Resilient Landscapes

National Environmental Science Program

Standard operating Procedure

Landscape Scale Camera Trap Monitoring

Version 1.1

Get ready to go on Country

Gather your gear

- Electronic device(s) – charge ready for use
- Camera traps
- SD cards
- Batteries
- Handheld GPS device

Consider

Timing

Prepare well before going on Country so that you have time to get approvals, gather equipment, and train staff if needed.

Training and skills

Preparing rangers trained and competent in using and setting up:

- mapping software (e.g., ARCGIS, QGIS)
- navigation systems (e.g., Avenza/GPS)
- data collection systems (e.g., Fulcrum /Datasheets)
- Programming cameras

Check Permissions

- Which areas you are allowed to set up monitoring sites.
- Data sharing permission, and who it can be shared with is determined by the decision makers in the community, and any rules about who can see the data, and when they need to check back in with you for its use.
- Ethics and licensing: depending on your use of lures or baits, and potential impact on threatened species, ethics approval and/or licenses may be required. Check with your state government department.

Actions

Plan

1. Which dates you will put out and collect the cameras.
   - Make sure that at these times of year your sites are accessible, and conditions are not too extreme.
2. How long you will leave the cameras out.
   - You may need to plan a "service" visit to swap the old batteries and SD cards for fresh ones.
3. Whether you will use a lure or bait.
   - Lures can attract some animals to the camera trap and increase the chance of capturing images. They are usually only effective for short periods of time (a few weeks, depending on weather). You should be very certain you require them as they can also have undesirable effects on camera monitoring data.
4. Choose sites (see "Choose sites" section).
5. Check "gather your gear" lists for all steps, get any equipment you don't have, prepare and pack your gear.
   - See 'Camera trap buying guide' for advice on which units may be suitable to buy.
   a. Check all equipment is clean and in good working order.
   b. Prepare cameras (see "Prepare cameras" section).
   c. Prepare your electronic device(s):
      - Charge the battery
      - Check data collection systems (e.g., Fulcrum) and navigation system (e.g., Avenza) are installed.
      - Load maps, datasheets etc.
   d. Check SD cards are cleared of images
   e. Charge camera batteries.
6. Check training and skills, make sure rangers know how to:
   a. Use the devices, data collection apps, navigation systems etc.
   b. Program, put out and activate cameras.
7. Arrange training if needed.

Plan to manage data:

1. How you will record data when on Country e.g. electronic or paper data forms.
2. How you will manage data collected on Country e.g. spreadsheet or database.
3. Where you will store the images, and how you will structure the filing system.
4. Which image management software you will use e.g. CPW Photo Warehouse, Wildlife Insights, Camelot, Timelapse Image Analyser etc.
5. You may also want to consider using an image classifier or object detector such as Megadetector to speed up image processing.
6. Decide how you will analyse the data.

Choose sites

1. Decide how many sites you need.
   - This is likely to be determined by how many cameras you have access to. We recommend at least 20 – 30 cameras for a landscape-scale project (more is even better).
   - Decide on an appropriate camera placement design such as a grid, transect, spatially constrained randomisation etc. Use a geographic information system (GIS) software like QGIS to select sites for the chosen method.
   - Landscape-scale cameras are often best setup with distances of up to 1km or more between them. This may vary depending on the purpose of the project and the size of the habitat of interest.
2. Make maps of the camera sites that can either be printed or used in mapping programs e.g. georeferenced PDFs for Avenza
3. Create GPX file with a point for every camera that can be saved and loaded into GPS devices.

Prepare cameras

1. Give each camera and its SD cards a unique name e.g. 'CAM01' and write it on the card and the camera with permanent marker or a labelling device. Each camera should have two SD cards, each uniquely identifiable e.g. 'CAM01A and CAM01B'.
2. Insert SD cards and charged batteries into cameras.
3. Check/change camera settings so that they are all the same:
   - Common basic settings are 3 images in rapid succession, no wait period between images, high PIR sensitivity, shutter speed >=1/60th second, camera label printed on image.
   - Date and time setting are correct. This is very important.
   - Internal label for the camera is set and matches the external label.

Next ste

Going on Country

Going on Country

Gather your gear

Put out cameras

One set of this equipment is needed for each site:

- ☐ Camera trap with SD card and batteries installed.
- ☐ Mounting hardware for every camera e.g. stakes/sand pegs, brackets and bolts.
- ☐ Optional (if using lures): lure bait, stake, cable tie, and canister to hold lure (e.g. 50 - 100 mm PVC pipe with a cap on each end and holes drilled into the pipe to let the scent out and thread a cable tie through).

One set of this equipment is needed for each team:

- ☐ Storage boxes for transporting camera traps
- ☐ Electronic device(s) – charged and ready to record data, take photos and navigate to sites. Datasheets can also be used for capturing data.
- ☐ Optional: GPS device to record camera locations
- ☐ Mallet, hammer or picket driver
- ☐ Pliers, multi-tool and/or screwdriver (for securing brackets/bolts)
- ☐ Safety gear e.g. first aid kit, communication device (radio, satellite phone etc.)

Service cameras

One set of this equipment is needed for each site:

- ☐ Replacement SD card and batteries for each camera

One set of this equipment is needed for each team:

- ☐ Electronic device(s) – charged and ready to record data, take photos and navigate to sites. Datasheets can also be used for capturing data.
- ☐ Pliers, multi-tool and/or screwdriver (for securing brackets/bolts)
- ☐ Spare mounting hardware e.g. stakes/sand pegs, brackets and bolts.
- ☐ Mallet, hammer or picket driver
- ☐ Safety gear e.g. first aid kit, communication device (radio, satellite phone etc.)
- ☐ Personal PPE e.g. hat, sunglasses, sunscreen, insect repellent, long shirt and pants, boots and gloves etc.

Collect Cameras

One set of this equipment is needed for each team:

- ☐ Electronic device(s) – charged and ready to record data, take photos and navigate to sites. Datasheets can also be used for capturing dataPliers, multi-tool and/or screwdriver (for securing brackets/bolts)
- ☐ Safety gear e.g. first aid kit, communication device (radio, satellite phone etc.).
- ☐ Personal PPE e.g. hat, sunglasses, sunscreen, insect repellent, long shirt and pants, boots and gloves etc.

Consider

Timing

- Make sure your sites will be accessible when you plan to visit.
- Work in the early or late part of the day when temperatures are coolest if hot days are expected.

People

- At least 2 people per team.

Training and skills

Field staff trained and competent in:

- Use of devices, data collection apps, navigation systems etc.
- How to program, put out, activate and service cameras.

Actions

Put out the cameras

1. Visit each camera site using the waypoints and/or map.
2. At the exact GPS coordinates, check that you can put the camera (and lure if using one) in an area clear of obstructions

   For example: avoid plants or rocks that might block the view of an animal or move and cause a "false trigger".
3. If the camera site is not suitable, move the site as close as possible to the original and record the coordinates of the new location.
4. Hammer in the camera stake and attach the camera so that:
   - The camera faces in a southerly direction where possible,
   - The camera's PIR is 30 – 40 cm above the ground, and
   - The stake and camera are secure and won't move or sway.
5. Hammer in the lure stake in front of the camera – make sure it is far enough away so the camera can focus on the lure clearly (approximately 1.5 metres for Reconyx cameras)– attach the lure canister securely.
6. Turn the camera on, use the "walk test" mode to check that the camera is working.
7. Arm the camera, once it is set walk in front of it once to trigger an image. This will confirm that the camera was operational when it was set.

Record when putting camera out

1. Date and time of setup
2. Site name
3. Installed battery charge status
4. Camera trap ID
5. SD card ID
6. Exact GPS coordinates of the camera's position, particularly if shifted from the predetermined point
7. Type of lure used
8. Who put out the camera
9. Site description

Service the cameras

1. Visit each camera site using the waypoints or map.
2. Check that the camera is securely attached to the stake and clear of obstructions e.g. new plant growth.
3. Check that the camera is still functioning, note how many photos have been taken and what the battery level is.
4. Record the service information (see "Record when servicing camera" section).
5. Replace the SD card and batteries.
6. Refresh the lure (if using one)
7. Arm the camera, once it is set walk in front of it once to trigger an image.

Record when servicing camera:

8. Date and time of service
9. Site name
10. Camera trap ID
11. Number of images recorded on the SD card
12. New SD card ID
13. Battery status before and after changing
14. Who serviced the camera
15. Any changes to the site or environment and notable observations.

Collect the cameras

1. Visit each camera site using the waypoints or map.
2. Power off the camera and remove from stake.
3. Remove all mounting equipment, including lures, stakes or bolts.

Record when collecting camera:

1. Date and time of collection
2. Site name
3. Camera trap ID
4. Remaining battery capacity
5. Number of images
6. Who serviced the camera
7. Any changes to the site or environment and notable observations.

Next step

After Going on Country

After going on Country

Gather your gear

- ☐ Electronic device(s) that you used to record your camera put out, service and collection data.
- ☐ SD cards from cameras
- ☐ Data management system e.g. cloud storage
- ☐ Computer or laptop
- ☐ Image management software (e.g. CPW Camera Warehouse, Timelapse etc.)

Consider

Timing

- Manage your data as soon as possible after a site visit, so that it is fresh in your memory.
- Download your images as soon as possible after your site visits so that SD cards are not overwritten or misplaced.

People

- At least one person to manage data.
- Ranger team to discuss findings and management.

Training and skills

Rangers managing data are trained and competent in:

- Use of data collection apps and data management system(s).
- Use of computer.
- Use of image filing system and image management software.
- Identification of species in camera trap images.

Check Permissions

- Data sharing permission, and who it can be shared with, is given by the decision makers in the community.
- Decide rules about who can see the data, and when they need to check back in with you for its use.

Action

1. Check all equipment is in good working order, clean, and put away in storage.

Manage data:

2. Upload or enter the visit (put out, service and collect) data into your data management system.
3. Remove SD cards from cameras.
4. Copy the images from the SD cards to your image filing system.
5. Back up the data.

Image management software:

6. Import data and images into the image management software.
7. Review images, identify the species in images and classify images.
8. If you have enough time and personnel to do so, get somebody else to proof the image classifications and visit data.
9. Export the data for analysis.

Analyse data:

10. The type of analysis will depend on the project purpose but might include:
    - Species Presence/Absence- identify which species were detected at each camera trap location. This gives an overview of what animals are in the area.
    - Relative Abundance Index (RAI): Count the number of times each species appears in the images as an estimate of their relative abundance across the landscape (not a precise population count).
    - Spatial Distribution: Map where each species was detected across the landscape to see if there are patterns in their distribution (e.g., certain

species preferring specific areas).

- Biodiversity Index: Count the total number of different species detected at each camera trap location to get a measure of biodiversity in different parts of the landscape.
- Occupancy Rate: Calculate the percentage of camera traps where each species was detected. This provides insight into how widespread each species is across the landscape.
- Detection Rate Over Time: Track detection rates of species over time (e.g., weekly, monthly or even longer) to identify any patterns that may correspond to environmental changes like seasons or weather. Tracking detection rates over longer times can show how species respond to management actions, such as fire or control of introduced predators, by highlighting any changes in animal activity or abundance following these management actions.

Discuss, review and share:

11. Discuss with the ranger team any reasons for species to have increased or decreased since the previous year, or why the number of species was different between sites.
12. Discuss whether these trends might be related to your management e.g. cat or fire management, to check how well your management is working, or if you need to make adjustments.
13. Share the data according to any data sharing or funding agreements you have made.