ENVIRONMENTAL MONITORING METHOD:

Mammal Cage Trapping

Each section can be completed separately but you should read all three parts before starting. You need to complete all three parts to finish the monitoring method.

Part 1: Getting Ready

GATHER YOUR GEAR

Equipment required for this part:

- ☐ Electronic device(s) – charge ready for use and check that it has:
  - ability to take photos
  - data collection systems (app and form) (e.g. Fulcrum)
  - navigation system (e.g. Avenza) and site maps
- ☐ Laptop or computer with mapping software (e.g. QGIS, ArcGIS, Google Earth)

Remember to check **GATHER YOUR GEAR** lists for **Out on Country** and **Back in the Office**. See the full list of equipment needed to complete this monitoring method on the last page.

KEEP IN MIND

Why?

Make sure there is a clear aim for your monitoring project and that the method you have selected will give you the answers you need. Think about what data you do and don't need to collect from the animal.

When?

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

Who?

At least one ranger/staff to plan and prepare.

Consult species experts for guidance on how to conduct trapping for the species at your location(s).

Training and skills

Staff involved in planning are trained and competent in:

- ☐ Mapping software (e.g. QGIS, ArcGIS, Google Earth)
- ☐ Navigation systems (e.g. Avenza, GPS)
- ☐ Data collection systems (e.g. Fulcrum, datasheets)

- ☐ Scientific licencing and ethics permit requirements
- ☐ Animal ethics

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 licencing, approvals or ethics.
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.

ACTIONS

Make a plan and prepare

1. Plan which dates you will do cage trapping.
    - A minimum of 4 nights every year is recommended. But how long and how frequently you do the cage trapping will depend on what you need to know and what species you are trying to trap.
    - Avoid trapping in mammal breeding seasons when lactating females may be separated from their dependent young or when females are more likely to have pouch young that may cause ethical concerns e.g. macropods can "throw" their pouch young when stressed.
    - Avoid trapping in extreme weather conditions (hot or cold).
2. Plan what times you will be checking the cage traps.
    - Most Australian mammals are nocturnal, so it is best practice to clear traps by 3 hours after sunrise. How often and at what times you check the traps will depend on the species you are trapping, how cold or warm it is going to be, and your animal ethics permit requirements.
    - Avoid leaving animals in traps for long periods, especially in very cold or hot weather.
    - Some mammals get capture myopathy – this is when they get very stressed from being in a trap and can die. If you are likely to trap a species that is more likely to get capture myopathy, you should check traps earlier in the night or multiple times so that animals aren't left in the trap for too long.

3. If this is the first year you are monitoring, gather mammal records in your area and identify where potential mammal habitat is. Such as from traditional owners, ALA or government databases.
4. Select your sites
    - How many and where the sites are will depend on what you are trying to find out. Consider the data you need, and the target species' likely use of the habitat, home range size and welfare implications.
    - Traps can be on transects that follow along roads that you drive between, or in transects or grids or in the bush that you walk between or placed randomly in preferred habitat of a target species.
    - 1-4 road-based transects of 50 cage traps each spaced at 200 m is a common design for monitoring medium-size mammals.
5. Prepare maps of sites/load sites onto navigation devices
6. Plan what data (body measurements, samples, demographics, individually identifiable animals etc.) are necessary to collect to answer your monitoring questions.
    - If animals need to be individually identifiable, plan how you will mark them.
    - Permanent options include ear notching (with numbering systems), ear tags and microchips.
    - Marking animals with paint pen or clipping hair/fur can be a less-invasive technique if your team are not trained in more invasive techniques, or if you don't need permanent markings.
7. Plan your data management system.
8. Plan how you will record information on Country e.g. Fulcrum electronic data forms.
9. Plan your data management system e.g. how you will store trap check and animal data.
10. Check **GATHER YOUR GEAR** lists for **Get Ready, Out on Country** and **Back in the Office** (complete list of equipment on last page) and get any equipment you don't have. See the buying guides for advice on what trapping equipment may be suitable to buy.
11. Be clear on how many people will be involved and what everyone needs to do the work.
12. Check the training requirements for **Get Ready, Out on Country** and **Back in the Office** steps to ensure that rangers know how to use the devices, data collection apps, navigation systems etc. and how to set and clear traps and handle animals.

Next Section – Part 2: Out on Country

Part 2: Out on Country

GATHER YOUR GEAR

One set of this equipment for each site:

- ☐ Cage trap
- ☐ Hessian sack
- ☐ Pre-prepared lure/bait (appropriate for the species you want to catch)
- ☐ Flagging tape

One set of this equipment for each team:

- ☐ Electronic device(s) – charges and ready to record data, take photos and navigate to sites
- ☐ Power bank – charged and ready to charge devices (optional)
- ☐ Datasheets: trap check datasheet (paper) and animal data (on the electronic device)
- ☐ GPS device and spare batteries (recommended)
- ☐ VHF or UHF radio (handheld or car mounted) to communicate with other teams (recommended, particularly in areas with limited phone reception)
- ☐ Headtorch (if setting or clearing traps in the dark)
- ☐ Handling bags
- ☐ Spare cage traps
- ☐ Spare hessian sacks
- ☐ Container with enough lure/bait for each trap site (and spares)
- ☐ Tongs or spoons (optional, if baiting traps with meat baits)
- ☐ Hand sanitiser and/or water and soap
- ☐ Animal safe residual insecticide (e.g. Coopex)
- ☐ Reference documents or field guides: Mammal identification keys
- ☐ Stationery: pencil, pencil sharpener, eraser, permanent marker
- ☐ Trapping kit:
  - Weighing scales (e.g. Pesola digital scale or spring scales with hook in relevant weight for target species, e.g. 1kg, 600g and/or 300g
  - Digital or vernier callipers (digital callipers don't work in the rain!)
  - Plastic ruler
  - Animal first aid including adhesive under wrap for repouching (e.g. Fixomull stretch tape), vet-grade antiseptic (e.g. Cetrigen) and saline solution
  - Latex gloves

- OPTIONAL – tools to permanently mark individuals: microchips and microchip scanner, ear tags and applicators, or ear punch
- OPTIONAL – tools to non-permanently mark individuals: non-toxic paint pen (e.g. uni POSCA) or scissors/razors
- OPTIONAL – tools to take genetic samples from ears: ear punch or sharp surgical scissors, alcohol swabs, lighter and genetic sample tubes (e.g. Eppendorfs) filled with 70-90% ethanol.

KEEP IN MIND

When?

Close traps if extreme temperatures (very hot or very cold), heavy rainfall, high winds or bush fires are predicted.

Who?

At least two people per team, including a team leader who must be an experienced animal handler

Training and skills

Make sure everyone knows the plan

Field staff are trained and competent in:

- ☐ Navigation systems (e.g. Avenza, GPS)
- ☐ Data collection systems (e.g. Fulcrum, paper datasheets)
- ☐ Animal ethics
- ☐ Setting and checking cage traps

Team leader trained and competent in:

- ☐ Scientific licencing and ethics permits requirements
- ☐ Animal ethics
- ☐ Handling and processing animals, including identifying mammals, permanent marking of individuals, euthanasia, dealing with pouch young, and dealing with venomous and dangerous by-catch.

Staff managing daily data are trained and competent in:

- ☐ Spreadsheet software (e.g. Microsoft Excel)
- ☐ Data collection systems (e.g. Fulcrum, paper datasheets)

ACTIONS

Setting and positioning traps

1. Drive or walk to the first trap site.
2. Place the trap in a protected position so that it is:
    a. At least 5 metres from the road (or 10-20 m if the road is used by other people)
    b. Facing away from the road and facing away from where you will approach
    c. Protected from sun, wind and rain by vegetation (check that it will be shady in the morning)
    d. On flat and stable ground
    e. Not on or nearby an ant nest
3. Cover the back half of the trap with a hessian sack
    - Secure the hessian so that wind or animals won't dislodge it.
4. Clear the area in front of the trap door from vegetation, rocks, sticks or leaves that might stop the door from closing.
5. Place the bait at the back of the trap, behind the treadle.
    - Make sure the bait isn't under the trap treadle and cannot be reached from outside the trap.
6. Test that the trap is working properly, and the door fully shuts.
7. Set the trap.
8. Ensure the location of the trap is well marked by either tying reflective flagging tape onto vegetation directly above the trap or by using the GPS to record the exact location of the trap.
    - If the site is publicly accessible, the trap should be well hidden to prevent unwanted interference.
    - Recommended: label the flagging tape with the site number.
9. Continue to your next site, and complete steps 2-8 until all traps have been set.
    - If you don't set some of the traps, record these as 'SHUT' on your **trap check data** so that the team checking the traps knows exactly which traps haven't been set.

Checking traps and processing animals

1. Drive or walk to the first trap site.
    - Even if the trap has been marked as 'SHUT' on the **trap check data**, it is still a good idea to go to the site and check the trap.
2. Collect two handling bags.
    - Handling bags can be reused between animals but use a fresh bag if the bag becomes dirty or wet including from scat and blood.

- It's a good idea to also have a smaller handling bag in your pocket in case of thrown pouch young.

3. Approach the trap as quietly as possible.
   - Avoid slamming car doors, talking loudly or walking loudly.
4. Look to see whether the trap door is open or shut.
5. If the door is open, collect the bait and shut the door.
6. If the door is closed, look inside the trap to check if there is an animal.
   - Use one of the handling bags to quickly cover the front half of the trap that isn't covered by the hessian. Covering the trap can help to calm an agitated animal.
7. If there isn't an animal, fully remove the hessian and look under the treadle to make sure there isn't anything in the trap, collect the bait and shut the door.
8. If there is an animal, quickly and quietly remove the animal from the trap:
   a. Place the other handling bag over the door end of the trap, making sure there are no gaps.
   b. Open the door of the trap so that the animal can walk into the bag.
      - If the animal has pouch young, take extra care. This should be done as quickly as possible but without risking the mother escaping and leaving her pouch young behind.
      - If venomous animals like snakes or dangerous animals like large goannas or non-target animals like Echidnas have been caught, if safe to do so, the door can be propped open or cage turned gently upside down to allow the animal to leave when it is ready.
   c. Encourage the animal to go into the bag by lifting the hessian and/or blowing on the animal with short, sharp breaths.
      - Avoid lifting or shaking the trap.
   d. Once the animal is fully inside the bag, close the bag and tie it shut tightly.
      - Check that the animal's tail is out of the way before you tie the bag.
      - Hold the bag above where it is tied to avoid getting bitten.
   e. Fully remove the hessian to check if there are any young left inside or beside the trap.
   f. Collect the bait and shut the door
9. Check that the bait has been removed and the trap has been shut properly to avoid capturing any more animals.
10. Put the bait into the bait container.
11. Check the site ID by comparing the flagging tape label and/or GPS waypoint.
12. Record **trap check data** by writing the trap status for the trap, either:
    - species of animal caught
    - open with bait (OB)

- open with no bait (ONB)
- closed with bait (CB)
- closed with no bait (CNB)

13. Collect and record **animal data** (including marking individuals and taking samples)
    - Ensure that consistent measurement units are used e.g. millimetres for body measurements and grams for weights.
    - If you are not sure about the species identification, take photos of identifying features and/or consult a field guide.
14. Release the animal at its capture site
    - Do not tip the animal out of the bag.
    - Try to give the animal a smooth exit out of the bag and a clear pathway that isn't blocked by shrubs, big logs etc.
    - Avoid releasing onto the road or directly next to the car.
    - For females with pouch young, listen out for pouch young calls and check inside the handling bag in case a pouch young has been left in the bag or nearby on release. You may also need to consider a soft release.
    - After release and weighing the bag, it is good practice to shake out the handling bag to remove any scat, fur etc.
15. Continue to your next site, and complete steps 2-15 until all traps have been checked.
16. Before leaving your final site, have a look at your **trap check data** to make sure that all the traps have been checked.

Daily data management

1. After everyone has finished checking their traps, collect the **trap check data** and **animal data** from that morning.
2. Check the data to see if there is missing information or any particular issues (e.g. traps moved or shut because of ants, broken traps, issues with pouch young, soft releases to be checked).
3. If you are using individual identification, create a re-trap list.
    - This is a list of all the animals that have been captured and given an individual identification mark. If any of these animals are recaught, they don't need to be processed again. Include details like individual ID (e.g. microchip number), pouch young, injuries and missing data.
4. Make sure any devices are charged, trapping kits are re-stocked and re-trap lists are provided to each trapping team.
5. Put any DNA samples collected into the fridge (or a cool room with a consistent temperature).

6. Inform team leaders of any data or trap issues they need to be aware of before resetting and checking traps.

Resetting traps

Re-open traps in the late afternoon

1. Drive or walk to the first trap site.
2. If the trap wasn't shaded in the morning or had an issue with ants, move the trap to a better spot.
3. Check that the trap is covered by the thick hessian and weighed down.
4. Put fresh bait into the back of the trap.
5. Test that the trap is working properly, and the door fully shuts.
6. Reset the trap.
7. Continue to your next site, and complete steps 2-6 until all traps have been set.
    - If you don't set some of the traps, note these as 'SHUT' on your **trap check data** so that the team checking the traps knows exactly which traps haven't been set.

Collecting traps

1. On the final trapping morning, traps and hessians must be collected.
    - Traps can either be collected as each site is cleared, or they can be collected after all sites have been cleared.
2. Collect any flagging tape.
3. After you have collected your traps and before leaving the area, count the traps to make sure you haven't forgotten any.

RECORD DATA

Data to record when setting and checking traps

What to record	Required?	Notes
Information to record about each trap check		
Project name	Yes	Make it clear which project this data belongs to and its purpose
Date	Yes	Record the date the traps were checked
Personnel	Yes	Record the name of the people who checked the traps - this is helpful if any questions come up about the data
Number of traps	Yes	Know how many traps you are supposed to check each day and count the number of traps you did check at the end of the trapping session.
Information to record about each trap that was checked		

Site name/number	Yes	Always check the site number against the flagging tape and GPS coordinates or map.
Trap checked	Yes	Record that the trap was checked.
Suggested information to record about each trap check and/or each trap that was checked		
Trap status	Optional	Record the status of the trap (e.g. animal caught, whether the trap was not set, or it was open or closed, with or without bait etc.).
Animal Identification	Optional	An animal's individual identification can be one of the most important pieces of information. Writing the animal identification or adding the microchip sticker can help figure out any mistakes if the information wasn't entered correctly into the electronic device.
Trap issues	Optional	Record whether there were issues with the trap e.g. ants, door not shut, hessian disturbed etc.
Start and end time of trap check	Optional	Record what time you started and ended your trap check.
Habitat description and/or photo	Optional	Describe or take a photo of the vegetation type and landscape features at the site
Signs of introduced species	Optional	Are there signs of introduced species like cats and foxes e.g. tracks or scats?
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.

Data to record when animals are trapped

What to record	Required?	Notes
Information to record about each animal trapped		
Project name	Yes	Make it clear which project this data belongs to and its purpose
Date	Yes	Record the date animal was captured
Personnel	Yes	Record the name of the people who processed the animal and recorded the data - this is helpful if any questions come up about the animal or data
Site name/number	Yes	
Species	Yes	
Animal individual identification	Optional	This is usually used for permanent individual marking, such as microchip or ear tag number
Weight	Optional	Specify the measurement unit to be used. Grams (g) is usually the standard unit for small – medium sized animals.
Sex	Optional	

Age	Optional	Age can be determined based on things like size, weight, breeding status or tooth wear.
Breeding status	Yes	Breeding status can be determined based on things like age, weight, pouch status, testes size, nipple colour and size, scent glands, fat deposits. This is particularly important information for female animals that may have pouch young or dependent young.
Sample number	Optional	If you have taken samples (e.g. DNA, ectoparasite, swabs), record the sample number of the sample tube. It is useful to have the sample tubes pre-labelled with an individual number or label them with the animal's individual ID (e.g. microchip number).
Illness, injuries, abnormalities	Optional	Information on whether an animal is sick, has a high parasite load, has lost fur or has an injury.
Unexpected outcome	Yes	Record if an animal (including pouch young) has died or has to be euthanised.

Next section – Part 3: Back in the Office

Part 3: Back in the Office

GATHER YOUR GEAR

Equipment required for this part:

- ☐ Electronic device(s) that you used to record your data
- ☐ Data management system, e.g. cloud storage
- ☐ Laptop or computer with software for spreadsheets (e.g. Microsoft Excel) and mapping (e.g. QGIS, ArcGIS, Google Earth)
- ☐ Trap check datasheets
- ☐ Disinfectant solution: diluted F10 (as recommended on label) or chlorine bleach (1:10)
- ☐ Safety data sheets for F10 or chlorine bleach
- ☐ Personal Protective Equipment (as recommended on the chemical safety data sheets)
- ☐ Spray bottles for F10 solution or large tubs for chlorine bleach solution
- ☐ Washing line
- ☐ Flagging tape
- ☐ Hose (high pressure hose recommended)

KEEP IN MIND

When?

Clean and put away equipment as soon as possible after trapping finishes, preferably the same day.

Download data and photos as soon as possible after trapping finishes so that the data is not lost.

Who?

At least one person from each trapping team to clean and put away equipment

At least one person to manage the data.

Training and skills

Staff cleaning equipment have:

- ☐ Read the chemical safety data sheets for the chosen disinfectant

Staff managing data are trained and competent in:

- ☐ Mapping software (e.g. QGIS, ArcGIS, Google Earth)
- ☐ Spreadsheet software (e.g. Microsoft Excel)
- ☐ Data collection systems (e.g. Fulcrum, datasheets)
- ☐ Data management systems (e.g. databases, cloud storage, external hard drives)
- ☐ Optional: Data analysis for estimating occupancy and/or population size

ACTIONS

Cleaning

1. After the traps have been collected, all equipment must be cleaned and disinfected with F10 or chlorine bleach solutions.
2. Read the F10 or chlorine bleach safety data sheet and wear the recommended PPE.
3. Dilute the F10 (as recommended on label) or chlorine bleach (1:10 solution).
4. Shake out, clean and hang hessians on washing line, disinfecting by either:
    a. Immersing in diluted chlorine solution (optional: soak for 10 minutes) and then rinsing with fresh water *or*
    b. Spraying all surfaces with diluted F10.
5. Clean the traps to remove dirt, scat, bait etc. with water, and disinfect by:
    a. Immersing in diluted chlorine solution (optional: soak for 10 minutes) and then rinsing with fresh water *or*
    b. Spraying all surfaces with diluted F10.
    - Wash traps outside on a concrete surface like a car parking bay.
    - High pressure hoses are an easy way to clean traps.
6. Leave hessians and cage traps to dry in the sun for a minimum of 10 minutes.
7. Tie flagging tape onto any cage traps that need repair.
8. Shake out trapping bags and turn inside out.
9. Wash trapping bags with diluted F10 or diluted chlorine solution.
    - You can use a washing machine but make sure you wash the bags separately from personal clothing and clean the washing machine after use.
    - Make sure bags are rinsed with fresh water after disinfecting.
10. Hang trapping bags to dry in the sun for a minimum of 10 minutes.
11. Check bags for holes, weak seams and loose threads that need to be repaired.
12. Clean out trapping kits and note down any equipment or supplies that need replacing.
    - Consider buying replacement supplies or equipment now so that everything is ready for the next time you do any trapping.
13. Once dry, pack away clean traps, hessians, trapping bags and any other equipment.

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. Upload the trap check and animal data to your data management system.
   - Recommended: get someone else to proof the data to check for mistakes.
3. Upload any photos or videos taken during the survey to your data management system.
4. Analyse the data (e.g. to estimate population size or occupancy) and/or make some simple graphs to show number of species, number of captures, sex ratio, trap success rates, raw/naïve occupancy.
5. Discuss with the ranger team or community the results of the monitoring, like the number of species or population size and health, and if there have been any changes to previous years.
   - Consider whether trends might be related to your management (e.g. feral cat and fox control) to check how well management is working, or if you need to make adjustments.
6. Share the data according to any data sharing or funding agreements you have made

Next section – Full Equipment List

Gather Your Gear – Complete List

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

Gear List	Required?	Get Ready	On Country	In Office
Electronic device(s): • Charged • Ability to take photos • App for data collection (e.g. Fulcrum) • App for navigation (e.g. Avenza)	✓	✓	✓	✓
Power bank • Charged	**Recommended**		✓	
Laptop or computer with software for: • Mapping (e.g. QGIS, ArcGIS, Google Earth) • Spreadsheets (e.g. Microsoft Excel)	✓	✓	✓	✓
VHF or UHF Radio	**Recommended**		✓	
GPS (e.g. Garmin handheld device) & spare batteries	✓	✓	✓	
Headtorch & spare batteries	**If checking traps at night/before sunrise**		✓	
Cage traps (e.g. Sheffield small animal trap) • treadle plate mechanism • no bait hook or a hook that has been closed to form a loop • no sharp edges that can hurt an animal • correct size for target species (e.g. 22cm x 22cm x 55cm with 11mm mesh spacing)	✓		✓	✓
Hessian sacks • heavy duty • correct size (approx. 100mm x 60mm)	✓		✓	✓
Bucket of pre-prepared lure/bait	✓		✓	
Tongs	**Recommended for meat-based lure/bait**		✓	
Flagging tape and reflective tape	**Recommended**		✓	
Clipboard with • Trap check datasheets • Re-trap list	✓		✓	
Stationery: • Pencil • Eraser • Pencil sharpener • Permanent marker				
Large handling bags	✓		✓	✓

• Thick but soft and breathable material like cotton drill • Dark coloured material • Approx. 75 cm x 55 cm				
Small handling bags • For thrown pouch young • Thick but soft and breathable material like polar fleece • Dark coloured material • Approx. 25 cm x 30 cm	✓		✓	✓
Trapping kit including: • Weight scales • Calipers (digital or vernier) • Ruler • Permanent marker • Animal first aid – adhesive stretch tape, wound treatment, saline solution • Disposable gloves • Hand sanitiser or soap • Optional - tools to permanently mark individuals: microchips and microchip scanner, ear tags and applicators, or ear punch • Optional – tools to non-permanently mark individuals: Non-toxic paint pen (e.g. uni POSCA) or scissors. • Optional – tools to take genetic sample from ears: ear punch or sharp surgical scissors, alcohol swabs, lighter and genetic sample tubes (e.g. Eppendorfs) filled with 70-90% ethanol.	✓		✓	✓
Mammal reference documents and/or field guides	✓		✓	
Snake handling kit	**Optional**		✓	
Solution for cleaning equipment: F10 or Chlorine bleach (1:10) *Don't forget to dilute to the recommended solution, read the safety datasheets and wear the recommended PPE!*	✓			✓
Spray bottle and/or tubs for cleaning equipment	✓			✓
Washing line	✓			✓
High pressure washer/hose	✓			✓
Data management system (e.g. cloud storage)	✓			✓