DATA COLLECTION in track-based surveys

There are several variations of track-based surveys being used across Australia, although the most common standardised method is a 2 ha plot survey (sometimes called a sign survey, track survey, 2 hectare plot, cybertracker survey or Tracks App survey). In the 2 ha plot survey, observers search a 2 ha area for signs of animal presence, ideally for a set period of time or effort. Transect searches – where a stretch of track is searched systematically, and timed searches, where trackers wander through an area in any direction for a set amount of time, are also commonly used.

Over time, groups have developed variations on track-based surveys to fit with their monitoring objectives and local context. In addition, the type of data that people collect during surveys has evolved and drifted, and people use several different data collection mechanisms, from paper datasheets to app-based systems.

Although the differences in method (2 ha plot vs transect) can be accommodated in analyses, any inconsistencies in data recording fields, and inconsistencies in data quality, can hinder the collation and interpretation of data across people and groups. Streamlining data collection to a core set of fields, with instructions on how to collect that information consistently, will make it possible to combine track-based data from many different people and groups. To that end, the Arid Zone Monitoring project worked with several tracking experts to design a data recording template that could be used nationally, regardless of the track-based survey method used.

The track-based survey datasheet: The datasheet includes fields for both site and sign information. Site information includes location details, date, time etc. Sign information includes whether tracks scats and burrows recorded for each species, and the age of the signs. Instructions follow after the datasheet.

To store your data, you may wish to use one of the preferred data entry templates.

For inquiries or information about where to send datasheets and photos, contact AridZoneMonitoring@gmail.com

DATA RECORDING SHEET FOR TRACK-BASED SURVEYS

Before you begin, check that:

- *Trackers are trained.*
- *Site has good tracking surface (areas of soft sand, not too much grass, soil crust or leaf litter).*
- *Tracking conditions are good (sunny, long shadows, no wind or rain in the last few days).*
- *Search effort will be about the same for each site (1 person 30 min, 2 people 15 min etc).*

Describe the survey and survey site

Who	Ranger group or organisation	
	Name of person recording *(optional)*	
When	Date	
	Start time	
Where	Lats (northings)	
	Longs (eastings)	
	Property/IPA name	
	Site name/ Location/ Plot ID *(optional)*	
	Photograph ID *(optional)*	
How	What sampling method was used *(circle)*	2 ha plot Road beside 2 ha plot Transect Timed search *Or describe in words:* *Or* Incidental observation (not from a standard method, you just came across the sign but didn't complete a full survey)
	Survey target* *(circle)*	Recording all species Recording only target species
	If recording only one or some species, what were they? *(e.g. Bilby, Tjakura)*	
Fire	How long ago was the last fire *(years, or local fire categories)*	
	Did the fire burn hot or cool?	

** It is most useful if you aim to record all animals at a site, instead of focusing on just one or two. The records of other animals can help you understand why your focal species is present or absent.*

Species Animal name	**Language/ local name for animal**	**Tracks**	**Burrow**	**Scats**	**Diggings**	**Other** (e.g skin, hair, feathers, see animal alive, see animal dead)	**Comments**	**If you surveyed the road next to the survey site, record those detections separately here (F, O, VO)**
You can pre-fill with species you may detect		***F*** *if Fresh (1-2 days),* ***O*** *if Old (3 days to 1 week),* ***VO*** *if Very Old (> 1 week),*						
Tracks or sign in the plot, along the transect, or in the timed search; or the incidental observation								

DATASHEET INSTRUCTIONS

The data collection template suits a standard 2 ha plot survey and a standard road transect adjacent to the 2 ha plot – however the same template could be easily modified for other standardised methods such as timed searches and transects, as well as for incidental (non-standardised) recordings of signs.

Who

Noting who made the records is useful in case details of observations need to be checked.

When

The date is essential for allowing analysis of trends in detections over time, and for showing that records at the same site were made on different visits.

Where

The coordinate information is essential, and the property or IPA name is very useful for checking that the coordinates have been correctly recorded. You may wish to give sites unique names if you plan to revisit them over time.

Recording location

- Ensure this record is accurate to within 50m if you are, or plan to, revisit sites.
- A geographic coordinate system using latitude and longitude should be used rather than projected coordinate system, for instance UTMs. If using UTMs, record relevant metadata (such as the Zone setting).
- When multiple GPS devices are used make sure they are set to use the same datum (e.g. AGD84, WGS84, GDA2020) which provides the frame of reference for measuring locations on the Earth's surface. Using multiple GPS devices with different datums creates misalignment in the location of sites when mapping (this may not cause issues if the scale of the analysis is coarse – for instance 1 km^2).

Photograph site

If possible, take a photo of the quadrat to provide a permanent record of the vegetation. Store the photo with the datasheet.

How

Sampling method

Record whether detections were made during standardised surveys, or via incidental observations (Figure 1). In standardised surveys, the sample method also needs to be recorded (e.g. 2 ha plot, road transect, timed search etc).

A standard 2 ha plot survey

For a 2 ha plot survey, mark out the area based on landmarks or with a GPS as you walk (100m x 200m). Trackers should spend the time needed to thoroughly search this area. If there are more people who are spread out, it may be quicker to search the area. In reality, the group size when carrying out tracking surveys is variable, and if there are more people searching, they may record more sign than a smaller group searching for the same amount of time. Larger groups could compensate for this by surveying for shorter periods than smaller groups to try and even out the effort. Another complication is that people spend more time at sites when they see more animals - each record involves identifying tracks, discussing with other group members, and entering data, all of which takes time away from searching. The rule of thumb is – *try and keep the search effort at each site or transect similar*, given the group size, and the interruptions for recording data or discussing finds. It is good to make a note of the length of survey

time and number of trackers used in your survey design, that why the same effort can be repeated when returning to the same sites over time.

Try and cover most of the 2 ha area by zig zagging up one side and back down the other. Record all tracks, burrows, diggings, sightings or scats of each species. If the sandy substrate is along narrow sand dunes you can reduce the width of the search area and increase the length providing the total area is 2 ha.

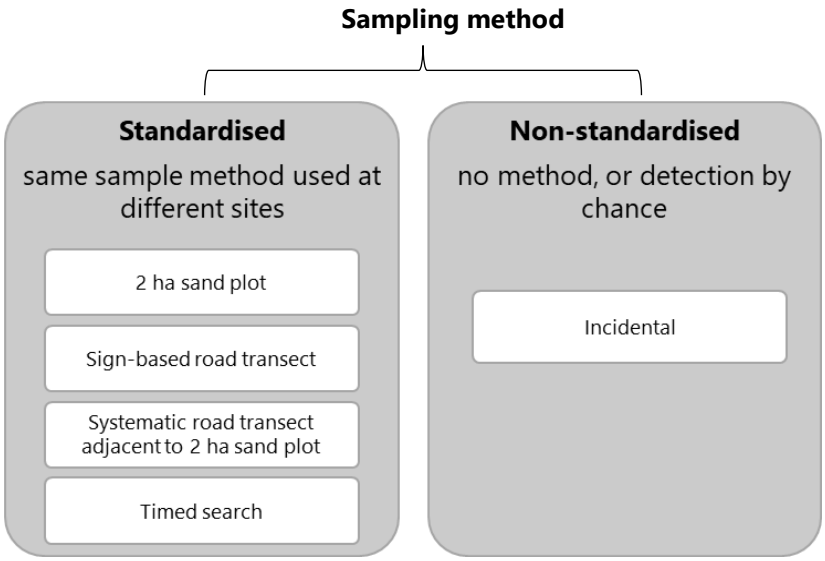
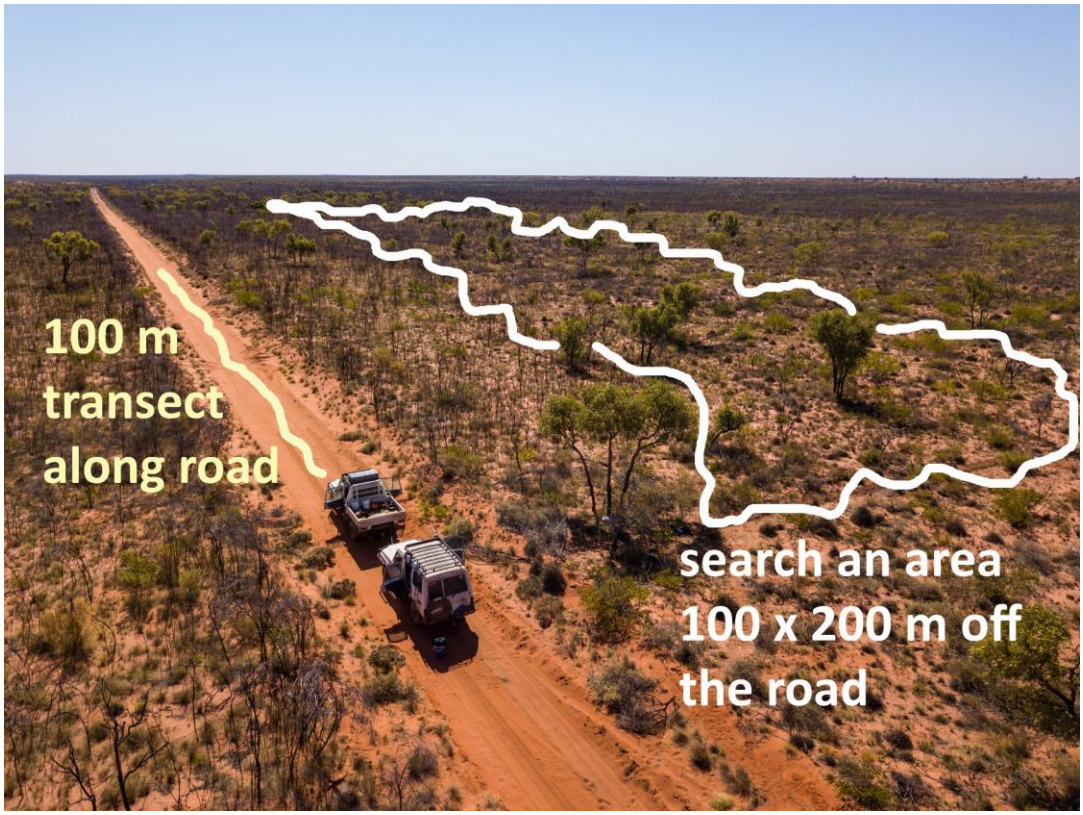


Figure 1: Track-based survey data classified by sample method. Surveys are standardised when data are recorded using the same survey method each time. Incidental records can be collected using any methods. Distinguishing the sampling method is essential to allow for analysis of data across time or multiple data collectors.

A standard road transect survey adjacent to the 2 ha plot

Some species such as cats, dogs and foxes may walk along roads and be more detectable there. Detections on roads adjacent to 2 ha plots can be included as data from a standardised survey if these road sections are checked systematically during a survey of the adjacent 2 ha plot. A 100m transect along the road is recommended. However, *records from 2 ha plots and adjacent roads should be separated and clearly identified to avoid introducing biases*, especially if adjacent road searches are not carried out for every 2 ha plot survey. This is because the propensity of predators to use roads may vary between regions, roads may not be representative of the study area, and lumping detections from roads with 2 ha plot data could elevate the occupancy of road species.

This photo shows a typical configuration of a 2 ha plot and a 100m road transect.



Survey target

In standardised surveys, note whether the survey recorded information on all species detected, or whether it targeted a focal species and information on other species could have been missed. It is most useful if you aim to record all animals at a site, instead of focusing on just one or two. The records of other animals can help you understand why your focal species is present or absent. Also, recording information on all species means you build up 'absence' data, which is valuable because it indicates the environmental conditions that are unsuitable for a species, at least during the time surveys are undertaken. Absence data, in tandem with presence data, can help narrow down our understanding of what drives species occurrence, and improve estimates of change over time. In general, the quality of absence information improves if the same sites are re-sampled over a relatively short time (e.g. 6 months). This is because repeat visits help to separate out 'true' absence from imperfect detection. Imperfect detection happens when tracks are missed by chance. By revisiting sites, we can estimate how often trackers detect a species when we know it really has passed through the plot.

Fire

In general, most environmental information such as landform, soil, elevation, vegetation type, and time since the last fire, can be gleaned from publicly available national datasets if the site coordinates are recorded. However, information on fire at the site – the time of the last fire, and how severe it was – can be useful for understanding variation in species presence at finer scales. In addition, fire history data collection is engaging - particularly for individuals involved with fire programs, and most groups want to observe and discuss the fire status at survey sites. Data field entry options should relate to Indigenous fire categories for that area, and trackers need to record this information consistently; data templates could include a picture card with time since fire categories relevant for the region.

Alternatively take a photograph of the site, in a standard way (for example, always pointing in a particular direction), but photographs need to be clearly labelled and stored to be useful. Or leave this field blank.

Data quality

Sites should be positioned in places that are good for tracking, with the right type of soft sand or soils for animals to leave tracks behind (not hard rocky soils), and not completely covered in thick vegetation, soil crust, or leaf-litter, as it will be hard to find tracks. The quality of the tracking surface is another factor that influences accurate identification of tracks. If the surface of the sand is soft, powdery, dry and comprised of fine-grained sand then it is possible to distinguish tracks of smaller animals. Conversely if the sand is coarse, wet, compacted or wind driven it may only be possible to distinguish tracks of large animals such as camels.

Data quality will be better if there is slanting sunlight that makes shadows (in the morning of afternoon), it is not raining, the ground is not wet, and it is not or has not been very windy in the past few days.

Recording the tracking conditions at the site can help with interpreting the data. However, bear in mind that if tracking conditions are poor, the best option is not to carry out the survey…wait for better conditions. Nothing can make up for missing species occurrence data because the conditions were poor for tracking.

Animal detections

Training to recognise animal sign correctly before carrying out surveys is essential. Only record when certain of identification. E.g. 'Large macropod' is better than recording 'red kangaroo' if you are not able to tell the difference between red kangaroo and euro. If you are very unsure then do not record anything. Having lists of the local animals and photos of their sign with you during surveys may help with identification. The AZM species profiles might be useful in the field or during training to improve knowledge and identification of sign.

Age of tracks

- *Fresh (1-2 days)*
- *Old (3 days to 1 week)*
- *Very Old (> 1 week)*

Tracks from larger animals remain visible for longer than those from small animals, so larger animals can seem more common than they are, if the age of sign is not accounted for. Very fresh tracks on good tracking surfaces are usually very clear, with small features like claws and footpads visible. Check tracks from very small animals (insects and mice), which are only clear for a day or two, and compare these with older tracks. If the tracks of insects can be seen passing over the track you are trying to identify, then you know your track is older than a couple of days. Separating "*old*" and "*very old*" can be more challenging. With time, the fine features of tracks disappear and only the general gait is visible.

Age of scats

As scats age they become drier, lighter in colour, and get harder and less smelly. Very old scats are crumbly and don't smell.

Age of burrows

Active burrows have an entrance that is not blocked by spiderwebs or vegetation, usually with tracks, scrapings and/or scats at the entrance. Some animals have burrow systems with multiple entrances, some freshly used and others older, so if you find a burrow that looks unused, check nearby for active entrances.

Practical tips

How easily a sign is detected varies between species and the age of the sign, and also by the tracking conditions. This is why it is important to set up sites in places where the tracking surface is good, and to collect data when weather and light conditions are best. Surveys should not be conducted immediately after rain or during windy conditions that may remove or obscure tracks or sign. How easily signs are detected is also affected by the experience of the observer, which is why training in track and sign recognition is so important. When searching for tracks, walk with the sun behind you, as tracks are easier to see. If needed, take a photo, with a scale (a ruler, matchbox or coin), so you can cross-check your identification with others later. Only record sign when you are sure of the identification, as recording the presence of species incorrectly is a much bigger problem than missing some records.

Collecting extra data on focal species

Learning more about threatened or culturally significant species may be a strong motivator for carrying out track-based surveys, and monitoring may be tailored to one or more focal species. In these situations, extra data on local habitat conditions, threatening processes and management needs of the focal species might be valuable. The most relevant extra data will depend on the ecology of the species and the specific local research question.

Focusing on important species could affect the quality of data collected on other species. Examples of trade-offs that need to be considered include:

- Observers who are concentrating on detecting focal species may be more likely to miss detections of other species.
- Placing sites within a focal species' habitat may mean the set of sites does not represent the range of habitats that other species prefer, and therefore these other species may mistakenly appear absent in the area.
- Recording additional site data (for example, extra habitat information to understand the distribution of focal species) will increase time required at the site, and therefore decrease the number of sites that can be surveyed.
- There may be specific training needs to allow for recording targeted data for focal species.

Collecting extra data can be valuable for species-specific work, but decide what extra data to collect carefully, because the collection will take time and therefore reduce the number of sites that are surveyed. It's also likely that training may be needed to ensure data quality is maintained. The general rule is do not waste time collecting data you won't use. For example, recording of age of species (adults or juveniles) may be relevant to key species such as bilby or great desert skink, but measuring track lengths in the field for all tracks adds time spent at each site, so only include this if the information is useful to your survey objective.

Examples of extra data fields that can be collected in surveys that aim to understand what drives bilby occurrence are shown in the example supplementary datasheet. This is a guide only, the actual data fields required will depend on the species and questions being asked.

Supplementary datasheet

Example of a Supplementary datasheet for surveys that target bilbies, in a project that aims to understand more about their ecology.

Information	Notes	Record information
What are they eating?		
Food plant	E.g. *Grass seeds, yakirra grass, witchetty grub shrubs, bush fruits, bush onions, yams and potatoes*	
Are they digging into roots of plants?	*Yes, No*	
Are they digging for ants?	Helps to validate the presence of bilby, but other bilby sign needed to prove presence.	
Age and breeding status		
Juveniles present?	*Yes, No* *Check measurements of tracks*	
How old is the animal?	*Big adult, small adult, young*	
How much bilby sign?	*Lots of bilby sign, little bit bilby sign, no bilby sign. This is subjective, so calibrate with other team members.*	