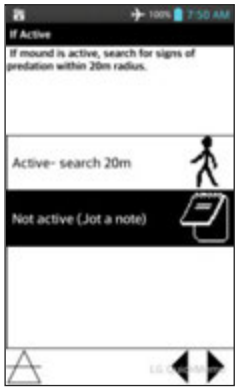
Remember, all values are in **centimetres**.

NOTE: The maximum number of digits that can be entered is 4
.
NOTE: If a value is entered incorrectly, use the c or < key to clear the incorrect entry, then re-enter the correct value.

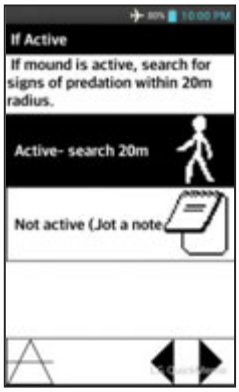


31b) Once all measurements have been entered correctly, tap ***Next***





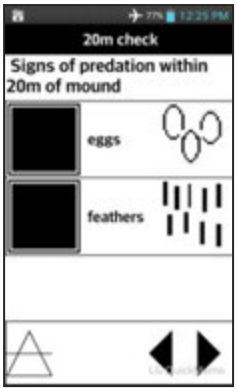
32) If the mound is determined to be Not active, select ***Not active (Jot a note)***



33) If the mound is determined to be Active, select ***Active - search 20m.***

Tap ***Next***

IF ACTIVE?
When a mound is assessed as active, monitors should conduct a search in a 20m radius around the mound looking for signs of predation. Any evidence of eggs, eggshell or feathers should be recorded. Additional observational notes can be recorded on the notes screen.



33a) If **Eggs/Eggshell** and/or **Feathers** that may be the result of predation are located, select them on the screen. If no signs of predation are found, leave them blank.

Tap ***Next***

33b) If Eggs or Feathers are located, take a photo of them using the camera function from within the sequence. See **17** to **20**, **Page 39/40** for camera instructions.

Tap ***Nex***t

33c) You may choose to take more photos if you locate more Eggs or Feathers by selecting ***Another photo***, otherwise select ***Finish*** and then tap ***Next***

33d) Follow the Camera instructions at point **17** to take more photos.

33e) Once the photos have been taken, select Finish then tap ***Next***

NOTE: A maximum of 3 photos may be taken using this method. If you require more photos, use the camera function from outside the sequence as outlined in **Section 4.3, Page 59**.

NOTES

Notes may be recorded using the **Notes** screen. Examples of notes may include:

- location notes that relate to the location of the mound and may help others to find the mound
- general notes regarding the mound itself e.g. was the bird seen
- notes to expand anything noted during the sequence

34) You may choose to enter a note about the mound or its surroundings. Tap the **Notes** screen **(Tap to edit)** to open the **Text editor**

If you do not wish to make any notes, just tap ***Next***. The sequence will move to **XsticksDep**, point 35 below.

34a) Tap the **Text Editor** screen to open the on screen keyboard and enter the note by tapping on the keys

NOTE: Toggle between letters and numbers by highlighting the required format at the bottom left of the keyboard. As details are typed they appear in the Text Editor screen. The notes are able to be edited by tapping in places where corrections are required.

Once the note is complete, tap the **ok** button in the top right to return to the **Notes** screen.

34b) The note now appears on the ***Notes*** screen

Tap ***Next***

XSTICKS (CROSSED-STICKS) ON DEPARTURE

Monitors should ensure that Xsticks are in place at the end of the monitoring sequence on in-active mounds. Two or three Xsticks (about 50cm long X 2cm wide) are routinely placed in the form of a X at the centre of inspected mounds on departure from each inactive mound.

If Xsticks are already present, they should be rearranged to ensure they are firmly in place.

These provide a quick indication as to whether the mound has been disturbed since it was last monitored.

If the Xsticks are present and in place when the mound is visited next, the mound has obviously not been disturbed since the sticks were put in place.

35) If Xsticks are in place when you leave (i.e. they were untouched or you replaced them), select ***IN PLACE X***

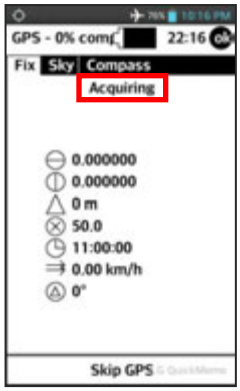
NOTE: Xsticks do not have to be placed on mounds that are definitively active. If there is any doubt as to whether the mound is active, Xsticks should be placed on it.

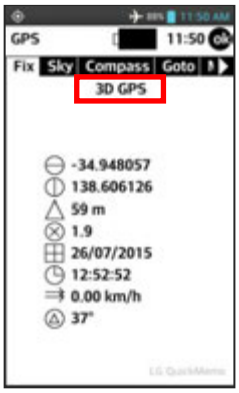
Tap ***Next***

36) While as close to the mound as practical, tap the Save arrow and remain close to the mound until the record is saved.

The record has been saved successfully when the sequence returns to the ***'DoWhat'*** screen. During the process, the following screens will appear.

36a) The GPS ***Acquiring*** screen will open.





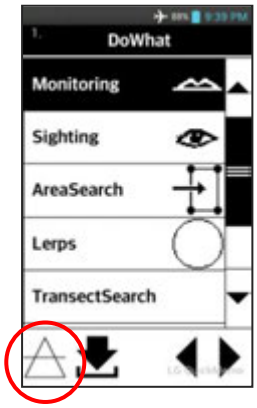
36b) Once a GPS signal had been received the **Acquiring** will change to *3D GPS*, a GPS fix will be taken and attached to the record and the current record will be saved to the device memory. The sequence will then return to the ***DoWhat*** screen ready to record the next mound.

Be patient whilst the GPS connects to the satellites and takes a fix. This may take some time, particularly for the first record of two of the day. You can be confident that the location has been saved if the sequence returns to the **'DoWhat'** screen.

NOTE: If after at least 5 minutes the GPS has not worked, the screen will *"hang"* and not move on. If this occurs, tap ***Skip GPS*** at the bottom of the screen until the sequence returns to the ***DoWhat*** screen. If this occurs there will be no GPS location recorded in the mound data.

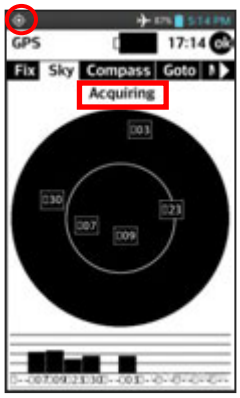
3.2.2 NAVIGATING USING THE GOTO FUNCTION IN CYBERTRACKER

Navigating to mounds by GPS can be accomplished within CyberTracker by using the GOTO tab in the GPS module which is accessed by tapping the triangle icon at the bottom of many screens.



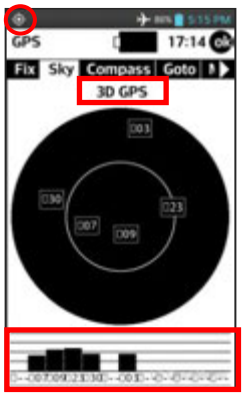
1) Tap the GPS control at the bottom left of the screen (triangle) and then open the **'Sky'** tab by tapping on it.

2) Initially, '**Detecting'** will appear at the top of the screen, and provided the GPS is turned on this will quickly change to **'Acquiring'**, indicated by the flashing GPS icon at the top left of the screen.



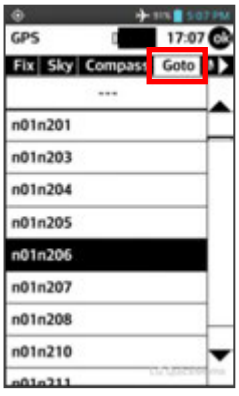
NOTE: If the screen does not change to **Acquiring**, either the GPS is turned off (turn it back on via the notification drawer (see **Section 4, page 55**)) or there is an internal problem with the GPS.

3) Once a GPS fix has been established, the screen will change to ***3D GPS*** and the white dot in the centre of the GPS icon in the notification bar will stop flashing.



The number of satellites the device is receiving a signal from will be indicated and the bars at the bottom of the screen indicate the strength of the signals.

4) Once a GPS fix has been established, open the **GOTO** tab and tap the site & mound number you wish to navigate to.



NOTE: Use the scroll bar on the right to move up & down the mound list.

5) The navigation screen will open, showing a direction arrow at the top of the screen and the **'mound number'**, **'bearing to mound'** and **'distance to mound'** below.

Use the direction arrow in conjunction with the '**distance to mound**' to navigate to the mound.

Note that you must walk at least 10m in a straight line for the GPS to determine your orientation and for the arrow to correctly indicate the direction to the mound.

For the arrow to work properly you should keep moving at all times & not stop if the movement of the arrow becomes inconsistent.

The arrow should be used as a general guide, to be glanced at from time to time.

NOTE: If you wish to change the mound you are navigating to, tap **Change** at the bottom of the screen and select the new mound number.

3.2.3 RECORDING MONITORING DATA ON PAPER DATA SHEETS

The following data sheet can be used to record mound monitoring data:

1) as a backup copy to the digital record saved on an Android device

2) in the event of an Android device failure where it can no longer be used to record mound monitoring data

The top of the sheet must be completed with the following information:

Date – the date the monitoring is taking place

Site – the site number including the state prefix

Device ID – the number/name of the device (usually written on the back of the device)

Name – the name or names of the monitors conducting the monitoring

Page # of # – if there are one or more groups monitoring the same site, the '# of #' should not be completed until all sheets have been collected

All boxes for each record should be completed. If there are box/s that have no data to record, use a dash, either – or /

NOTE: If there is insufficient space on the front of the sheet the back may be used.

There is a full size data sheet at the end of this manual that can be copied.

Malleefowl Monitoring Data Sheet

Form Revised: 15/10/2015

Date: Site: Device ID: Name(s): Page of

												Prints (Y/N)				Scats (Y/N)				Inner Mound (N/S/L)			Dimensions in Centimetres						Notes
Mound Number	Sought (Y/N)	Found (Y/N)	Needs Stake? (Y/N)	Needs Tag? (Y/N)	Profile (see below)	Photo taken (Y/N)	Is the mound Active? (Y/N)	X Sticks (see below)	Freshly Scraped (Y/N)	Eggshell (N/S/L)	Lerp on mound (N/S/L)	MF	Fox	Roo	Other (specify)	MF	Fox	Roo	Other (Specify)	Innber Crust	Inner Moss / Lichen	Inner Herbs	Height North side	Height South side	Depth	Outer Diameter	Rim Diameter	X Sticks Replaced (Y/N)	(if you require more room use the back of this data sheet)
26	Y	Y	Y	Y	1	Y	N	G	N	S	N	Y	Y	N	ec	Y	Y	Y	r	S	N	S	30	25	20	700	250	Y	Notes

Prints & Scats:
c = cat e = emu
d = dog ec = echidna
r = rabbit Others note here:

X Sticks:
I = In cross
D = Displaced on mound
G = Gone

Profiles:

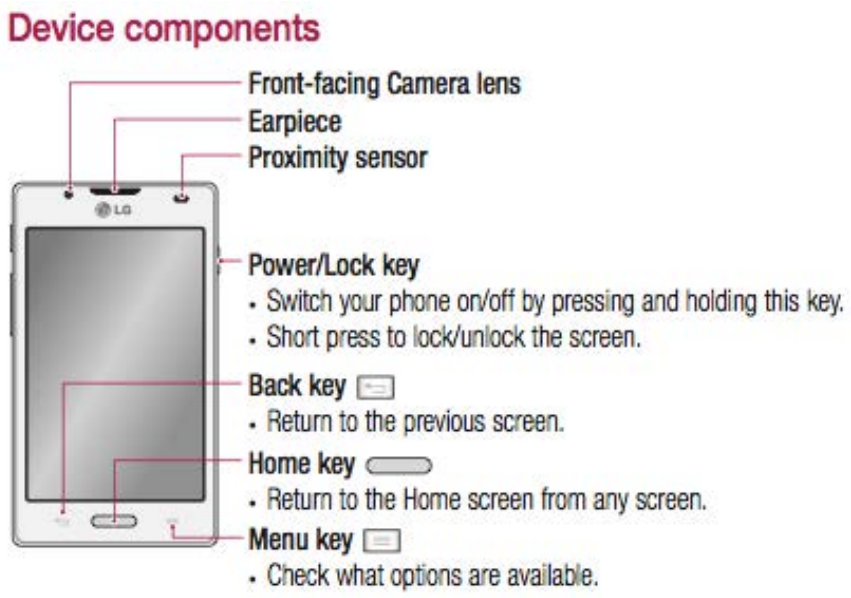
SECTION FOUR

Monitoring Equipment Guidelines

SECTION 4 – MONITORING EQUIPMENT GUIDELINES

4.1 GUIDELINES FOR THE USE OF AN ANDROID DEVICE

The following guidelines apply to the LG L711 only. Guidelines for other devices may be found on the NMMD.



Device Functions
This device is an Android mobile phone, however the unit does not have a SIM card installed and **CAN NOT** be used as a mobile telephone. All unnecessary functions that consume power have been turned off. The only functions required are **CyberTracker, GPS** & **Camera**.

GPS: The GPS is fully automatic and turns itself On/Off as needed and requires no intervention by the user.

Camera: The device has an in-built camera. Instructions on the use of the camera are outlined in **Section 4.3, Page 59**.

Backup: The data recorded by this device are stored in a non-volatile area of the memory and do not require any manual backup in the field.

Battery: The battery is built into the device and can not be replaced in the field. The battery % is shown in the notification bar next to the battery icon. A low battery warning will show at 20% and then again at 5%. The battery life is approximately 8 hours from fully charged when used in **Airplane Mode**. This is a limited amount of time so it is important that the battery is fully charged at the start of each day. An external battery & cable are usually supplied to be used in the event of a battery going flat.

Stylus: Because of the size of this device it is easier to operate with a stylus rather than trying to use your finger. The stylus used on the old palms will not work on these devices.

The Device Basics

The device has three states, **Off**, **On** & **Sleep**. In the sleep mode the device still consumes battery power, so it should be turned **Off** overnight or if it is not going to be used for more than a day.

1) To turn the device **ON** from the **OFF** mode, press and hold the **Power / Lock key** for around 1 sec. You will feel a short vibration when the device turns on. Once started, swipe the screen to open the **Home Screen**. Tap ***No*** on the **Note screen** to leave **Airplane** mode **On**. When the device starts from the **OFF** mode it will always open to the **Home Screen**.

2) To turn the device **OFF**, press and hold the **Power / Lock key** for around 2 second, then tap the **Power Off** button and then **OK**.

3) To put the device to sleep, press and release the **Power/Lock key**. To wake the device from the **SLEEP** mode, press and release the **Power/Lock key**. When the device wakes up from the **SLEEP** mode it will revert to the screen that was in use prior to the device entering the sleep mode.

4) On the front of this device below the screen (see figure on previous page) you will find three buttons. From left to right they are:

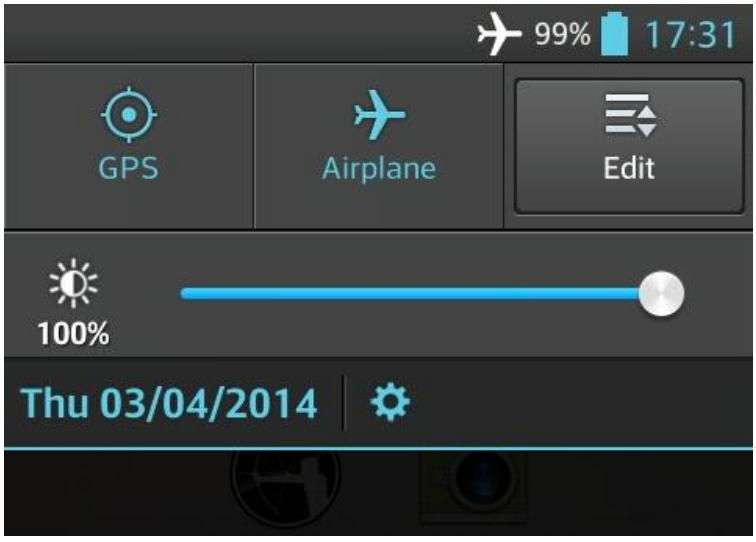
Back key – (Lower left) Open's the previous screen the device was working in. Once back at the Home screen the back key ceases to function.

Home key – (Centre) A single press returns to the **Home screen**. Press and hold opens the **Recent apps** screen showing a list of apps you've opened recently. To open an app, tap it. To remove an app from the list, swipe it to the right.

Menu key – (Lower right) Checks what options are available.

Notification Drawer

The notification drawer runs across the top of the screen and allows quick access to some settings on the device. Touch and slide the notification drawer down to open.



Open Drawer - Buttons highlighted in Blue are On

GPS

The GPS is activated as required and should not require any user intervention. If you are having trouble getting the GPS to work, check that it is **On:**

1) Open the ***"Notification Drawer"***. The GPS in **On** when the GPS button is blue.
2) If the GPS button is white (Off), tap it to turn it **On**.
3) Tap the ***"Back Key"*** to return to the previous screen.

Airplane Mode

Using the device in **Airplane** mode saves the battery and offers the longest operating time in the field. Airplane mode is on when the airplane icon appears in the Notification Drawer.
To Turn **Airplane** mode **On**:

a) Open Notification Drawer.
b) Tap **Airplane** button. Airplane mode is **On** when the button is blue.
c) Tap ***"OK"***.

Adjust Screen Brightness

1) Open the Notification Drawer.
2) Use the slide bar to adjust the screen brightness.
3) Tap the ***"Back Key"*** to return to the previous screen.

Camera

For details on the use of the internal digital camera see Section 4.3 page 8.

Reset Device

If the device becomes unresponsive or erratic in its operation, try a Reset to see if it resolves the problem:

1) Press and hold the ***"Power/Lock key"*** for 3 seconds
2) Tap the ***"Power off and restart"*** button

Rain Protection

If the device is to be used in wet weather, place it into a clear zip lock bag. This will keep it dry and the stylus will still work through the plastic.

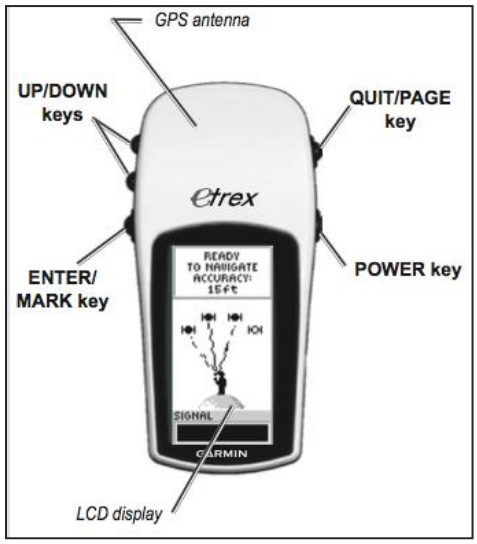
Device Storage between monitoring Seasons
Between monitoring seasons the device should be stored with the battery installed and with a battery capacity of around 50%. It should be kept in a cool dry place, preferably in a protective cover.

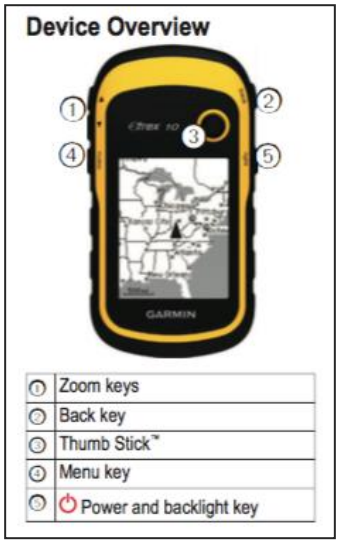
4.2 GUIDELINES FOR THE USE OF SEPARATE GPS

GPS units are used to assist in locating Malleefowl mounds in sites across Australia. The following guidelines are for the Garmin Etrex H and Etrex 10. These units are robust and small and the most commonly used GPS units. There are a number of screens which are described in the user manual, but only the screens essential to monitoring are described here.

Etrex H

- **Turn On/Off** – press and hold **Power** key (bottom right) for one second.
- **Scroll to new pages** – to scroll through the pages, press the **Page** key (top right).
- **go to waypoint** – press **Page** key until the **MENU** page appears, then using the **Up/Down** keys (top left), scroll to **WAYPOINTS** & press **Enter.** Again, using the **Up/Down** keys, scroll to '0-9' & press **Enter**. Scroll to the 'site + mound number' and press **Enter** twice.
- **Mark waypoint** – Press and hold the **Enter** key for one second. Press the **Enter** key to save the waypoint, remembering the waypoint number.
- **Batteries** – battery level is indicated at the bottom left of the **MENU** page. When the batteries are flat (i.e. when the unit turns itself off) change the batteries by removing back cover (2*AA). The GPS units do not need to have continuous battery power to hold the data and may be stored without batteries.





Etrex 10

Turn On/Off – press and hold **Power** key (bottom right) for one second.

Navigate to a waypoint

1. Press the menu key to open the menu
2. Select & press **'Where To?'** using the Thumbstick
3. Press **'Waypoints'**
4. Press **'Back'** in the top right corner and you will have a list of waypoints.
5. The Thumbstick will move up/down the list one at a time
6. The Zoom keys scroll up/down several at a time
7. Select **'Go'**. The map page opens with your route marked with a magenta line
8. Navigate using the map

Navigate using the Compass

1. Press the **'Back'** button and select the compass option
2. Use the compass to navigate to the waypoint

Stop Navigation

1. Select **'Where To?'** Then **'Stop'**

Mark Waypoint – You can save your current location as a waypoint:

1. On the main menu select **'Mark Waypoint'**
2. Make a note of the waypoint flag number
3. Select an option:
   - To save the waypoint without any changes, select **'Done'**
   - To make changes to the waypoint, select an item to edit, and select **'Done'**

Batteries – battery level is indicated at the bottom left of the **MENU** page. When the batteries are flat (i.e. when the unit turns itself off) change the batteries by removing back cover (2*AA). The GPS units do not need to have continuous battery power to maintain data and may be stored without batteries.

4.3 GUIDELINES ON THE USE OF THE DIGITAL CAMERA

It is helpful if the mound photos taken during routine mound monitoring are taken as part of the CT sequence, using the digital camera built into the Android device. These photos are then embedded into the mound records and automatically labelled with the correct mound data when they are extracted.

If there is a requirement to take extra photos that are not part of routine monitoring, the digital camera built Into the Android device can be used independent to the monitoring sequence.

To activate the camera:

1) Navigate to the home screen by tapping the home button
2) Tap the camera icon
3) Frame the photo as required
4) Tap the camera Icon (at the bottom of the screen in portrait Mode or the side of the screen in landscape mode)

These photos are saved to the device memory and also copied to an external SD card, if installed.

4.4 GUIDELINES FOR THE USE OF CYBERTRACKER

For detailed guidelines on the use of CyberTracker, (see **Section 3.2**, **Page 33)**

SECTION FIVE
Database

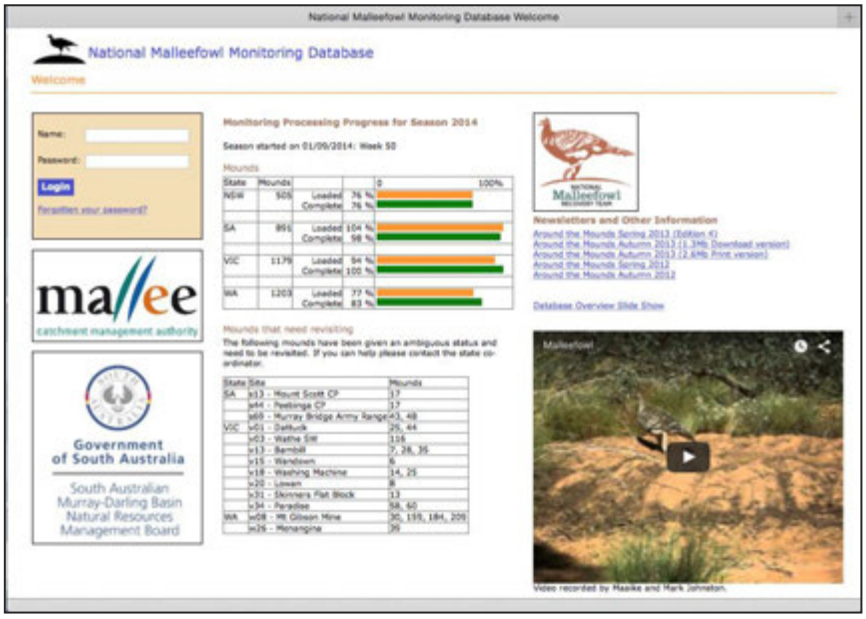
SECTION 5 THE DATABASE

The National Malleefowl Monitoring Database (NMMD) is central to the Malleefowl monitoring effort across Australia, providing centralised and secure data storage, and a range of data management, reporting and information distribution facilities.

There are two main areas of operation:

1. The secure storage of historical Malleefowl data collected in the routine mound monitoring program across Australia and the dissemination of that data in the form of statistics and reports to people and organisations that require the data to assist in their management and decision making. This includes land managers as well as scientists and students working and studying in the area of Malleefowl conservation.

2. The provision of information required by volunteers to support their National Monitoring effort, e.g. maps, mound lists, GPS data, safety information etc.



National Malleefowl Monitoring Database - Log in Screen

5.1 THE OPERATION OF THE NATIONAL MALLEEFOWL MONITORING DATABASE (NMMD)

The National Malleefowl Monitoring Database (NMMD) is the central storage facility for the data collected in the field by our many volunteer monitors. Monitoring data, including photos, are collected on electronic devices running CyberTracker software (such as Android smartphones). These data and photos are uploaded to a PC, also running the CyberTracker software.

The photos are extracted from the data, are resized and labelled with their unique mound code:

Site code (three characters)**_mound number** (three digits) **_season** (four digits) e.g. w08_056_2015 refers to WA site 08, mound 056 in the 2015 season i.e. 2015/16.

The monitoring data and photos are then uploaded from the PC to the NMMD. On the NMMD, the data is accessible to the monitors who collected the data. Monitors can also leave notes and corrections, although the raw data remains unchanged.

An ecologist then validates the data and photos on the NMMD against a set of scientific criteria to ensure the data is as error free as possible.

The validated data is then available to NMMD users, including monitors, scientists, land managers etc. Decisions can be made based on the latest available data to assist on-ground programs that are likely to benefit Malleefowl and their habitat.

Access to the NMMD and the data is protected by passwords and there are varying levels of access depending on peoples requirements.

The Co-ordinator and Ecologist columns are only available to those with that level of access

National Malleefowl Monitoring Database - Home Screen

5.2 THE MANAGEMENT OF THE NATIONAL MALLEEFOWL MONITORING DATABASE (NMMD)

There are several essential tasks required in managing and maintaining the NMMD, and these are performed by people in specific roles:

- **Data collectors** collect mound data in the field using Android devices and communicate with Coordinators and Ecologist on issues regarding the accuracy of the collected data

- **Coordinators** prepare Android devices for data collection in the field and upload the collected data to the NMMD at the completion of each site monitoring. Coordinators are responsible for the day to day running of the monitoring program

- **Ecologists** validate the data on the NMMD to minimize any inconsistencies and ensure the data is correct and ready for analyses

- **Science Advisor** works with all levels and advises on various aspects including the production of analytical reports

- **Data Manager**
  1. Works with the Database Technician and Science Advisor to solve any issues with the operation of the NMMD
  2. Prepares a new sequence for each season, ensuring it incorporates the most up to date mound data from the previous monitoring season. The new sequence should be available by 1st September each year.
  3. Works with everyone to solve any issues that arise with the Android devices or the NMMD

- **Data-handlers** - A data-handlers group, consisting of people from each state who are responsible for data from their state make decisions about further developments of the NMMD, investigates and chooses equipment and generally looks for ways to make processes more efficient. This group meets as required and comprises the Coordinators, Ecologists, Science Advisor and Data manager.

5.3 DATA OWNERSHIP

Each person that gathers data is regarded as the owner of that data and they can determine who has access to it. By taking part in the national Malleefowl Monitoring Program, data-collectors automatically give the National Malleefowl Recovery Team permission to use the data in aggregate and access to data can be arranged by the Coordinator. Whilst the specific data gathered is owned by the monitor, the aggregated data is the property of the Recovery Team and will be used to provide management information which ultimately aids in Malleefowl recovery. The aggregated data produced through this database is held in trust by the National Malleefowl Recovery Group Inc. under the direction of the National Malleefowl Recovery Team.

5.4 ACCESS AND SECURITY OF THE NATIONAL DATABASE

Access to the NMMD and the security of its information is controlled by passwords.

There are several levels of access that ensures sensitive information is only available to the few people who need it.

The different levels of access are as follows:

Data Collectors

1. Access monitoring data for the grid/s they monitor and leave notes for the ecologist
2. Print maps and other information necessary to undertake their monitoring task
3. Access various reports of a more general nature

Coordinators

1. Access the above
2. Upload data and other files to the NMMD
3. Register Data Collectors and allocate passwords
4. Register data providers
5. Register activities e.g. Training

Ecologists

1. Access all of the above
2. Incorporate and validate records
3. Check monitoring progress on a state level
4. Download waypoint files
5. Register new sites and mounds
6. Register biogeographical and NRM regions

SECTION SIX

Specific State by State Detail

6 SPECIFIC STATE BY STATE DETAIL

There is a responsibility for each state to provide guidance, policy and community expectation to cover all safety and communication requirements to ensure safety and processes meet legal requirements for community groups to operate on state owned land and in remote locations.

If you are unsure contact the relevant coordinator for your site.

6.1 FORMS AND INFORMATION

Most forms and information required for conducting monitoring in the various states can be downloaded from the NMMD:

1. Open the database at http://database.malleefowlvictoria.org.au/Exit.aspx
2. Log on using your allocated **Name** & **Password**.
3. Under the Monitoring column click on **'Monitoring Kit'**.
4. Select the **'Site & Season'** then **'Next'**.

6.1.1 NEW SOUTH WALES

6.1.2 SOUTH AUSTRALIA

Any activity with the Department of Environment, Water & Natural Resources (DEWNR) that involves volunteers must adhere to the Volunteer Safety Framework and all volunteers must be registered with DEWNR if undertaking any monitoring on DEWNR reserves. This should be covered by coordinators employed or contracted through DEWNR.

Permit to undertake scientific research

All monitoring undertaken on DEWNR reserves and private property under Heritage Agreement must be undertaken under a current **Permit to undertake scientific research**. This permit is renewed annually, and covers all persons involved in Malleefowl monitoring in SA. A copy of the current permit can be downloaded as per 6.1 above.

Relevant DEWNR regional offices and/or landowners must be notified at least 10 days prior to undertaking any monitoring on those reserves/properties.

6.1.3 VICTORIA

6.1.3.1 VICTORIAN MALLEEFOWL RECOVERY GROUP (VMRG) VOLUNTEER SAFETY PROCEDURES

The VMRG has developed a five point training package for volunteer monitors. The training package is discussed at all VMRG training weekends.

1. **Background to safety requirement**
   - Introduction to safety requirements

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

3. **Resources required for monitors**
   - Individual capabilities
   - Records and data
   - Field work safety procedures
   - 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

6.1.3.2 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 has been completed

6.1.4 WESTERN AUSTRALIA

Volunteer monitoring in Western Australia

The National Malleefowl Recovery Team (NMRT) project is registered with the Western Australian Department of Parks and Wildlife (DPaW).

Volunteers undertaking monitoring for this project are required to become a registered volunteer with DPaW's Community Involvement Unit so that they are covered by the Department's insurance from the time they leave home until they return home. A registration form and a record of daily hours must be completed and submitted to the Department via the NMRT co-ordinator.

The required forms to be completed for undertaking malleefowl monitoring are available from the NMRT database: see **'Monitoring Kit'**.

DPaW rewards its community involvement volunteers. Further information regarding volunteering for DPaW can be obtained from its website: www.dpaw.wa.gov.au - look for the **'Get Involved'** tag.

APPENDIX ONE

Establishing and Re-searching Malleefowl Monitoring Sites

APPENDIX ONE

Establishing & Re-searching Malleefowl monitoring sites

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APPENDIX ONE

Establishing & 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 Malleefowl Monitoring 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.

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 shrubland or low woodlands dominated by Mallee. Malleefowl prefer 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 2km2, a size large enough to provide an estimate of breeding density, yet still small enough to manage. As at January 2015, around 42 sites were operational in northwest Victoria, with around 50 established throughout South Australia, 37 in Western Australia and 10 in NSW.

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Establishing & Re-searching Malleefowl monitoring sites

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 (e.g. 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 to 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 to ten years (involving 10 to 12 people again), and be coordinated and attended by persons experienced in site 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 searched; however, they are not actual sites that are part of the national monitoring (**See 7, Page 81** – Alternatives to the establishment of a site).

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Establishing & Re-searching Malleefowl monitoring sites

Fig 1 An area of Mallee woodland known to contain Malleefowl mounds within Gum Lagoon CP, south east SA, was selected as a proposed 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 site area subsequently selected is shown by dotted line over the searched area.

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 After the area was completely searched, all identified mounds were mapped, and a site 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 site s66. Each mound and the site corners were duly staked, tagged and GPS points recorded for future identification and monitoring. White dots show mounds.

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Establishing & Re-searching Malleefowl monitoring sites

3. SEARCHING FOR MOUNDS IN THE SELECTED SITE

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 to 12 people is then organised to undertake a broad search of the area, which is typically two km2 (400ha) in size. The locations of all Malleefowl mounds that are found within the search area are recorded by GPS using the WGS84 datum.

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 searches are conducted accurately and that the following standardised techniques are used during each site search.

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 (400ha) 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 PERSON-POWER REQUIREMENTS

An ideal number for a site search is around 12 people, providing a 200m wide search transect at a spacing of approximately 20 meters between people (spacing of 10 to 15m may be required in very thick habitat). The team should comprise of between one and three team leaders, and around 10 searchers. Progress is usually about 1km/hr, though faster in more open country.

3.2.2 ROLES AND RESPONSIBILITIES OF TEAM LEADERS

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 search, 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 (e.g. one whistle to stop when a mound is located and two whistles to resume the search after data is collected).

The search 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. Searches should be fun and not an endurance trial.

On completion of a search, 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 coordinator.

3.2.3 CONDUCTING AN INITIAL 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 to15m) 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 the searching of a whole site 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 most efficient method used to search a proposed site is with 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.

3.2.4 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

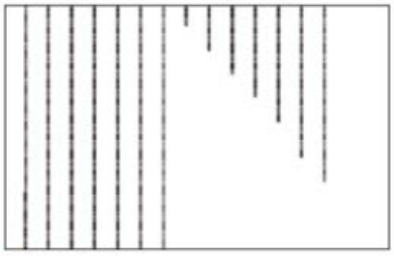

Fig 4 Example of the staggered line search method used in WA

to maintain an orderly search because people are regularly reminded of where their neighbours are.

In WA an angled system is used, 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:

1. team leader maintains the sweep GPS position
2. it is easier for team members to maintain correct position by communicating
   forward rather than back to their team member, especially in thick vegetation
3. ensures individual responsibility for team efficiency (particularly line gaps)
4. 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

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 sweep, the team moves across to the next 200m transect line, maintaining their original order in the 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.

3.2.5 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 with a GPS unit using the WGS84 Datum.
- tie flagging tape or other coloured tag above or near the mound. Later when this mound is visited, the tape/tag will confirm that it is the correct location. This is especially important for very old or inconspicuous mounds.

Of course, you can record other interesting information 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 you record later in the year.

3.2.6 POINTS FOR THOSE INVOLVED IN A MOUND SEARCH

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 mounds
6. notebook and pencil
7. bright coloured clothing, such as fluorescent safety vest safety glasses or wrap-around sun glasses
8. back pack carrying water, bandaids, sunburn cream, snack food
9. appropriate dress – 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:

- 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 to ensure 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 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 sweep. Note: This does not apply to the 'angled' search method.
- 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. E.g. 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.

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. The site should be established in an area where Malleefowl are known to be present and the site boundaries are generally determined prior to the site being initially searched. Mounds found are recorded by use of GPS in WGS84 datum and then mapped within the site boundary determined on a map. Part of the site boundary may be delineated by an existing road, dirt track, fire track, etc., on one or more sides if possible, for ease of access and easier for search team positioning. It helps 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 mounds. 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 the mound number, identifying it within the site. Mounds are permanently marked by a metal tag attached to a metal stake (galvanised fence-wire spacer). The stake and tag are placed about 3m to 5m due north of the mound centre, or at the nearest alternative with an unobstructed view of the mound for the purposes of taking mound photos. The metal tag should be stamped with the site number followed by the mound number, i.e. s13_24 = South Australia Site 13, Mound 24.
The accurate locations of mounds are described by means of GPS coordinates, using eastings and northings and always using WSG84 Datum.

5. RE-SEARCHING A SITE

5.1 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. Re-searches should be initiated every five to ten years or more frequently if recovering from fire and Malleefowl are thought to be moving back into the area. Mounds that are found during these repeat searches are added to the list of mounds to be checked annually.

5.2 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 to 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 routine 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, Page 74**) '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.

5.3 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 with a GPS unit using the 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 search, if needed. Also, if the mound is difficult to locate, a reflector could be put on the nearest tree to aid navigation.

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Establishing & Re-searching Malleefowl monitoring sites

6. LIDAR

In more recent years an alternative method of searching larger sites for mounds has been developed. LiDAR (Light Detection and Ranging) data is collected from aircraft and processed to reveal the location of objects on the ground that look like Malleefowl mounds. These specific sites can then be visited during field-based Malleefowl surveys to examine the characteristics of the mounds. LiDAR data is obtained when laser light is sent from an aircraft towards the ground and the time it takes for the bounced light to return is used to determine the height and location of objects such as vegetation, buildings and the ground. Several returns may be observed for each laser pulse.

7. 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

Trouble Shooting Guide

Q: The GPS on the smartphone will not connect to any satellites?

A: Make sure the GPS is on by following the GPS instructions on **Page 56**.

Malleefowl Monitoring Data Sheet

Form Revised: 15/10/2015

Date: Site: Device ID: Name(s): Page of

Mound Number	Sought (Y/N)	Found (Y/N)	Needs Stake? (Y/N)	Needs Tag? (Y/N)	Profile (see below)	Photo taken (Y/N)	Is the mound Active? (Y/N)	X Sticks (see below)	Freshly Scraped (Y/N)	Eggshell (N/S/L)	Lerp on mound (N/S/L)	Prints (Y/N)				Scats (Y/N)				Inner Mound (N/S/L)			Dimensions in Centimetres					X Sticks Replaced (Y/N)	Notes (if you require more room use the back of this data sheet)
												MF	Fox	Roo	Other (specify)	MF	Fox	Roo	Other (Specify)	Innber Crust	Inner Moss / Lichen	Inner Herbs	Height North side	Height South side	Depth	Outer Diameter	Rim Diameter		
26	Y	Y	Y	Y	1	Y	N	G	N	S	N	Y	Y	N	ec	Y	Y	Y	r	S	N	S	30	25	20	700	250	Y	Notes

Prints & Scats:

c = cat
d = dog
r = rabbit
e = emu
ec = echidna
Others note here:

X Sticks:

I = In cross
D = Displaced on mound
G = Gone

Profiles: