ENVIRONMENTAL MONITORING METHOD:

Mammal Spotlighting Survey with Line Transects

About This Method

This document helps you to monitor mammals using spotlighting. This method has been partially adapted from: Survey guidelines for Australia's threatened mammals, Department of Sustainability, Environment, Water, Population and Communities. You can find more information on the Monitoring Country website: monitoringcountry.org.au or scan the QR code.

This method has three parts: **1. Get Ready**, **2. Out on Country** and **3. Back in the Office.** Each part can be undertaken separately but you must complete all three parts to finish the method. At the end of the document, you will find guidance for all the gear you need - **Gather Your Gear – Complete List**.

We recommend you read the whole document before you start.

Part 1: Get Ready

GATHER YOUR GEAR

Equipment required for this part:

- ☐ Tablets/phones with:
  - ability to take photos
  - data collection and navigation apps
- ☐ Laptop/computer with software for:
  - mapping
- ☐ GPS device (recommended)

KEEP IN MIND

Why?

Make sure there is a clear monitoring question and that the method you have selected will answer the monitoring question.

If this is the first time you are monitoring, you will need to design the survey: what are you monitoring, where will you survey, and when and how often you will survey?

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Mammal Spotlighting Survey with Line Transects

When?

Prepare well before heading out on Country so that you have time to gather gear or train staff, if needed.

Who?

At least one ranger/staff to plan and prepare.

Training and skills

Staff involved in planning are trained and competent in:

- ☐ Mapping software (like QGIS or Google Earth) and/or monitoring point generator
- ☐ Navigation systems (like Avenza app or GPS device)
- ☐ Data collection systems (like Fulcrum app or paper datasheets)
- ☐ Identifying nocturnal mammals (or other species)
    - At night, many mammals (and other species) can be difficult to identify
    - Ensure that you know which mammals (or other species) you are likely to see on your country, and how to tell them apart (using eye shine, behaviour, identifying features etc)

Check permissions

Consult with Traditional Owners, landholders and relevant government agencies and authorities, to determine appropriate access and approvals for environmental monitoring:

1. Where you can go – consult with the owners/managers of the land.
2. What you can do – check if you need scientific licences or ethics permits
3. What or who can you take photos of
4. What can be done with data and photos – who owns them, where will they be stored and how will data be interpreted and communicated

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Mammal Spotlighting Survey with Line Transects

ACTIONS

Make a plan and prepare

If you have done this monitoring before, it is best to do the surveys at the same time and same sites so that you can compare the data to previous surveys and see if there have been changes.

1. Plan which dates you will do the spotlighting
   - If you want long-term data, consider doing the survey at the same time of year (month or season) each year to ensure comparability
   - To improve how useful and reliable the data is for analysis, plan to survey the same transects at least 2 nights in a row (replicates), with 3-5 nights even better
2. Gather species of interest records in your area and identify where potential species of interest habitat is
   - Such as from Traditional Owners, Atlas of Living Australia (ALA) or government databases
   - Spotlighting surveys are usually for nocturnal mammals like possums, wallabies, and gliders, though can be used for nocturnal reptiles and other species
3. Use the monitoring point generator or mapping software to select your sites
   a. Decide on site size and transect length
      - Sites are usually 5 ha in size (about 250 m x 250 m) with 200 metre long walking transects.
      - Site can be larger, especially for driving transects which can be many kilometres long.
   b. Select site locations
      - It is best to randomly select site locations and stratify them by major habitat types
      - Space sites at least 250 m apart
      - You can add a square around the point to show the site boundaries (250m x 250 m for 5 ha sites).
   c. Put at least 2 transects within each 5 ha site
      - There should be at least 100 metres between transects
   d. Create points for the start and end of each transect.
4. Give each site and transect a unique name, and export and save the location data in your data management system
   - It is best to label transects using the site name and then a number (like SiteA_01, SiteA_02)

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5. Prepare maps of sites and transects and load transect start and end points onto navigation devices
6. Plan how you will record information on Country (electronic data forms or paper datasheets)
7. Plan your data management system (how you will store spotlighting data)
8. Check **GATHER YOUR GEAR** lists for **Get Ready, Out on Country** and **Back in the Office** (complete list on last page) and get any equipment you don't have
   - See buying guide(s) for advice on which spotlighting head torches and laser range finders to buy
9. Charge electronic devices (tablets/phones, power banks, GPS) and batteries

Train

1. Check the **Training and skills** requirements for **Get Ready, Out on Country** and **Back in the Office** steps and arrange any training or expertise that you need.
2. Run everyone involved in the survey through the plan.
   - Be clear on how many people will be involved, what everyone will be doing, and what they will need to do the survey.
3. Prepare guides for identifying species of interest and how to distinguish them in the field at night
   - ID books or apps can be used instead, but a short guide that is specific to your area/species makes it quicker and easier to check when out on Country
   - Guides can be loaded onto tablets/phones or printed and laminated
4. Run a training session for all rangers involved in the survey to learn or refresh:
   a. How to use the devices (like tablets/phones and GPS)
   b. How to use data collections apps and record data

Next Section – Part 2: Out on Country

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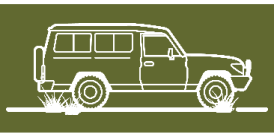
Part 2: Out on Country



GATHER YOUR GEAR

<u>One set</u> of this equipment for <u>each team</u>:

- ☐ Tablets/phones
- ☐ Power bank (optional)
- ☐ GPS device and spare batteries (recommended)
- ☐ Bright headtorch (minimum 300 lumens; 1 per person) and charged batteries
- ☐ Laser rangefinder and charged batteries
- ☐ VHF or UHF radios – to communicate with other teams (optional)
- ☐ Thermal scope (optional)
- ☐ Reflective flagging tape (optional)

KEEP IN MIND

When?

Avoid nights when it is raining or windy because it can be difficult to spot animals.

Start surveys at least 60 minutes after sunset to allow animals time to wake up.

Who?

1 observer and 1 navigator per team, at least 1-2 teams

- Single count: each transect is surveyed once each night, can be completed by 1 or more teams
- Double count: each transect is surveyed twice each night, 2 teams walk the same transects on the same night but at different times (e.g. walk transects in opposite order OR walk the same order 30 mins apart)

Training and skills

Make sure everyone knows the plan.

Field staff are trained and competent in:

- ☐ Navigation systems (like Avenza app or GPS device)
- ☐ Data collection systems (like Fulcrum app or paper datasheets)
- ☐ Using the laser rangefinder
- ☐ Identifying mammal species

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ACTIONS

Check that your electronic devices (tablets/phones, power banks, GPS, headtorches, rangefinders, radios, thermal scope) are charged before you head out.

Ground truth transects (optional)

1. If this is the first year you are monitoring, it is a good idea to walk the transects before the survey to check they work well
2. Check that the transects are in the correct habitat type
   - Move transects to somewhere else within the 5 ha survey site if they are in very thick vegetation, along roads (for walking transects), crossing poor habitat (e.g. car parks, gravel plains) or don't match the mapped habitat type.
3. Check that you can get to all of the transects
   - Move transects to somewhere else within the 5 ha survey site if the sites aren't accessible (e.g. a creek or big boulder or very thick vegetation)
4. Take notes on the best to drive/walk to the transects and the easiest order of walking the transects
   - The route should not have people walking along or across transects to get to the start point.
5. Mark trees or bushes with reflective flagging tape at regular intervals (optional)
   - A pre-marked route means people doing the survey will spend less time navigating.

Survey the transect

Start the survey at least 60 minutes after sunset.

Do the survey quietly to avoid scaring animals and to make it easier to hear calls and other animal noises.

1. Walk to the start point of the transect, walking quietly when you are 20 m away.
   - It is a good idea to record where you left the car on the navigation device (e.g. GPS) so you can find your way back to it.
2. On the navigation device, navigate to the end point of the transect.
   - Choose a landmark in the correct direction to help keep the observer walking on the transect.
3. If this is the first year you are monitoring, use the laser rangefinder to get the angle of the transect:
   a. Stand on the start point of the transect

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   b. Turn on the device and look through the viewfinder
   c. Aim the device towards the end point of the transect
   d. Press the FIRE button
   e. Scroll through the display to find the ANGLE

4. Record **survey effort data**
5. Start recording your track on the navigation device
6. Start walking along the transect, the observer in front and the navigator following behind.
   - Walk slowly, about 10 m per minute. A 200 m transect will take ~20 minutes, a 1 km transect ~ 1.5 hours.
7. The observer looks for mammals on both sides of the transect, moving the spotlight beam slowly over the ground and up into the bushes and trees while listening and looking for any signs of movement or red eyeshine.
   - A thermal scope can help to find mammals at night, except in hot weather when other things in the environment will be a warmer temperature.
8. The navigator follows along behind the observer, regularly checking the navigation device and making sure the observer is walking along the transect
9. When the observer sees a mammal, stop walking.
10. Identify the mammal
    - Walk closer to the animal if you need a closer look
    - If you walk away from the transect, make sure you return back to where you first saw the animal before recording any data.
11. Mark your location on the transect on the navigation device
12. Use the laser rangefinder to get the distance and angle of the mammal
    a. Stand on the transect where you first saw the mammal
    b. Look through the viewfinder
    c. Aim the device to where you first saw the animal
    d. Press the FIRE button
    e. Scroll through the display to get the DISTANCE and ANGLE

- If the animal is on the ground, use the ACTUAL DISTANCE. If the animal is above the ground, use the HORIZONTAL DISTANCE or SLOPE DISTANCE.
- If you don't have a laser rangefinder, walk to where the animal was first seen and records its location on the navigation device.

13. Record **detection data**

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14. At the end of the transect, finish recording the track on the navigation device and turn off the laser range finder.
15. Record **survey effort data**
16. Continue onto the next transects, until all transects have been surveyed.

RECORD DATA

RECORD DATA

Data to record when starting and finishing each transect (survey effort data)

What to record	Required?	Notes
Information to record about each transect surveyed		
Project name	Yes	Make it clear which project this data belongs to and its purpose
Date	Yes	Record the date the transect was surveyed
Personnel: observer and navigator	Yes	Record the name of the people who surveyed the transect, and who was the observer and who was the navigator - this is helpful if any questions come up about the data, and can be used to include observer bias in analysis
Transect name/number	Yes	Record the name/number of the transect
Transect angle	Yes	Use the laser rangefinder to get the angle of the transect
Start time	Yes	Time when you started walking the transect
Finish time	Yes	Time when you finished walking the transect
Weather	Optional	Describe the weather conditions (temperature, cloud clover, rainfall, wind)
Equipment used	Optional	Note down if you used thermal scopes, laser rangefinders etc.
Stories and notes	Optional	Record information or stories from Elders, and anything else worth noting about the area or animals.
Video	Optional	Record videos of information or stories from Elders, and rangers performing or describing the work they are doing.

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Mammal Spotlighting Survey with Line Transects

Data to record about each mammal seen (detection data)

What to record	Required?	Notes
Information to record about each mammal seen		
Transect name/number	Yes	Record the name/number of the transect
Time	Yes	Time when the mammal was seen/heard
Location coordinates	Yes	Record an accurate location (using handheld GPS if possible) of where you were standing when you first saw the mammal. If you don't have a laser rangefinder, also record the location of the mammal
Species	Yes	Record what species the mammal is. Make note if you are unsure of the identification and include a description of what it looks like.
Number of individuals	Yes	Note down if there was more than 1 of the same species seen together.
Animal distance	Yes	Use the laser rangefinder to get the distance of the animal. If the animal is on the ground, use the ACTUAL DISTANCE. If the animal is above the ground, use the HORIZONTAL DISTANCE or SLOPE DISTANCE.
Animal angle	Yes	Use the laser rangefinder to get the angle of the animal
Habitat	Optional	Describe what habitat the mammal was seen/heard in (e.g. climbing large Eucalyptus tree, moving through thick shrubland etc.)
Photo	Optional	Take a photo of the mammal and make a note of which camera/tablet/phone the photo was taken on, and the filename of the photo (usually ends in .JPG)

Next section – Part 3: Back in the Office

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Part 3: Back in the Office

GATHER YOUR GEAR

Equipment required for this part:

- ☐ Tablets/phones that you used to record data
- ☐ Data management system
- ☐ Laptop or computer with software for:
  - Spreadsheets
  - Mapping
  - R Software for distance sampling (optional)

KEEP IN MIND

When?

Always try to complete this work as soon as you can after returning from your time on Country so that the navigation device data is not lost and what you did and what you saw is fresh in your memory.

Who?

1 person to manage the data

Training and skills

Staff managing data are trained and competent in:

- ☐ Mapping software (like QGIS or Google Earth)
- ☐ Spreadsheet software (like Microsoft Excel)
- ☐ Data collection systems (like Fulcrum app or paper datasheets)
- ☐ Data management systems (like databases, cloud storage and external hard drives)
- ☐ Using R software for distance sampling analysis (optional)

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ACTIONS

Data entry, analysis and reporting

1. Record a summary of what you did and why, any observations (e.g. weather conditions, fire history, site condition), anything that went wrong or didn't work and things that worked well.
2. Download the walking tracks and observation waypoints from your navigation device
3. Upload the **survey effort and data** to your data management system.
   - Recommended: get someone else to proof the data to check for mistakes.
4. Upload any photos or videos taken during the survey to your data management system.
5. The data can be analysed using Microsoft Excel to estimate an index of abundance or activity, such as:
   a. Copy your detection data into a spreadsheet
   b. Add up the total number of animals detected for each species
   c. Add up the total distance (e.g. km) surveyed by multiplying transect length by number of transects surveyed by number of nights surveyed
   d. Divide the total number of animals by the total km surveyed to get an index of activity of detections/km.
   e. Make a simple graph showing the values for each species and include previous years if you have this data.
6. If you have the expertise, you can use R software and a distance sampling package to estimate population size.
7. Discuss with the ranger team or community the results of the monitoring, any reasons for the presence or absence of mammal species, and if there have been any changes to previous years.
   - Consider whether trends might be related to your management (e.g. feral cat control to check how well management is working, or if you need to make adjustments.
8. Share the data according to any data sharing or funding agreements you have made.

Next section – Full Equipment List

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Gather Your Gear – Complete List

The complete **GATHER YOUR GEAR** list for **Get Ready**, **Out on Country** and **Back in the Office**.

Gear List	Required?	Get Ready	On Country	In Office
Tablets/phones: • Ability to take photos • Apps for data collection (like Fulcrum) and navigation (like Avenza)	✓	✓	✓	✓
Laptop or computer with software for: • Mapping (like QGIS or Google Earth) • Spreadsheets (like Microsoft Excel) • R software (optional)	✓	✓		✓
GPS device & spare batteries	**Recommended**	✓	✓	
Power bank	**Recommended**		✓	
Bright headtorch & spare batteries • 1 per person • Minimum 300 lumens	✓		✓	
Laser rangefinder & spare batteries	✓		✓	
VHF or UHF radios	**Optional**		✓	
Thermal scope	**Optional**		✓	
Reflective flagging tape	**Optional**		✓	
Data management system (like databases, cloud storage and external hard drives)	✓			✓

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