

Version
1.0

BMD
Biodiversity Meets Data

A PRACTICAL GUIDE TO CAMERA TRAP SURVEYS

Co-funded by
the European Union

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Federal Department of Economic Affairs
Education and Research EAER
**State Secretariat for Education,
Research and Innovation SERI**



26 June 2026

Maya Beukes, Senckenberg Nature Research
Rotem Zilber, Institute for Biodiversity & Ecosystem Dynamics – University of Amsterdam
Niels Raes, Naturalis Biodiversity Center
Lennart Suselbeek, Wildlife Monitoring Solutions

Co-funded by the European Union

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Federal Department of Economic Affairs
Education and Research EAER
State Secretariat for Education, Research and Innovation SERI

BMD (Biodiversity Meets Data) receives funding from the European Union's Horizon Europe Research and Innovation Programme and the Swiss State Secretariat for Education, Research and Innovation (SERI) (ID No 101181294). Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union, the European Research Executive Agency (REA) or SERI. The EU, REA and SERI cannot be held responsible for them.

TABLE OF CONTENTS

About this guide 4

1. Planning your camera trap study 5

Define your research question or monitoring objective 5

Select an appropriate survey layout 5

Decide on the survey duration 6

Select your camera equipmen 7

2. Prepare for the deployment of cameras in the field 9

Camera equipment checklist 9

Field equipment checklist 9

Camera settings 10

3. Camera deployment 12

Mapping and navigation 12

Selecting the exact camera location 12

Selecting a mounting surface 13

Positioning and orientating the camera 13

Environmental considerations 14

Security and theft prevention 15

Test cameras 17

4. Camera maintenance and routine checks 18

Planning camera maintenance visits 18

Prepare for camera checks 18

Conducting the camera check 18

5. Data management and processing 20

Downloading and organising data 20

Data quality control 20

Data storage and backup 20

Processing camera trap data 21

6. Complementary data collection 23

Field-based measurements 23

Landscape and remotely sensed data 23

7. Ethics, permissions, and data stewardship 25

8. Stakeholder engagement, citizen science, and outreach 26

Stakeholder engagement 26

Citizen science 26

Education and outreach 27

Science communication 28

References 30

Appendix 1: Camera Trap Data Sheet 31

Appendix 2: Camera Check Datasheet 32

Appendix 3: Camera-specific configuration sheet 33

Appendix 4: Protocol for naming 34

ABOUT THIS GUIDE

Camera traps have become one of the most widely used tools in wildlife research, conservation, and biodiversity monitoring. Their applications range from species inventories and long-term ecological monitoring to behavioural studies, population estimation, citizen science, and the development of artificial intelligence for wildlife conservation. As the popularity and accessibility of camera trapping continue to grow, so too does the range of resources available to support researchers and practitioners, including books, field manuals, standardised protocols, best-practice guidelines, software platforms, coding packages for data management and analysis, online training materials, and a growing number of open-access AI and citizen science tools.

This guide is intended to complement, rather than replace, these existing resources. Instead of providing a comprehensive review of camera trap methodology, it brings together practical advice, field-tested recommendations, and lessons learned from camera trap projects conducted across a range of ecosystems and study objectives. The guide draws on the collective experience of researchers and conservation practitioners involved in long-term camera trap programmes, combining insights from both the scientific literature and practical field applications.

The emphasis is on the practical aspects of planning, preparing, deploying, maintaining, and managing camera trap surveys, with the aim of improving survey design, increasing data quality, enhancing field efficiency, and maximising the long-term value of camera trap datasets. Throughout the guide, readers are directed to additional resources for more detailed information on specialised topics such as survey design, statistical analyses, and data management.

Whether you are planning your first camera trap survey or refining existing workflows, this guide is intended as a practical, accessible reference that can support project planning, field deployment, routine maintenance, and data management. As camera trap technology and analytical approaches continue to evolve, readers are encouraged to use this guide alongside the broader camera trap literature and to adapt the recommendations to the objectives, environmental conditions, and logistical constraints of their own projects.

1. PLANNING YOUR CAMERA TRAP STUDY

A successful camera trap project begins long before the first camera is deployed. Careful planning helps ensure that the data collected are fit for purpose and that the survey design aligns with the ecological or management questions being addressed. This section provides guidelines to help you develop your project objectives, select an appropriate survey design, and provide you with additional resources to support study planning.

Define your research question or monitoring objective

A clearly defined research question or monitoring objective is the foundation of a successful camera trap project. The objectives of the study should guide all subsequent decisions, from survey design and camera placement to camera settings, sampling effort, and data analysis. Consider the following:

- **Define the objective:** Clearly identify the primary aim of the project, such as a species inventory, occupancy study, abundance or density estimation, behavioural observations, species interactions, long-term monitoring, or species-specific conservation.
- **Match the survey design:** Different objectives require different survey layouts, camera spacing, deployment durations, and analytical approaches. The survey design should be selected to answer the research question rather than simply being the easiest to implement.
- **Consider the target species**: The ecology, body size, movement patterns, and expected detection rates of the target species may influence camera placement, height, settings, and maintenance schedules.
- **Plan for data analysis:** Consider the intended analytical methods during project planning, as different approaches (e.g. species inventories, occupancy, or capture–recapture studies) have different data requirements and assumptions.
- **Balance ambition with practicality:** The most ambitious survey design is not always the most practical or sustainable. Consider the available funding, personnel, equipment, logistical constraints, and the time required for fieldwork and data processing when designing the study.

Select an appropriate survey layout

Once you have clearly defined your research question or monitoring objective, you can design the spatial arrangement of your camera traps. The layout should maximise the ability to answer the research question while balancing statistical requirements and practical field constraints. Common camera trap survey designs include (Figure 1):

- **Grid or systematic design:** Cameras are placed at regular intervals across the study area to provide even spatial coverage. This approach is commonly used for long-term monitoring, occupancy studies, and abundance or density estimation.
- **Random design:** Camera locations are selected randomly to reduce sampling bias and provide representative estimates of biodiversity or habitat use.
- **Stratified random design:** The study area is divided into habitat types, management units, or other categories, with cameras allocated randomly within each. This ensures adequate representation of important landscape features.
- **Clustered design:** Cameras are grouped around focal areas or within sampling clusters. This can improve logistical efficiency or target particular species or habitats, but may reduce representation of the broader landscape.
- **Camera spacing:** Consider the appropriate distance between cameras, which is often determined by the home range size, movement patterns, and ecology of the target species, as well as the objectives of the study.
- **Targeted or opportunistic placement:** Positioning cameras on well-used game trails, waterholes, or other high-activity locations can increase detection rates for particular species and may be appropriate for species inventories or targeted studies. However, these approaches should generally be avoided when the aim is to estimate biodiversity, occupancy, abundance, or density, as they can introduce sampling bias.

Practical tip: There is no universally "best" survey design. The optimal layout should balance the study objectives, ecological assumptions, logistical constraints, and available resources.

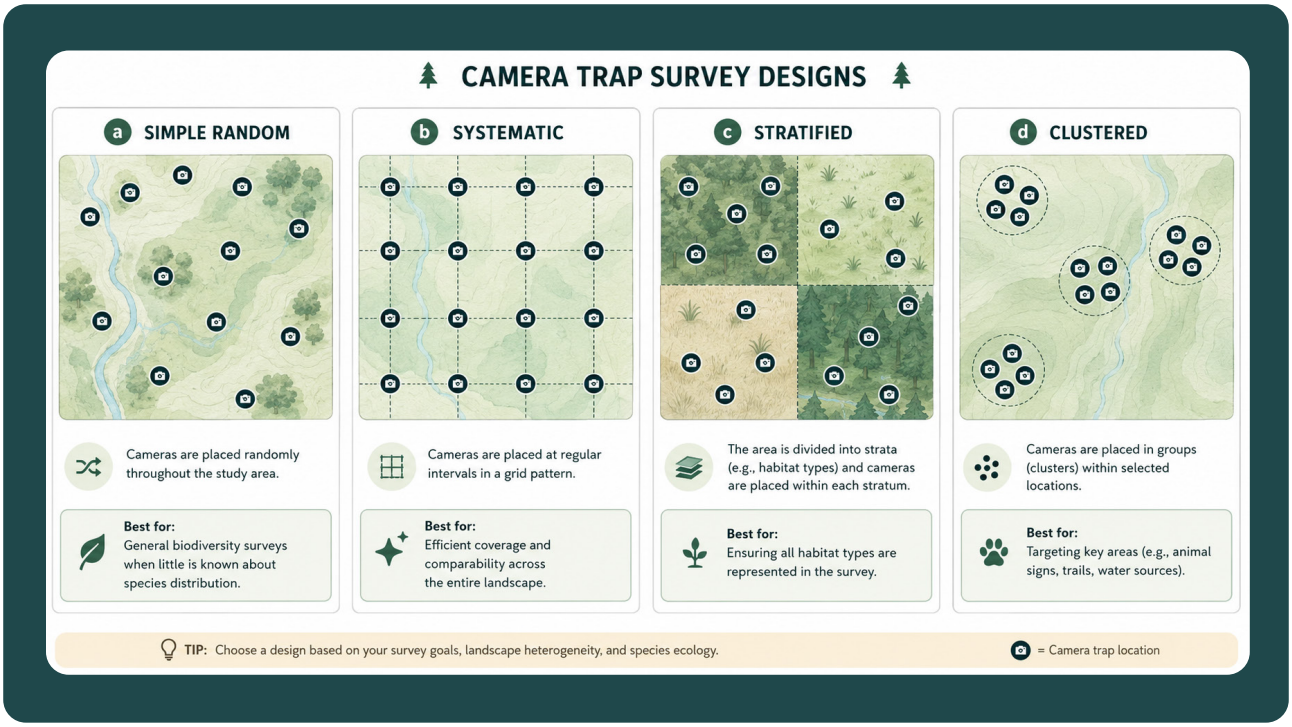


Figure 1: Examples of common camera trap survey designs (adapted from Wearn & Glover-Kapfer (2017)). Camera traps can be deployed using a variety of sampling strategies depending on the study objectives, target species, and characteristics of the landscape. (a) Simple random sampling places cameras randomly throughout the study area and is well-suited for general biodiversity surveys where little is known about species distributions. (b) Systematic sampling uses a regular grid and provides even coverage across the landscape, facilitating comparisons between sites and repeated monitoring. (c) Stratified sampling divides the study area into habitat or environmental strata to ensure that key habitat types or landscape features are adequately represented. (d) Clustered sampling places cameras in groups within selected areas and may be useful for targeting specific features such as wildlife trails, water sources, areas of high animal activity, or logistical constraints. The choice of survey design should be guided by the research question, target species ecology, landscape heterogeneity, and available resources.

Decide on the survey duration

The optimal survey duration (effort) will depend on the study objectives, target species, environmental conditions, and available resources. Consider the following:

- **Study objectives:** Survey duration should be compatible with the assumptions and requirements of the intended analytical approach.
- **Species accumulation**: For species inventories, consider whether sampling has approached an asymptote (Figure 2).
- **Target species ecology**: Common and widespread species are typically detected first, while low-density, cryptic, or wide-ranging species may require longer deployments to achieve adequate detection rates.
- **Seasonality**: Longer surveys may capture seasonal changes.
- **Logistics and resources:** Consider practical constraints, including funding, field staff, equipment, site accessibility, and time required for camera maintenance and data processing.

Further reading

Find out more on how to choose and refine your study design in these links:

- Remote Camera Survey Guidelines & AB Metadata Standards (Alberta Remote Camera Steering Committee (RCSC) et al. 2024).
- WWF Camera-trapping for conservation: a guide to best practices (Wearn and Glover-Kapfer 2017).
- Wildlife camera trapping: a review and recommendations for linking surveys to ecological processes (Burton et al. 2015).
- Study design field protocol for camera trap survey (video)

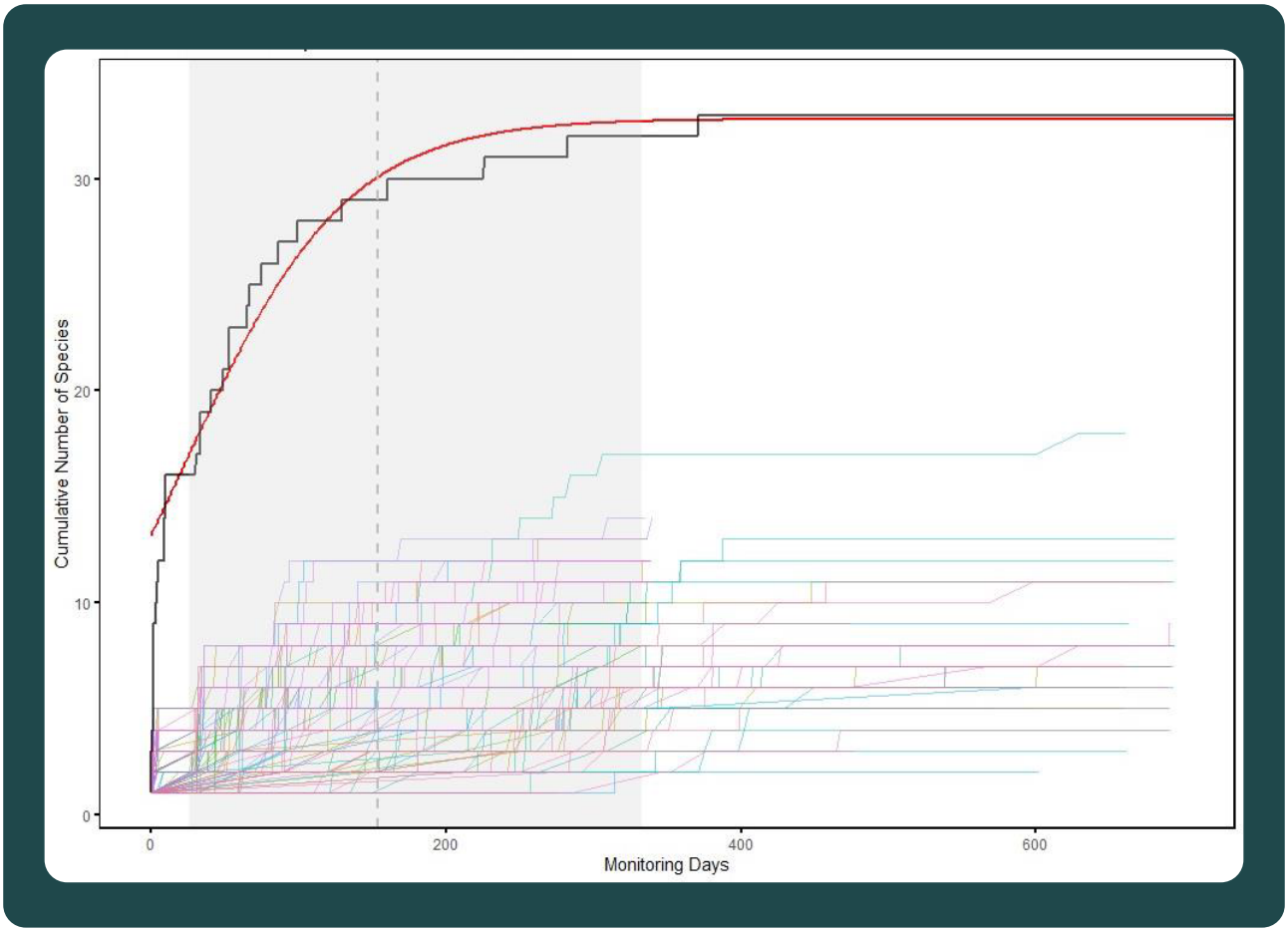


Figure 2: An example of species accumulation across camera deployments over time. Coloured lines represent individual deployments, the bold red line shows the logistic growth model prediction, and the black stepped line aggregates all observations. The vertical dashed grey line marks the mean asymptote (153.43 days) with a shaded 95% confidence interval, indicating species detection saturation (Beukes et al. 2025).

Select your camera equipment

The choice of camera equipment should be guided by the objectives of the study and the environmental conditions of the survey area. Key considerations include camera model, trigger speed, detection range, flash type, power supply, storage capacity, and available connectivity options.

- **Camera model:** trigger speed, detection range, image quality, battery performance, and compatibility with SD card capacities.
- **Flash type:** white flash for individual identification and colour images, low-glow or no-glow infrared for reducing disturbance to wildlife and minimising theft risk.
- **Photo or video mode:** photographs are generally sufficient for species inventories and occupancy studies, whereas videos can provide valuable behavioural information and high-quality outreach material. Time-lapse mode can be used for camera operation checks and monitoring environmental conditions, e.g. vegetation growth, flooding, snowfall.
- **Paired cameras:** where individual identification is required (e.g. spotted cats or other uniquely marked species), paired cameras can capture both flanks of an animal to improve identification success (Figure 3).
- **Connectivity options:** modern camera traps increasingly offer Bluetooth, Wi-Fi, 4G/LTE, LoRa, or other remote communication systems. The most appropriate option will depend on project requirements, available infrastructure, and budget.

Further resources for selecting camera equipment and study design:

- Which camera trap type and how many do I need? (Rovero et al. 2013).
- A Practical Guide to Using Camera Traps for Wildlife Monitoring in Natural Resource Management Projects (Molloy 2018).
- WILDLABS Camera Trapping Resource Hub.



Figure 3: Paired camera traps being deployed in the field. Cameras are mounted on metal poles to provide flexible placement options, while rocks are stacked around the base of the pole to improve stability and help maintain the desired camera position. Paired camera setups are commonly used for studies that require individual identification, such as capture–recapture surveys of uniquely marked species (Photo credits: Maya Beukes, Creative Commons Attribution 4.0 International (CC BY 4.0)).

2. PREPARE FOR THE DEPLOYMENT OF CAMERAS IN THE FIELD

Thorough preparation before entering the field can reduce equipment failures, improve data quality, and minimise the need for repeated field visits. Good preparation and standardised procedures help surveys run more efficiently and will reduce avoidable errors that can occur during data collection. This section provides practical checklists, equipment recommendations, and field protocols to help prepare for successful deployments.

Camera equipment checklist

CAMERAS

- ☐ Label cameras ahead of time using a unique identifier for each camera.
- ☐ Consider including contact details in case a camera is lost or found in a public space.

SD CARDS

- ☐ Label SD cards with a unique identifier.
- ☐ Suggested minimum capacity 32 GB, recommended 64 GB.
- ☐ Larger capacity SD cards may not be compatible with all camera models.
- ☐ Check the camera user manual to confirm compatible SD card types (e.g. SDHC/ SDXC).
- ☐ Formatting SD cards in the camera ensures the correct format.

BATTERIES

- ☐ Rechargeable batteries are suitable for projects with regular maintenance visits.
- ☐ Lithium batteries generally provide longer deployment times.
- ☐ Solar panels can be useful for long-term deployments.
- ☐ If using solar panels, consider cable protectors to reduce damage.
- ☐ Keep batteries together as dedicated sets for individual cameras and, where possible, mark batteries or battery sets. This can help monitor battery performance over time and identify potential equipment failures.

CAMERA SECURITY

- ☐ Camera security boxes can provide protection against wildlife damage and theft.
- ☐ Carry spare locks and keys for field deployments.

FIELD DATASHEETS

- ☐ Standardised field datasheets help ensure that important information is recorded consistently across deployments and field teams.
- ☐ Datasheets can be adapted to project objectives, but may include: Camera and SD card IDs, camera model, GPS coordinates, date and time of deployment, camera height, orientation, and angle, mounting.
- ☐ Datasheets can also include site-specific observations and measurements such as: structure, habitat, vegetation, and land-use characteristics.
- ☐ Examples of camera setup and camera check datasheets are provided in Appendix 1 and 2.

Field equipment checklist

- ☐ GPS and GPS backup (phone/app).
- ☐ SD card reader or laptop to view photos in the field.
- ☐ Lens cloth for cleaning cameras.
- ☐ Whiteboard and marker (photograph timestamp, site reference number).
- ☐ Pliers, wire cutters, screwdriver.
- ☐ Clipboards for datasheets.
- ☐ Bush clearing equipment, e.g. brush slashers, folding saw, loppers.
- ☐ Cable-ties, wire, straps, etc.
- ☐ Poles and a 5-pound hammer (to knock them into the ground).
- ☐ First aid kit and other safety equipment, such as: sun protection, gaiters, satellite phone, etc.
- ☐ Drinking water.
- ☐ Flagging tape (optional).
- ☐ Headlamp or torch.
- ☐ Other: Diatomaceous earth (for insect repellent), desiccant (placed in camera housing in areas of high humidity).

Camera settings

Check camera functioning: Before heading into the field, confirm that cameras are operating correctly and that batteries and SD cards are functioning as expected. Replace damaged or unreliable equipment.

Standardise settings: Use consistent camera settings across the survey to improve comparability between sites and over time (Figure 4 and Appendix 3). The optimal settings will depend on the study objectives, target species, and habitat. Important settings include:

- **Sensor sensitivity:** Determines how readily the camera is triggered. Higher sensitivity may improve detections, but can increase false triggers from vegetation movement or changes in temperature.
- **Burst mode:** Controls the number of images captured per trigger event. Multiple images can improve species and individual identification, but require additional storage capacity (NB the first image often has partial coverage of the animal).
- **Delay interval:** The time between consecutive trigger events. Short intervals can maximise detections and behavioural observations, whereas longer intervals can reduce duplicate images and conserve battery life and storage.
- **Image resolution:** Higher image quality may improve species identification and outreach opportunities, but increases storage requirements and file processing times.
- **Video length:** Videos can provide valuable behavioural information, but require more battery power and SD card capacity.
- **Flash intensity and type:** Flash settings influence night-time image quality and may affect animal behaviour or the visibility to people.
- **Date and time settings:** Ensure the correct date, time, and format are selected before deployment. Accurate timestamps are critical for activity pattern, occupancy, and long-term monitoring.
- **Check batteries and storage:** Ensure batteries are fully charged or replaced and that SD cards have sufficient capacity and are correctly formatted for the camera model.
- **Clean lenses and sensors:** Dirt, fingerprints, water spots, spider webs, or dust can reduce image quality and potentially affect camera performance. Check and clean the lens and sensor windows.
- **Conduct a test:** Take a few test images or videos to confirm that the camera is functioning correctly and the settings are correct.

CAMERA CONFIGURATION TIPS

- **Camera settings sheet:** Many camera models contain a large number of configurable settings, and navigating these menus can be challenging. It can be useful to develop a standardised settings sheet for each camera model to ensure consistency. Hint: display the camera settings on a whiteboard for teams to refer to (Figure 4 and Appendix 3).
- **Avoid mixing SD cards between devices:** Many camera trap users check images by placing SD cards into DSLR cameras or other devices before returning them to the camera trap. However, different devices may cause compatibility issues (e.g. altering file structures and metadata). Rather, use a dedicated SD card reader to view images, format SD cards inside the camera trap before deployment, and avoid returning an SD card to a camera trap after it has been used in another device unless it has been reformatted.
- **Time-lapse mode:** Consider enabling a low-frequency time-lapse image (e.g. one image at midday and one at midnight each day). Although primarily designed for monitoring, e.g. vegetation growth, flooding, snowfall, or other environmental conditions, this can serve as a quality-control tool if a camera malfunctions or the batteries fail between field visits. The last time-lapse image will provide a record of when the camera was still operational.



Image generated using OpenAI based on a prompt developed by the authors

Figure 4. Preparing camera traps for field deployment. Pre-deployment preparation includes labelling cameras, checking batteries and SD cards, cleaning lenses and sensors, standardising camera settings, and testing camera functionality. Providing field teams with a settings checklist or camera-specific configuration sheet (see Appendix 3) can reduce setup errors, improve consistency between deployments, and facilitate training of new personnel (Photo credits: Maya Beukes, Creative Commons Attribution 4.0 International (CC BY 4.0)).

3. CAMERA DEPLOYMENT

Once planning and preparation are complete, careful camera deployment is essential to maximise the value of the data collected. The precise location, placement, and installation of a camera trap can have a major influence on detection probability, image quality, equipment reliability, and ultimately the success of a survey. While camera placement should follow the objectives of the study and survey design, some flexibility in the field can help maximise detections while minimising disturbance and logistical challenges.

Mapping and navigation:

- Before heading into the field, use a mapping program to position camera traps according to your survey design.
- Consider access routes, terrain, and any logistical constraints that may influence which locations can realistically be deployed and maintained.
- Where possible, minimise walking distances from roads or access points (e.g. ideally <1 km), while avoiding introducing sampling bias.
- Navigate to the proposed GPS location in the field.

Selecting the exact camera location

REFINING THE CAMERA LOCATION

- Navigate to the proposed GPS location in the field.
- If the exact GPS location is unsuitable for camera deployment (e.g. dense vegetation, inaccessible terrain, or an unstable mounting surface), consider searching within a predefined radius (e.g. up to 100 m) for a more suitable location.
- The amount of flexibility should be guided by the study objectives and survey design. For strictly random or systematic surveys, cameras should be placed as close as possible to the predetermined location to minimise sampling bias.
- Studies targeting particular species or aiming to maximise detection rates may benefit from a wider search radius to identify suitable animal trails, natural clearings, or other high-probability locations.
- Where adjustments are made, record the final camera location and any deviations from the original sampling point in the field datasheet.

MAXIMISING DETECTIONS

- To increase the likelihood of wildlife detections, look for signs of animal activity such as tracks, spoor, droppings, burrows, scratch marks, feeding signs, or well-used game trails.
- Areas where multiple animal paths intersect, natural funnels, and locations near water sources can provide particularly good opportunities for wildlife encounters.
- Natural landscape features such as rocks, vegetation, fallen logs, drainage lines, or terrain features can channel animal movements and increase detection probabilities.
- The level of flexibility in selecting these features should be guided by the study objectives and survey design. Studies targeting particular species or aiming to maximise detections may benefit from incorporating these landscape features into camera placement decisions.

MINIMISING DISTURBANCE

- Unless human activity is the focus of the study, avoid heavily used human trails and roads where possible. These areas may increase the risk of theft, vandalism, or accidental disturbance of camera traps, while also increasing the number of non-target detections and potentially influencing wildlife behaviour.
- Where possible, select locations with existing natural clearings or openings along animal trails. This can reduce the amount of vegetation that needs to be cleared, minimising habitat disturbance and the likelihood of false triggers.

Selecting a mounting surface

- Choose a stable tree or pole that will maintain the desired camera position throughout the deployment period.
- Poles with ridges, holes, or features that improve grip can help prevent cameras from slipping. If using smooth poles, select a mounting system that can be firmly tightened and secured in place.
- When mounting on trees, avoid surfaces with large angles, pronounced curves, or irregular bark structures where possible. These may require additional wedges or spacers to achieve the correct camera angle and can make it more difficult to secure the camera adequately and maintain a stable viewing angle.
- Give the mounting structure a firm shake. If it moves easily in the wind, it may generate false triggers or alter the camera position over time.

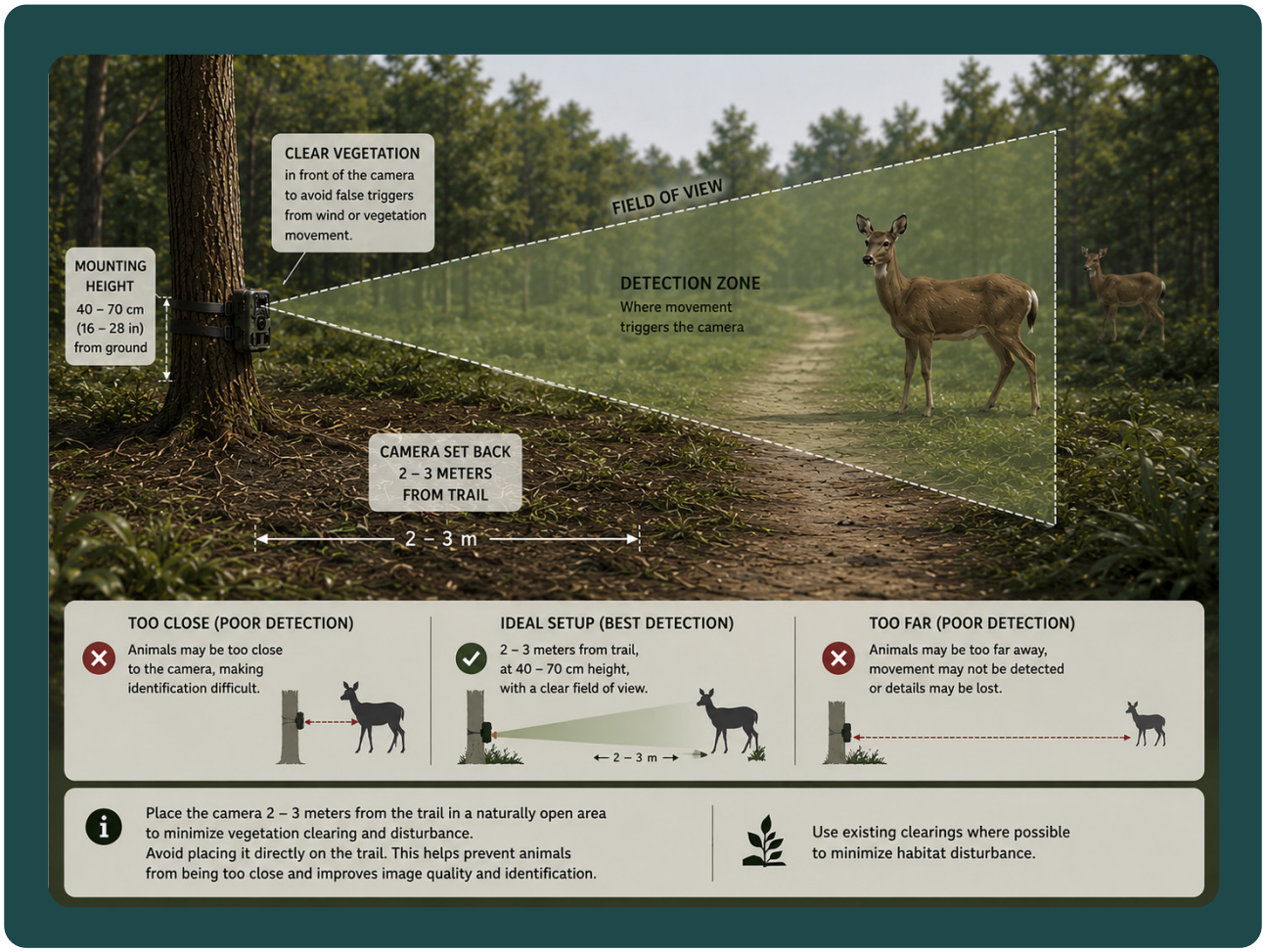


Figure 5: The relationship between a camera trap's field of view and detection zone influences the detection probability and image quality. Placing the camera approximately 2–3 m from a trail in a naturally open area, with the sensor aligned to the target species, can improve capture success and reduce false detections. Minimising vegetation immediately in front of the camera and avoiding excessively close or distant placements can also improve image quality for species identification. Image generated using OpenAI based on a prompt developed by the authors.

Positioning and orientating the camera

CAMERA HEIGHT

- For general mammal surveys, knee height (approximately 40–70 cm) provides a useful starting point.
- Adjust the camera height according to the body size of the target species and the camera lens angle. For example, cameras with wide-angle lenses (e.g. 100°) can often be positioned lower while still capturing larger animals.

POSITION RELATIVE TO THE TARGET AREA

- Random or systematic surveys: Position the camera as close as possible to the predetermined sampling point. Assess the immediate surroundings to maximise detection opportunities without compromising the survey design.
- Target-species or detection-focused surveys: Position the camera approximately perpendicular to the expected direction of animal travel, such as along game trails or other movement corridors. This can increase the amount of time animals spend within the detection zone and improve opportunities for identification (Figure 5).
- Where appropriate, position the camera approximately 2 m from the trail or target area to avoid animals being too close to the lens when triggered and to improve image quality.

CAMERA ORIENTATION

- Where possible, orient cameras towards the south or north to reduce glare from sunrise and sunset. This consideration is generally less important in heavily shaded habitats such as forests.
- If using paired cameras, avoid positioning them directly opposite one another, as flash interference may reduce image quality (Figure 3).



Figure 6: Field deployment of camera traps involves standardised data recording, careful vegetation management, verification of camera placement, and ongoing attention to field safety. In areas with dangerous wildlife, deploying cameras with a second person acting as a lookout may reduce risks to the field team. Photo credits: Maya Beukes, Creative Commons Attribution 4.0 International (CC BY 4.0).

SLOPE AND TERRAIN

- Keep the camera as level as possible with the ground.
- Avoid steep upward or downward angles. Angling cameras steeply upwards or downwards angles the sensor towards the ground or sky, reducing the effective detection probability of passing animals.
- In some situations, such as flood-prone areas, slight downward angles may be necessary to protect equipment from inundation, although this type of setup should be minimised where possible.

SECURING THE CAMERA

- Camera traps can be attached using straps, wire, cable ties, bungee cords, or custom-made mounting systems (Figure 7).
- Select the mounting system according to the mounting surface and the likelihood of disturbance by wildlife or people.
- Wire is often a good option because it can be adjusted and tightened securely.
- To achieve the desired orientation, sticks, wedges, or rocks can be placed behind the camera to fine-tune both the horizontal and vertical angles.

- Do not fully tighten the mounting system until the final position has been achieved.
- Once secured, give the camera a firm shake to ensure that the viewing angle does not change.

VEGETATION MANAGEMENT

- Remove or cut back vegetation within the immediate field of view that may cause false triggers.
- Remember to check for hanging branches, overhead vegetation, and ground-level plants.
- Vegetation located several metres from the camera (approximately 3–4 m or more) is generally less likely to trigger the sensor (Figure 6).

Environmental considerations

- Insects can sometimes use camera housings or security cases as nesting sites (Figure 8). If this is a local problem, natural deterrents such as diatomaceous earth may help reduce insect activity.
- In humid environments, desiccant packets can be placed inside camera housings or storage cases to help reduce condensation, mould growth, and corrosion.
- In areas with seasonal snowfall, consider how snow accumulation may alter the effective camera height or field of view, and position cameras accordingly.
- Be aware that spiders may build webs around cameras and infrared sensors, potentially causing false triggers or obscuring images.
- Consider how seasonal vegetation growth may change the field of view between maintenance visits and increase the likelihood of false triggers.
- Avoid areas with high levels of domestic animal activity where possible, as livestock may investigate, rub against, or displace cameras (Figure 9).



Figure 7: Camera traps can be secured using a variety of mounting materials, including wire (top left), clasps (middle top), straps (middle bottom), and cable ties (right). Sticks, stones, or wedges can be placed behind the camera to fine-tune the viewing angle and provide additional stability, helping to maintain the desired field of view throughout the deployment period. Photo credits: Maya Beukes, Creative Commons Attribution 4.0 International (CC BY 4.0).

Security and theft prevention

- Camera traps are often deployed in remote locations for extended periods and may be exposed to theft, vandalism, or damage by people and animals. A few simple precautions can reduce these risks and improve equipment security.
- Consider using security boxes and locking cables where there is a risk of theft or damage by wildlife (Figure 9).
- Unless human activity is the focus of the study, avoid placing cameras along heavily used human trails or roads.
- Avoid publicly sharing exact camera locations, particularly on social media.
- Record camera serial numbers and maintain an equipment inventory.
- Label cameras with a unique identifier and, where appropriate, discreet contact information to facilitate recovery if lost or found.
- Consider using no-glow infrared cameras in areas where security is a concern, as these produce less visible illumination during nighttime operation.





Figure 8: Camera traps and security cases can provide attractive nesting sites for insects, which may obstruct sensors, lenses, or moving components and reduce camera performance. Regular cleaning and maintenance are recommended, and natural deterrents such as diatomaceous earth may help minimise insect colonisation. Photo credits: Maya Beukes, Creative Commons Attribution 4.0 International (CC BY 4.0).





Figure 9: A metal security case can help protect camera traps from theft and animal damage (left). Placing cameras in areas with high levels of domestic animal activity may result in large numbers of non-target detections and increased disturbance of camera placement (right). Photo credits: Maya Beukes, Creative Commons Attribution 4.0 International (CC BY 4.0)).

Test cameras

- A few minutes spent testing a camera before leaving the site can prevent equipment failures and data loss. Confirm that the camera is functioning correctly and that the field of view matches the intended survey design.
- Conduct a walk test from different distances and directions. Consider varying your height and speed of movement to simulate different target species.
- Review a small number of test images to confirm that the camera angle, field of view, and detection zone are appropriate.
- Check that the time and date are correct, paying particular attention to AM/PM settings and date formats.
- Ensure that the SD card has been formatted in the camera.
- Use a whiteboard to record the camera or site reference, date, and time, and photograph it at the beginning of each deployment and retrieval event (Figure 10). This provides a reference for correcting metadata errors if required.
- Confirm that the camera is switched on and armed before leaving the site.



Figure 10: Checking a sample of images during camera servicing (top) can help identify problems such as incorrect camera positioning, false triggers, or equipment malfunctions before the next survey period. Photo credits: Martin Jansen, Creative Commons Attribution 4.0 International (CC BY 4.0).

Recording the camera location, date, and time on a reusable whiteboard and photographing it during each camera check (bottom) provides an independent record of the maintenance event and can be invaluable for verifying or correcting time and date errors in the camera metadata. Photo credits: Maya Beukes, Creative Commons Attribution 4.0 International (CC BY 4.0).

4. CAMERA MAINTENANCE AND ROUTINE CHECKS

Routine camera checks are an important part of long-term camera trap projects. Regular maintenance and checks help to ensure that the equipment remains operational and provide an opportunity to identify and correct any problems before substantial amounts of data are lost. Standardised maintenance procedures also help to improve record-keeping and facilitate subsequent data management.

Planning camera maintenance visits

- As a general guideline, camera traps powered by rechargeable batteries may benefit from maintenance visits every 2–4 weeks, depending on activity levels and environmental conditions.
- Cameras using lithium batteries or solar-powered systems can often operate for considerably longer periods, with maintenance intervals of 4–8 weeks or more in suitable conditions.
- Battery life should not determine maintenance intervals by itself. The optimum maintenance interval should consider battery life, SD card capacity, image capture rates, accessibility, seasonal vegetation growth, environmental conditions, and the objectives of the study.
- Avoid excessively long periods between maintenance visits, even if battery life and storage capacity allow, as camera malfunctions, vegetation growth, animal interference, or changes in the field of view may go unnoticed and result in substantial data loss.
- Review maintenance schedules throughout the study and adjust them if local conditions or camera performance indicate that more frequent or less frequent visits are appropriate.
- Emerging camera technologies with 4G, LTE, satellite, or other remote communication capabilities can provide camera status updates, battery levels, storage capacity, and image previews. These systems can help identify equipment failures and optimise maintenance schedules, potentially reducing unnecessary field visits.

Prepare for camera checks

- Refer to camera and equipment checklists and field data sheets
- Bring replacement batteries and SD cards.
- Carry cleaning materials.
- Bring field datasheets.
- Carry the whiteboard and marker.
- Review previous maintenance records for known issues.

Conducting the camera check

- When arriving at a camera station, follow a consistent step-by-step process to ensure that data collection remains standardised and that any problems are recorded and corrected.
- Record the camera or location reference name, date, and time on the whiteboard, and allow the camera trap to capture a photo of it before making changes to the setup.
- Check a sample of recent images in the field to identify any problems with camera positioning, vegetation growth, false triggers, missed captures, or equipment malfunction (Figure 10).
- Inspect the camera position and mounting system to confirm that the camera has not shifted, tilted, been damaged, or been disturbed by animals, livestock, people, or weather.
- Clear or trim any vegetation that has grown into the field of view and may cause false triggers.
- Clean the lens, PIR sensor, flash, and camera housing using a suitable cloth.
- Replace batteries if needed and swap out the SD card according to the project protocol.
- Check the time and date settings, paying attention to AM/PM settings and date format.

- Format the replacement SD card inside the camera before continuing the deployment, where appropriate.
- Complete the camera check recording form (Figure 12; Appendix 2), including:
  - Station ID: the unique reference for the camera-trap station.
  - Camera: identifies the individual camera at paired-camera stations (e.g., Camera A or B).
  - Number of images: the total number of images recorded by that camera during the capture period.
  - Camera active: record whether the camera was still operational at the time of the check (e.g., batteries had not failed).
  - Start date: the date of the first valid image recorded during the capture period.
  - End date: the date of the last valid image recorded during the capture period. This may be earlier than the camera-check date if the camera stopped functioning or the data became unusable. For example, because the batteries failed, the camera was displaced or knocked over, or the field of view became unsuitable.
  - Notes: record any malfunctions, incorrect timestamps, camera disturbance, image-quality problems, or other relevant field observations.
- Before leaving the site, confirm that the camera is correctly positioned, switched on, and armed.

A	B	C	D	E	F	G	H
upload	station	camera	n_of_images	camera_active	date_start	date_end	notes
SGN_BOL_2025-07-24	G-03	A	27	yes	12/07/2025	25/07/2025	
SGN_BOL_2025-07-24	G-03	B	-	-	-	-	
SGN_BOL_2025-07-24	G-04	A	44	yes	12/07/2025	25/07/2025	
SGN_BOL_2025-07-24	G-04	B	63	no	12/07/2025	24/07/2025	
SGN_BOL_2025-07-24	G-05	A	10	no	12/07/2025	16/07/2025	
SGN_BOL_2025-07-24	G-05	B	1888	no	12/07/2025	17/07/2025	
SGN_BOL_2025-07-24	G-06	A	26	yes	13/07/2025	24/07/2025	
SGN_BOL_2025-07-24	G-06	B	50	no	13/07/2025	15/07/2025	wrong timestamps
SGN_BOL_2025-07-24	G-07	A	45	yes	13/07/2025	24/07/2025	
SGN_BOL_2025-07-24	G-07	B	27	yes	13/07/2025	24/07/2025	
SGN_BOL_2025-07-24	G-08	A	863	yes	NA	NA	wrong timestamps
SGN_BOL_2025-07-24	G-08	B	2718	no	12/07/2025	17/07/2025	
SGN_BOL_2025-07-24	G-09	A	-	-	-	-	
SGN_BOL_2025-07-24	G-09	B	-	-	-	-	
SGN_BOL_2025-07-24	G-10	A	0	no	-	-	
SGN_BOL_2025-07-24	G-10	B	32	yes	11/07/2025	25/07/2025	
SGN_BOL_2025-07-24	G-11	A	167	yes	13/07/2025	26/07/2025	
SGN_BOL_2025-07-24	G-11	B	-	-	-	-	
SGN_BOL_2025-07-24	G-12	A	4	no	13/07/2025	13/07/2025	
SGN_BOL_2025-07-24	G-12	B	-	-	-	-	
SGN_BOL_2025-07-24	G-13	A	97	no	12/07/2025	16/07/2025	
SGN_BOL_2025-07-24	G-13	B	-	-	-	-	
SGN_BOL_2025-07-24	G-14	A	33	yes	11/07/2025	25/07/2025	some wrong timestamps but without animals
SGN_BOL_2025-07-24	G-14	B	0	no	-	-	
SGN_BOL_2025-07-24	G-15	A	80	yes	11/07/2025	25/07/2025	
SGN_BOL_2025-07-24	G-15	B	21	yes	11/07/2025	25/07/2025	overexposure
SGN_BOL_2025-07-24	G-16	A	-	-	-	-	
SGN_BOL_2025-07-24	G-16	B	-	-	-	-	
SGN_BOL_2025-07-24	G-17	A	1117	no	12/07/2025	22/07/2025	wrong timestamps
SGN_BOL_2025-07-24	G-17	B	339	no	12/07/2025	12/07/2025	wrong timestamp
SGN_BOL_2025-07-24	G-18	A	27	yes	13/07/2025	24/07/2025	
SGN_BOL_2025-07-24	G-18	B	18	yes	13/07/2025	24/07/2025	
SGN_BOL_2025-07-24	G-19	A	105	yes	13/07/2025	25/07/2025	

Figure 11: An example of a completed camera check recording form used during routine maintenance visits. Recording information such as battery status, SD card replacements, camera performance, maintenance actions, and field observations helps maintain accurate records and facilitates quality control.

5. DATA MANAGEMENT AND PROCESSING

Good data management should begin before the first camera is deployed and continue throughout the project. Standardised workflows for organising, storing, processing, and analysing camera trap data can substantially reduce errors, improve efficiency, and maximise the long-term value of datasets.

Downloading and organising data

- Develop a standardised folder structure and file naming convention before fieldwork begins. Examples are provided in Appendix 4 (Figure 12).
- Keep image files and associated metadata together.
- Maintain records linking camera IDs, SD card IDs, deployment dates, and folder names.

Data quality control

- Verify timestamps and metadata.
- Check for corrupted files.
- Confirm camera locations and deployment periods.
- Record equipment failures or time/date corrections (Figure 11).

Data storage and backup

- Consider long-term storage requirements at the start of the project.
- Maintain multiple copies of data where possible.
- Use combinations of institutional servers, cloud storage, and external hard drives.
- Consider data security and access permissions.
- After the project, consider archiving the camera trap data and associated metadata in recognised repositories that support FAIR (Findable, Accessible, Interoperable, and Reusable) data principles. Such repositories, e.g. Global Biodiversity Information Facility (GBIF), can increase the long-term value of datasets by facilitating future biodiversity research, conservation planning, long-term monitoring programmes, and the development of machine-learning tools, while respecting sensitive species or stakeholder agreements.

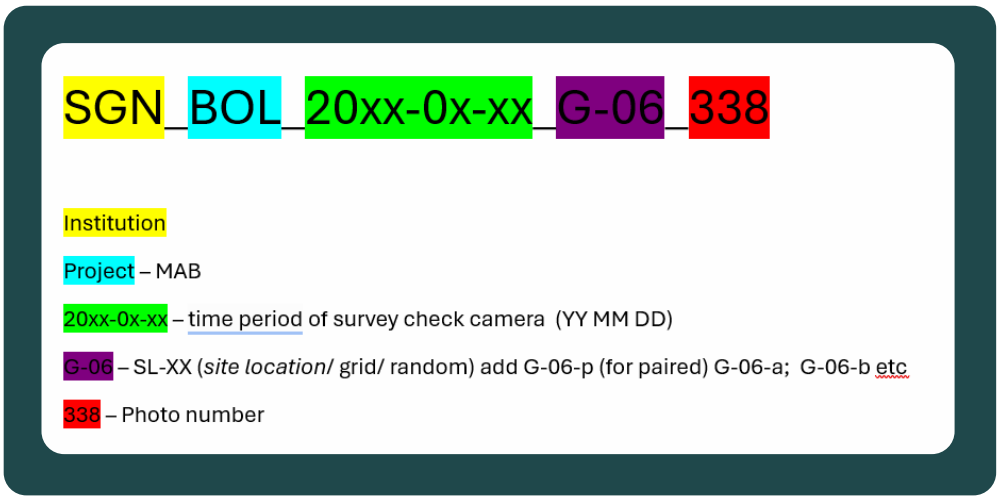


Figure 12: An example of a camera trap file and folder naming convention. Developing a standardised naming structure at the start of a project helps organise large datasets, improves traceability of images, and reduces errors during data management and analysis. The naming convention should be adapted to the specific needs of each project (see Appendix 2).

Processing camera trap data

IMAGE CLASSIFICATION:

Decide which software or platform you will use to manage and annotate your camera trap images. The choice of software will depend on the study objectives, project size, available infrastructure, and whether manual, citizen science, or AI-assisted workflows are required (Figure 13). Examples include:

- Agouti
- ARISE
- Camelot
- Wildlife Insights
- Wild.ID
- WildLIVE

DATA PROCESSING:

AI tools for processing and preprocessing can aid:

- Detecting and removing blank images;
- Identifying and separating images containing people or vehicles;
- Filtering common non-target species (e.g. livestock);
- Automatically detecting and classifying wildlife;
- Assisting with species identification and image annotation;
- Prioritising images for expert review.
- Examples of commonly used tools include MegaDetector, which can detect animals, people, and vehicles in images; SpeciesNet, which provides automated species classification for many wildlife datasets.

DATA ANALYSIS:

Camera trap data can be used to address a wide range of ecological and conservation questions. Common applications include:

- species richness
- diversity,
- relative abundance indices,
- activity patterns,
- habitat use,
- occupancy,
- spatial capture–recapture, and
- population density,
- species interactions and behavioural ecology.

Further reading

Many freely available software packages, online resources, and training materials can assist with the management and analysis of camera trap data. Useful starting points include:

- An Introduction to Camera Trap Data Management and Analysis in R (Beirne et al. 2022).
- camtrapR: an open-source R package for camera trap data management and analysis (Niedballa et al. 2016).
- An Open Standard for Camera Trap Data (Forrester et al. 2016).

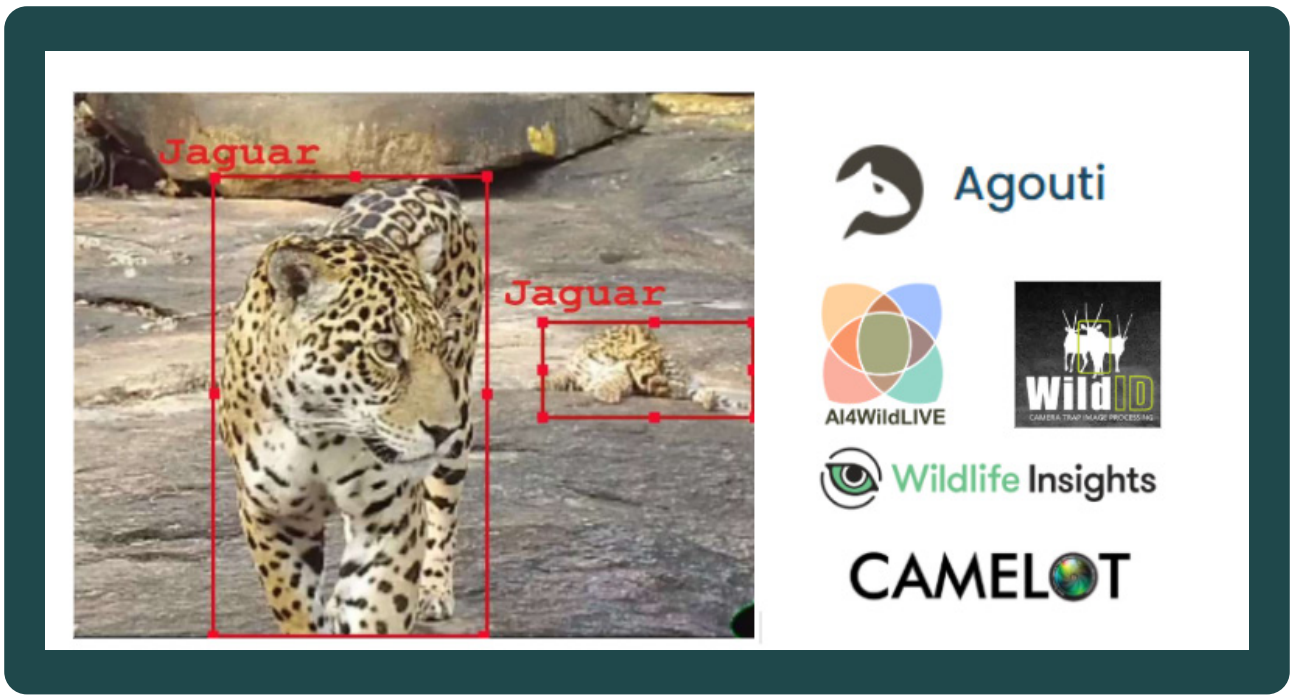


Figure 13: Many software platforms are available for labelling and managing camera trap images. While the best choice will depend on project needs, it is important to select a platform that will allow data and metadata to be exported in standardised formats, ensuring compatibility with future analyses and long-term data management.

6. COMPLEMENTARY DATA COLLECTION

Camera trap surveys provide an excellent opportunity to collect additional environmental and habitat information that can improve understanding of wildlife observations and ecological processes. Many complementary datasets require relatively little additional effort but can substantially increase the ecological value of a study.

Field-based measurements

Camera traps provide valuable information on wildlife, but additional field observations can help explain patterns of species occurrence, abundance, and behaviour. Where practical, consider collecting complementary environmental and habitat data alongside camera trap surveys, such as:

- **Vegetation and habitat structure:** Record vegetation characteristics that may influence wildlife, such as transects, vegetation plots, canopy cover, ground cover, vegetation height, or other habitat assessments.
- **Horizontal visibility and vegetation density**: Estimate the line of sight available to animals and the openness of the habitat, which may influence movement patterns and camera detection probabilities (Figure 14).
- **Habitat condition and disturbance**: Document evidence of natural or human-induced disturbance, such as grazing, fire, logging, invasive species, erosion, flooding, or human activity.
- **Animal signs:** Record burrows, dens, nests, resting sites, scat, tracks, spoor, scratch marks, feeding signs, or other evidence of animal activity that may provide additional ecological information.
- **Landscape features and resources:** Map features that may influence wildlife movements and habitat use, including fences, roads, trails, water points, salt licks, agricultural activities, and other natural or artificial resources.

Landscape and remotely sensed data

Many environmental variables that influence wildlife distributions and habitat use can be obtained from remotely sensed products and existing spatial datasets, reducing the need for extensive field measurements. Consider incorporating variables such as:

- **Vegetation productivity and habitat condition:** Metrics such as the Normalised Difference Vegetation Index (NDVI; Figure 14) can provide information on vegetation productivity, habitat quality, and changes in land cover (e.g. forest cover) over time.
- **Habitat and vegetation classifications**: Broad-scale vegetation or habitat maps can be used to investigate species-habitat relationships and compare wildlife communities across landscapes.
- **Topography:** Variables such as elevation, slope, and aspect may influence microclimate, vegetation patterns, and animal movements.
- **Water availability:** The distribution of rivers, wetlands, waterholes, seasonal water sources, and drainage networks can strongly influence wildlife occurrence and movement patterns.
- **Human activities and infrastructure:** Roads, tracks, fences, settlements, agricultural activities, and other forms of development can affect habitat use, connectivity, and disturbance.
- **Disturbance regimes:** Fire history, fire frequency, flooding, drought, and other natural or anthropogenic disturbances may influence vegetation structure and wildlife communities.
- **Land use and landscape structure:** Land-use and land-cover classifications, habitat fragmentation, and measures of landscape connectivity can provide valuable insights into habitat availability and animal movements.
- **Climate and environmental conditions:** Rainfall, temperature, drought indices, and other climatic variables can help explain seasonal and long-term patterns in wildlife activity and distributions.
- **Anthropogenic pressure:** Human population density, livestock densities, hunting pressure, or other measures of human influence may help explain patterns of wildlife occurrence and behaviour.

Further resources

A wide range of freely available spatial and remotely sensed datasets can be incorporated into camera trap studies. Readers interested in landscape ecology, habitat mapping, and remote sensing applications are encouraged to explore:

- Copernicus Land Monitoring Service for European and global land cover and vegetation products.
- Google Earth Engine for accessing and analysing satellite imagery and environmental datasets.
- Global Forest Watch for forest cover and habitat change.
- WorldClim (Fick and Hijmans 2017) and CHELSA Climate (Karger et al. 2023) for high-resolution climatic variables.
- OpenStreetMap and national spatial data portals for roads, settlements, and other infrastructure.

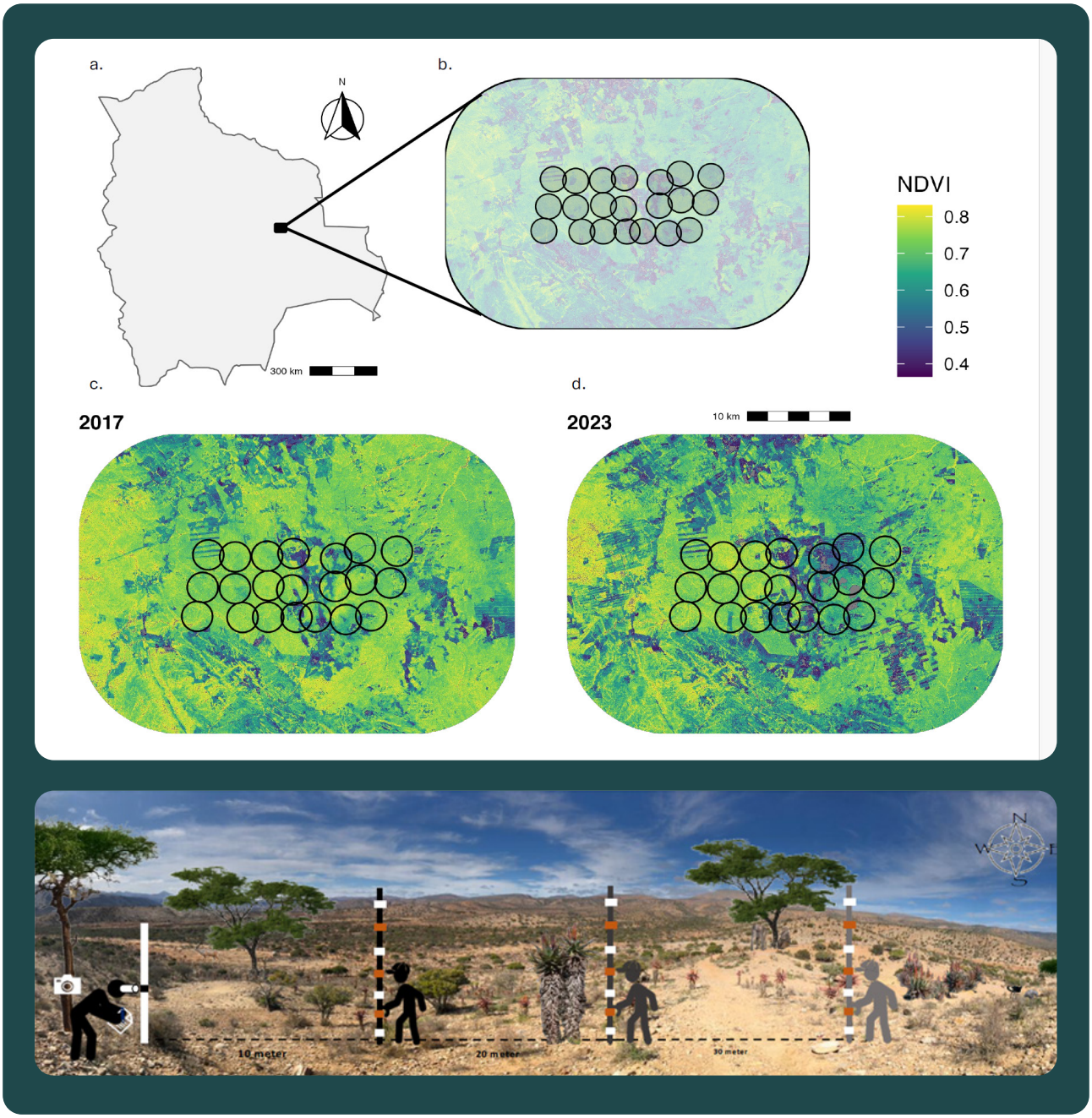


Figure 14: Don't miss the opportunity to collect additional environmental and habitat data while conducting camera trap surveys, as these can provide valuable context for understanding the ecology of your study species and landscape. Examples include satellite-derived Normalised Difference Vegetation Index (NDVI) for assessing vegetation cover and habitat change (Weiss et al. 2026) and horizontal visibility measurements around camera traps to quantify vegetation structure and line of sight (bottom) (Hamelink, 2023).

7. ETHICS, PERMISSIONS, AND DATA STEWARDSHIP

Camera trap projects involve responsibilities that extend beyond wildlife monitoring. Legal, ethical, and data management considerations should be incorporated into project planning to ensure compliance while protecting wildlife, people, and sensitive information.

- **Permits and permissions:** Camera traps cannot simply be deployed wherever convenient. Depending on the location and study objectives, permits or permissions may be required from protected area authorities, government agencies, private landowners, Indigenous communities, or other stakeholders. Researchers should familiarise themselves with local regulations and obtain all necessary approvals before commencing fieldwork.
- **Photographing people:** Camera traps may inadvertently capture images of people. Be aware of local legislation and institutional policies regarding privacy, personal data protection, image storage, and data sharing.
- **Sensitive species:** Avoid publicly sharing the locations of threatened or sensitive species, nesting sites, dens, etc., that could increase the risk of disturbance, poaching, or illegal collection. Consider removing sensitive metadata, such as GPS coordinates or exact timestamps, before publicly sharing images or datasets.
- **Minimise disturbance:** Deploy and maintain cameras in a manner that minimises disturbance to wildlife, habitats, and local communities. Avoid leaving strong scents, minimise vegetation disturbance, and avoid visiting the site too frequently.
- **Institutional requirements:** Many universities, research organisations, and protected areas require ethical approval, research permits, or data-sharing agreements as part of project planning. Ensure that these requirements are considered well in advance of field deployment.
- **Data ownership and sharing:** Establish clear agreements regarding image ownership, data access, and data sharing before the project begins. Camera trap datasets can have considerable long-term value for biodiversity monitoring, conservation planning, and the development of machine-learning tools. Where appropriate, consider sharing data through recognised repositories or collaborative initiatives, while ensuring compliance with legal requirements, ethical considerations, and any agreements with landowners, collaborators, or local communities.



Figure 15: Camera trap projects can generate benefits far beyond their original research objectives. Shown here are examples of working with landowners to promote camera trapping (left); engaging broader audiences through outreach activities (right). Photo credits: Maya Beukes, Creative Commons Attribution 4.0 International (CC BY 4.0).

8. STAKEHOLDER ENGAGEMENT, CITIZEN SCIENCE, AND OUTREACH

Camera trap images and videos can add value to projects far beyond their original research objectives. They provide excellent opportunities for stakeholder engagement, citizen science, education, and conservation outreach, which helps maintain engagement and foster long-term collaborations (Figure 16). Consider the following approaches:

Stakeholder engagement

Engaging with those involved in or affected by a camera trap project can strengthen relationships, improve project outcomes, and foster long-term support for conservation initiatives. Where appropriate, involve stakeholders throughout the project rather than only sharing the final results:

- Share regular project updates and interesting findings.
- Hold periodic meetings or feedback sessions with key stakeholders, such as landowners, protected area managers, local communities, or project partners, to discuss progress, gather local knowledge, and encourage co-creation of project outcomes.
- Provide participating stakeholders with interesting images and videos, species lists, biodiversity records, and project summaries.
- At the completion of the project, consider presenting the findings through in-person or online meetings, workshops, webinars, or community events.
- Tailor communication materials and presentations to the target audience. Different stakeholders may require different levels of technical detail and different methods of communication.
- Highlight the practical conservation and management implications of the findings and discuss potential future collaborations or monitoring opportunities.

Citizen science

Camera trap images provide excellent opportunities for citizen science, where members of the public actively contribute to scientific research while increasing their knowledge and engagement with biodiversity conservation. Citizen science projects can substantially expand the scale of data collection and processing while fostering a stronger connection between people and nature.

VOLUNTEERS MAY CONTRIBUTE TO:

- Species identification and image classification.
- Behavioural observations and ecological interactions.
- Data validation and quality control.
- Recording additional ecological information, such as age classes, sex, group size, or the presence of offspring.
- Reviewing or validating AI-assisted classifications.

BEYOND SUPPORTING RESEARCH, CITIZEN SCIENCE PROJECTS CAN:

- Increase data processing capacity and reduce bottlenecks.
- Raise awareness of local biodiversity and conservation issues.
- Improve scientific literacy and environmental education.
- Foster long-term engagement with conservation initiatives.
- Build communities of practice that connect researchers, conservation practitioners, and the public.

SUCCESSFUL CITIZEN SCIENCE PROJECTS BENEFIT FROM:

- Clear instructions and training materials.
- Regular feedback and communication with participants.
- Sharing interesting findings and project outcomes.
- Recognition of volunteer contributions.
- Combining citizen science with AI-assisted workflows to improve efficiency and data quality.
- Examples of citizen science projects using camera trap data include WildLIVE and Zooniverse.

Practical tip: Citizen science works best when participants feel that they are making a meaningful contribution. Providing feedback, sharing project results, and demonstrating the real-world conservation impact of volunteer contributions can help maintain long-term engagement.

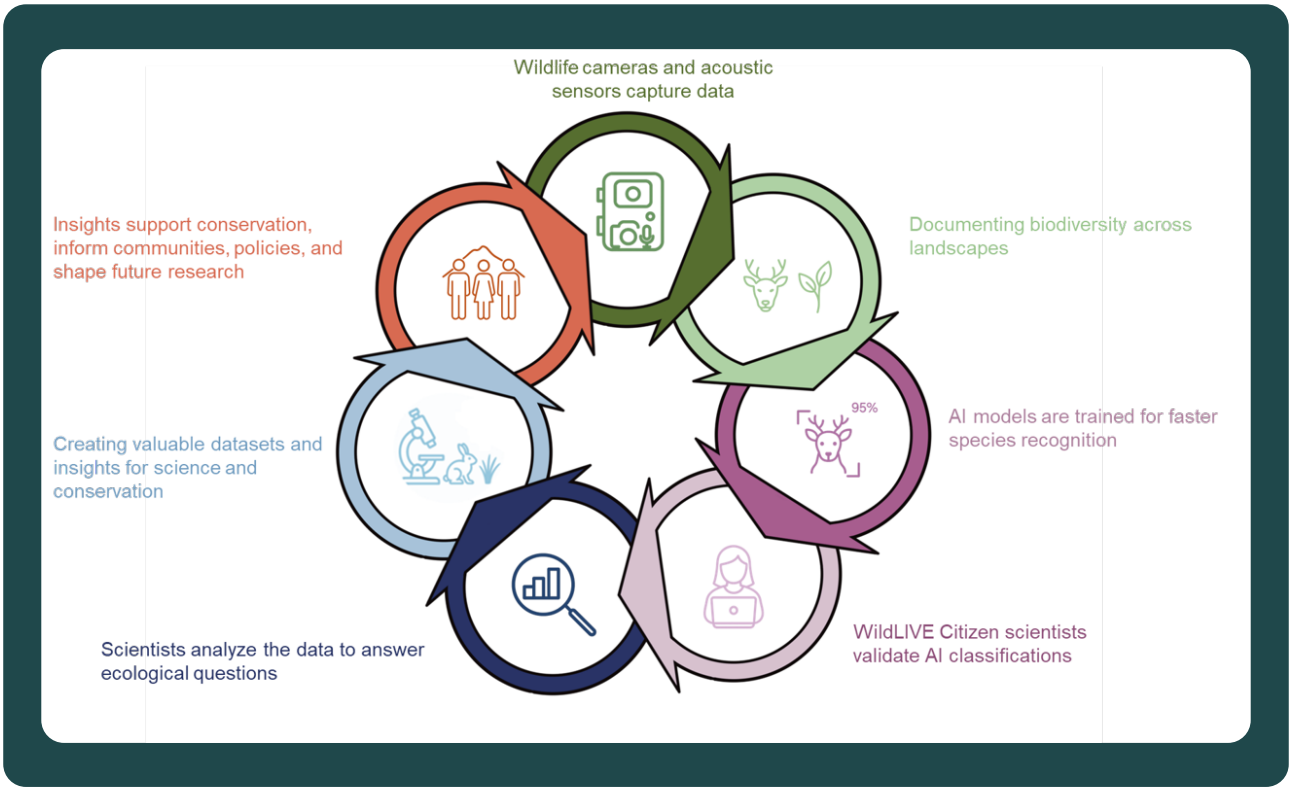


Figure 16: Example of the AI 4Wildlive workflow, illustrating how camera-trap and acoustic monitoring data can move through biodiversity documentation, AI-assisted species recognition, citizen-science validation, and ecological analysis to generate insights that support conservation, communities, policy, and future research. The workflow highlights the positive feedback loop between biodiversity monitoring, data generation, scientific understanding, and conservation action.

Education and outreach

Camera trap images and videos provide engaging and accessible ways to communicate biodiversity and conservation to a wide range of audiences. They can help increase awareness of local wildlife, promote environmental stewardship, and inspire interest in science and conservation:

- **Museum exhibits and interactive displays** that showcase local biodiversity and ecological processes.
- **School and university programmes**, including classroom activities, educational resources, and student projects.
- **Social media and digital platforms** to share wildlife discoveries, project updates, and conservation messages with a broader audience.
- **Public talks, workshops, and community events** that communicate research findings and encourage public participation in conservation.
- **Educational resources and training materials** for researchers, conservation practitioners, protected area staff, and citizen scientists.
- **Interpretive materials**, such as visitor centre displays, information boards, field guides, and newsletters.

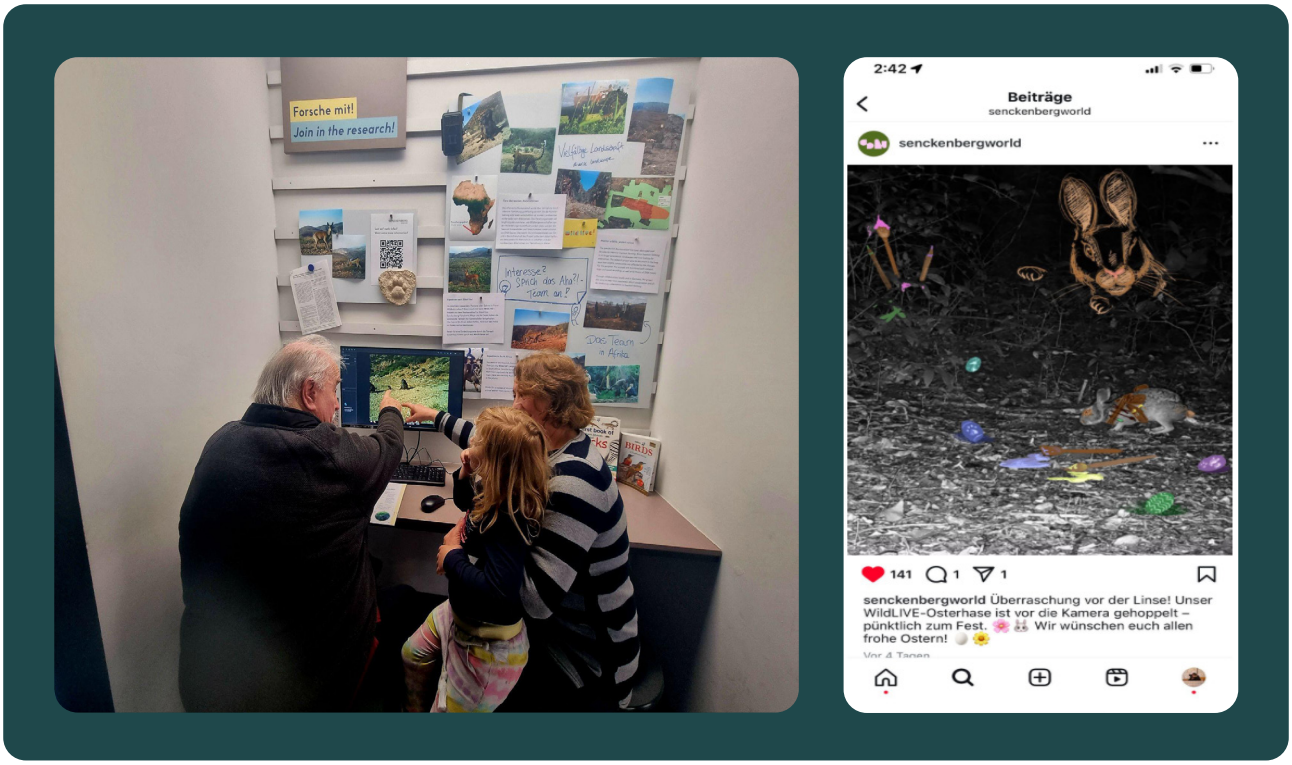


Figure 17: Camera trap projects provide valuable opportunities for stakeholder engagement, citizen science, education, and conservation outreach. Shown here are examples of incorporating camera trap data into interactive museum exhibits and educational displays (left), and sharing wildlife discoveries through social media platforms (right). Senckenberg Nature Research, @senckenbergworld (Instagram). Photo credits: Maya Beukes, Creative Commons Attribution 4.0 International (CC BY 4.0).

Science communication

Think beyond traditional research outputs. Camera trap images and videos can be powerful tools for communicating science, increasing public appreciation of biodiversity, and building support for conservation initiatives. Their visual nature makes them particularly effective for engaging audiences that may not typically interact with scientific research. Consider a range of communication approaches, including:

- Graphical abstracts and visual summaries of research projects (Figure 19).
- Social media campaigns and digital storytelling.
- Newsletters, blogs, and project websites.
- Infographics and interactive online resources.
- Short videos and documentaries.
- Public talks, webinars, and science festivals.
- Educational materials for schools and universities.
- Policy briefs and management reports for decision-makers.

Effective science communication should be tailored to the target audience. Different groups, such as local communities, landowners, policymakers, conservation practitioners, researchers, and the general public, may require different levels of technical detail and different communication approaches. Camera trap projects provide unique opportunities to tell compelling stories about wildlife, ecosystems, and conservation challenges. Innovative communication approaches can increase public engagement, strengthen stakeholder relationships, promote conservation action, and inspire future scientists and citizen scientists.

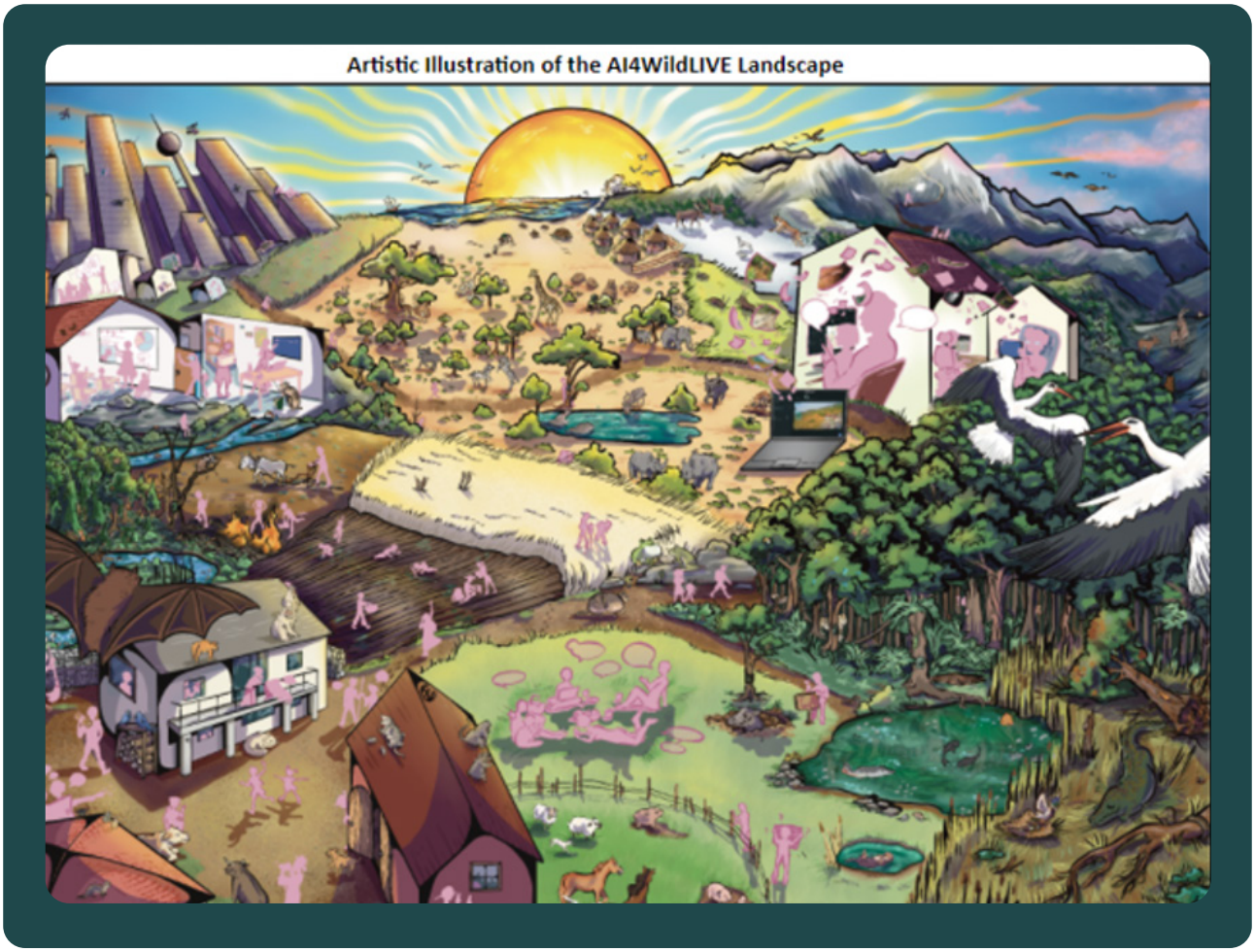


Figure 18: Example of an AI4WildLIVE graphical abstract illustrating how innovative science communication can help bridge the gap between research and society. By combining artistic visualisation with concepts such as biodiversity monitoring, artificial intelligence, citizen science, and conservation, graphical abstracts can communicate complex scientific ideas to diverse audiences and promote engagement with biodiversity research and conservation. Graphic design and illustration: Chiara Zapf (2025).

REFERENCES

Alberta Remote Camera Steering Committee (RCSC), Stevenson, C., Hubbs, A., and Wildlife Cameras for Adaptive Management (WildCAM) 2024. Remote Camera Survey Guidelines: Guidelines for Western Canada.

Beirne, C., the Wildlife Coexistence Lab, UBC, and the WildCam Network 2022. An Introduction to Camera Trap Data Management and Analysis in R.

Beukes, M., Perry, T., Parker, D. M. and Mgqatsa, N. 2025. Refining Camera Trap Surveys for Mammal Detection and Diversity Assessment in the Baviaanskloof Catchment, South Africa. - Wild 2: 15.

Burton, A. C., Neilson, E., Moreira, D., Ladle, A., Steenweg, R., Fisher, J. T., Bayne, E. and Boutin, S. 2015. Wildlife camera trapping: a review and recommendations for linking surveys to ecological processes. - J. Appl. Ecol. 52: 675–685.

Fick, S. E. and Hijmans, R. J. 2017. WorldClim 2: new 1-km spatial resolution climate surfaces for global land areas. - Int. J. Climatol. 37: 4302–4315.

Forrester, T., O'Brien, T., Fegraus, E., Jansen, P. A., Palmer, J., Kays, R., Ahumada, J., Stern, B. and McShea, W. 2016. An Open Standard for Camera Trap Data. - Biodivers. Data J. 4: e10197.

Hamelink, V., 2023. Horizontal vegetation assessment within multiple vegetation types in the Baviaanskloof, South Africa – Eastern Cape. Research Report of Forest and Nature Management, specialization in Tropical Forestry, Van Hall Larenstein University of Applied Sciences, Netherlands.

Karger, D. N., Chauvier, Y. and Zimmermann, N. E. 2023. chelsa-cmip6 1.0: a python package to create high resolution bioclimatic variables based on CHELSA ver. 2.1 and CMIP6 data. - Ecography 2023: e06535.

Molloy, S. W. 2018. A Practical Guide to Using Camera Traps for Wildlife Monitoring in Natural Resource Management Projects.

Niedballa, J., Sollmann, R., Courtiol, A. and Wilting, A. 2016. camtrapR: an R package for efficient camera trap data management. - Methods Ecol. Evol. 7: 1457–1462.

Rovero, F., Zimmermann, F., Berzi, D. and Meek, P. 2013. "Which camera trap type and how many do I need?" A review of camera features and study designs for a range of wildlife research applications. - Hystrix Ital. J. Mammal. 24: 148–156.

Wearn, O. R. and Glover-Kapfer, P. 2017. Camera-trapping for conservation: a guide to best-practices.

Weiss, M., Beukes, M., Jansen, M., Aramayo Bejarano, J. L., Aramayo Ledezma, G. and Weterings, M. J. A. 2026. Trait-filtered responses of mammal communities to land use change in a Neotropical dry forest. - Ecosphere 17: e70650.

APPENDIX 1: CAMERA TRAP DATA SHEET

CAMERA TRAP DATA SHEET

LOCATION & CAMERA DETAILS

SITE NO:					
CAMERA TRAP NO:		**SURVEYOR/S:**		**GPS CO-ORDINATES:**	
LOCATION ID:					
ELEVATION:					
DATE OF SET UP:				**DATE OF REMOVAL:**	
CONCISE LOCATION NAME:					
GENERAL DESCRIPTION OF LOCATION:					
SKETCH OF LOCATION:					

SITE DESCRIPTION:	NATURE RESERVE	LIVESTOCK FARMING		CROP FARMING		RESTING FARMING LAND
IS THE CAMERA TRAP ON A TRAIL?	GAME TRAIL	ROAD	NONE	OTHER:		
HOW IS THE CAMERA TRAP MOUNTED:	TREE	METAL STAND	OTHER:			
TOPOG LANDSCAPE:	VALLEY	HILLSLOPE	HIGH PLATEAU		ALLUVIAL FAN	FLOODPLAIN
VEGETATION TYPE:		FOREST	FYNBOS		SAVANNAH	THICKET
DISTURBANCE GRADIENT:		TRANSFORMED	SEVERELY DEGRADED		MODERATELY DEGRADED	IN TACT
AGRICULTURAL ACTIVITY:		ESSENTIAL OILS	FODDER		LIVESTOCK	
RESTORATION ACTIVITY:		EROSION CONTROL	REVEGETATION		PONDINGS	
OBSERVED GRAZING INTENSITY	HIGH	MEDIUM	LOW			
DISTANCE FROM WATER POINT:			**DISTANCE FROM LIVESTOCK:**			
DISTANCE FROM HUMAN SETTLEMENT:			**SETTLEMENT TYPE:**		HOMESTEAD	HOUSE / COMMUNITY

PHOTOGRAPHIC INFORMATION

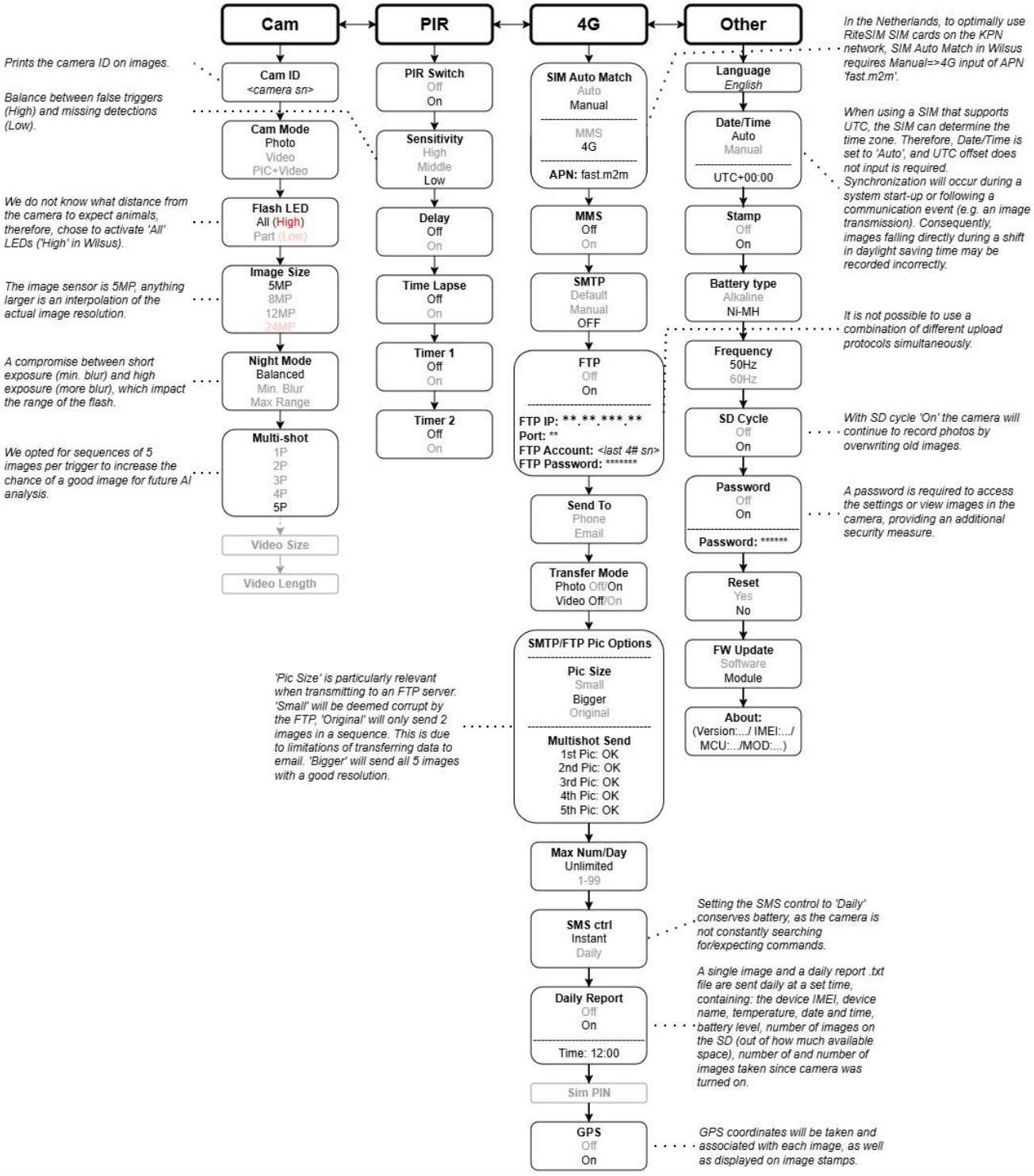
BEARING	CAMERA TYPE	ANGLE	ELEVATION	SD CARD NO	PAIRED	MARKERS	NOTES

NOTES:

APPENDIX 2: CAMERA CHECK DATASHEET

Camera Check Datasheet														
Site No.	Date	Time	Surveyor	Camera No.	No. of Images	Camera Active (Y/N)	Camera Damage (Y/N)	Batteries Changed (Y/N)	SD Card Changed (Y/N)	Old SD Card no	New SD Card No	Markers Damage (Y/N)	Paired Camera? (Y/N)	Notes

APPENDIX 3: CAMERA-SPECIFIC CONFIGURATION SHEET



APPENDIX 4: PROTOCOL FOR NAMING

Protocol for naming / ID-ing photos and videos from camera trap projects (AI4WILDLIVE)

The individual ID is compiled of the following classes of information divided by an underscore:

Institution_Country_QualityCheckDate_Projectname-StationName-CameraPosition_ImageNumber

SGN_BOL_2025-02-10_G06-A_338

SGN_BOL_2024-01-21_LaCachuela-A_338

SGN_BOL_2026-03-29_PIF03_338

Institution: Try to use 3 letters

Country: Please use the 3 letter ISO code (https://en.wikipedia.org/wiki/List_of_ISO_3166_country_codes)

QualityCheckDate: This is the date when you checked the cameras and/or downloaded the data. E.g., if the Bolivian Team checks the cameras it usually lasts a couple of days unless they have visited the entire grid of cameras. We usually take the last day of this checking trip as "QualityCheckDate".

Projectname-StationName-CameraPosition: A code that reflects your project, camera location in the field, as well as position at the camera station (e.g. A for left, B for right etc)

ImageNumber: Running number of chronologically ordered images of that camera at that checking trip.

IMPORTANT:

- Don´t use blanks
- Use underscores only to divide class of information
- Reduce information wherever possible (e.g. the use of "-" and "0": G06 instead of G-006; PIF01 instead of e.g. PIF0006
- Camera names are linked with station/locality not fabric numbers (=>camera name is no physical ID)

Folder Structure Example from Mabula project:

File path "\AuVisBioDivRes\Mabula Data\2025\SA_SL13\SL13_25Jan25"

Naming photo or video files in folder**: SGN_MAB_2025-01-25_SL-13_(1)**