

Tropical Ecology Assessment and  
Monitoring Network

**TERRESTRIAL VERTEBRATE (CAMERA TRAP)  
MONITORING PROTOCOL  
IMPLEMENTATION MANUAL**

**Version 3.0**

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## 1 INTRODUCTION

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This manual describes in detail all the steps and procedures needed to implement the TEAM Terrestrial Vertebrate Monitoring (formerly, camera trap) Protocol. The methods described here are based on the collective experience of many field biologists with experience in using camera traps to estimate the abundance of a range of terrestrial mammal and bird species. The detailed justification for the sampling design and the basics of the analytical approach are presented in the Terrestrial Vertebrate Scientific Protocol (in preparation).

Figure 1 shows the general implementation workflow<sup>1</sup> for the Terrestrial Vertebrate Monitoring Protocol. Each step in the process is thoroughly described in this document. Some steps may occur only during the first year the protocol is implemented (e.g., sampling design, deployment plan, and first year field deployment). The workflow contains three main sections, each of which is separated by conditional (i.e., Yes/No) decision steps:

1. Sampling design, preparation, and submission of the deployment plan.
2. First-year deployment, which includes measuring the spatial locations of all sampling points, first-year sampling, and analysis to determine a minimum number of camera trap points.
3. Field deployment in subsequent years, data recovery, data processing, and data upload.

The details involved in the first-year deployment and deployment in subsequent years are shown in Figures 3 and 4.

The integrity of the data resulting from the TEAM Terrestrial Vertebrate Monitoring Protocol strongly depends on proper functioning equipment. The protocol uses digital camera traps. Each digital camera trap stores many photographs and requires minimal post-processing but adequate care and maintenance. Successful implementation of this protocol also depends on the expert judgment of the deployment crew. The crew determines, on the basis of the protocol, where to place the camera traps and how to set them up. Because of the high equipment cost and the time lag involved in repairing damaged camera traps, it is imperative that staff maintain the equipment well, and promptly report damaged equipment to the TEAM site manager, regional manager, and Terrestrial Vertebrate Protocol manager by e-mail.

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<sup>1</sup> A workflow is a reliably repeatable pattern of activity or actions enabled through a systematic organization of resources, defined roles, and information flows, into a work process that can be documented and learned.

GENERAL WORKFLOW: Terrestrial Vertebrate Protocol

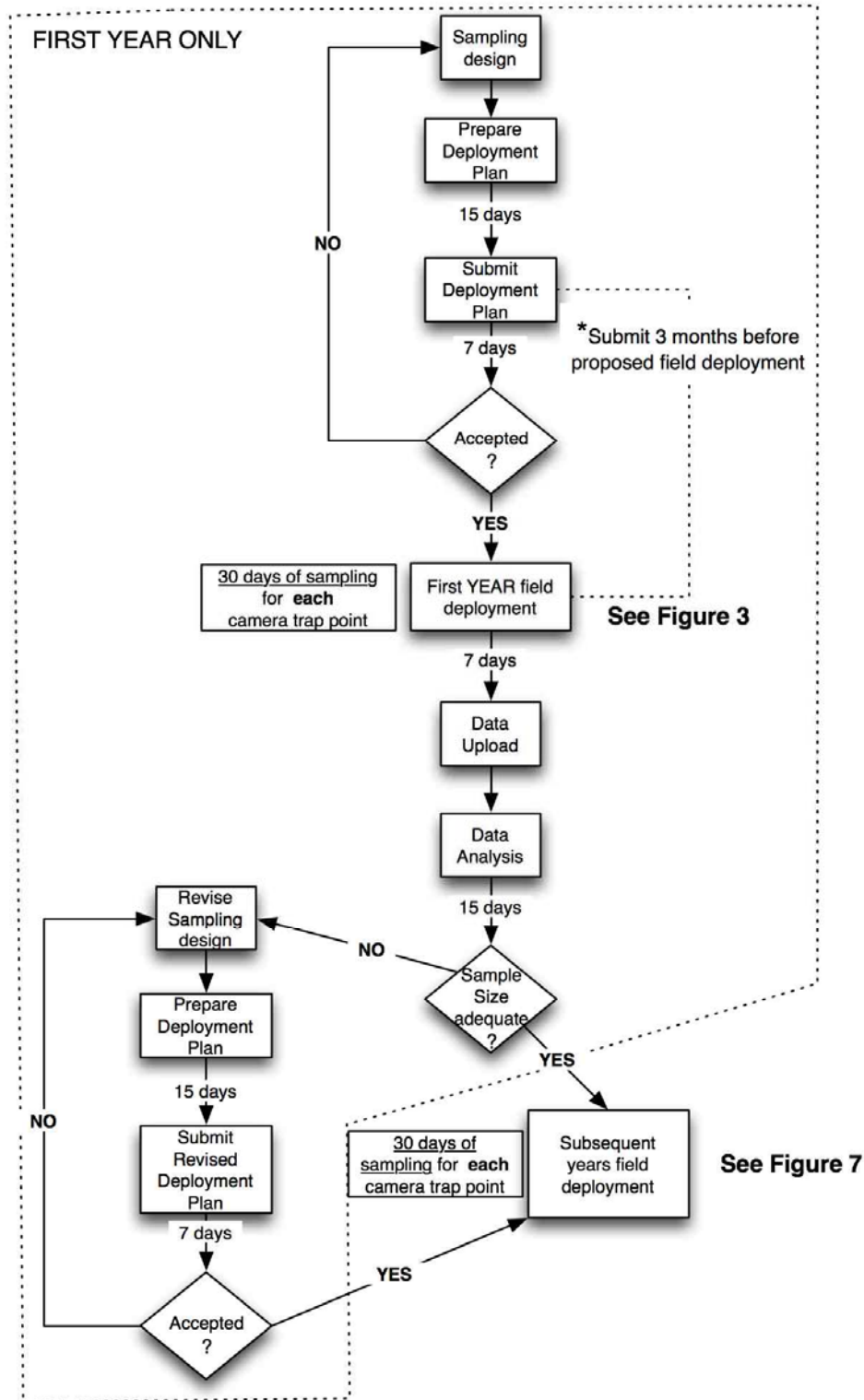


Figure 1. General Workflow illustrating the implementation of the TEAM Terrestrial Vertebrate Monitoring Protocol. Events that happen during Year 1 are enclosed in a dotted outline.

Become thoroughly familiar with this document and strictly follow all the steps to ensure that all data from the field site are properly standardized with all other data for this protocol from the TEAM Network. Consult Section 7 for a description of the roles and responsibilities of all individuals involved with the TEAM Terrestrial Vertebrate Monitoring Protocol. Direct any questions, comments, or proposed revisions to the TEAM Terrestrial Vertebrate Monitoring Protocol manager (email: TEAMVertebrates@conservation.org).

### 1.1 Key Technical Terms

The Glossary (Section 9) contains complete definitions of all technical terms used in this manual; however, for clarity, some key terms, an understanding of which is essential, are defined in Box 1 and Box 2.

BOX 1: Key terms describing the statistical design and deployment plan

- **Camera trap point.** A particular spatial location (latitude and longitude) where the camera trap is located during sampling.
- **Camera trap array.** A set of camera trap points (usually 20–30) distributed at a density of 1 camera trap every 2 km<sup>2</sup>. All camera traps in the array sample during the same 30-day period.
- **Deployment plan.** A plan describing when, where, and how the protocol will be implemented at a specific TEAM site. The plan must contain the proposed sampling design, including the proposed geo-spatial location of each camera trap array, potential locations of the camera trap points within each array, relevant geographic information system (GIS) layers (shape files) for each array (e.g., topography, access, water drainages), and a detailed chronogram of activities.
- **Sampling design.** Refers to the number of camera traps (sample size), their locations (spatial distribution), the time of year and frequency of successive sampling periods (temporal distribution), and the length of time the cameras are deployed in the field during each sampling period (effort).
- **Sampling period.** A specified period of time (e.g., week, month, climatic season) during which all camera trap points are sampled. The TEAM Terrestrial Vertebrate Monitoring Protocol has only one sampling period per year (during the dry season, see below).

BOX 2: Key terms describing protocol implementation and equipment

- **Camera trap.** A piece of equipment installed in the field to automatically take photographs of animals passing in front of it. The camera trap consists of the camera, a control unit, a sensor and a memory card.
- **Camera trap point identification (ID).** A unique code, assigned on the basis of a standard convention to a particular **camera trap point** (i.e., the location, **not** the camera trap itself). See Section 4.3.2 (and the Data Management Protocol) for the specific convention TEAM uses to label camera trap point IDs.
- **Control unit.** An electronic board with a small central processor unit that turns the camera on and off in response to a signal provided by the

sensor. The control unit can be programmed by a user to specify the level of sensitivity to movement, the number of photographs the camera takes when it is activated, etc.

- **Memory card.** A small electronic card that stores the photographs taken by the camera. The memory card must be installed inside the camera or the camera will not record photographs; however, it can be temporarily removed from the camera so that photographs can be transferred to the TEAM Information Management System.
- **Motion sensor.** A small device mounted in front of and on the outside of the camera trap that detects movement within the area in front of the camera. Signals from the motion sensor travel to the control unit, which in turn, controls the camera.

## 1.2 Standard Conventions Used Throughout This Document

The following conventions will be used throughout this document:

- Bold text used throughout the document emphasizes critical points. Sometimes entire paragraphs appear in bold. This means that this information is critical and needs to be considered carefully. Sometimes bold text is underlined; this is an additional level of emphasis stronger than bold alone.
- Complicated procedures are often divided into discrete steps. These are numbered with a brief description of the step in bold. Sometimes, steps are divided into sub-steps, indicated with lower-case letters (e.g., a, b, c, etc).
- Names of TEAM standard field forms or Microsoft Excel templates appear in italics (e.g. *Camera Trap Point Form*).
- The names of particular variables in field forms or Excel templates are underlined (e.g., Latitude). Usually, in the text, the name of the field form or Excel template where this column is located is referred to at the end of the sentence and in parentheses [e.g., “Fill in the columns labeled Year, Month, Day, Time, and First Name of the Person Taking the Reading (*Camera Trap Spatial Form*)”].
- Descriptive text in bold is used in the margins highlighting different types of processes/activities to aid the reader: important/critical steps, preparations before field trips, data entry/upload, use of a GPS is required, TEAM administrative steps, etc.

## 2 SAMPLING DESIGN

**Important:  
a critical  
step/process**

The sampling design for the TEAM Terrestrial Vertebrate Monitoring Protocol has been carefully specified to maximize the probability of photographing an adequate sample of tropical forest terrestrial mammal and bird species. It is intended to monitor **changes in the community of ground-dwelling, terrestrial vertebrates, and not to monitor the abundance of individual species**. This is an important distinction. As such, the sampling design represents a compromise between the level of effort required to detect species that range over large areas (>100 km<sup>2</sup>), such as elephants, tigers, and jaguars and the effort required to detect species with smaller home ranges (~1 km<sup>2</sup>), such as terrestrial birds (e.g. currasows,



guans) and smaller carnivores (e.g. coatis, fossas). The design also accounts for sampling constraints in the field, which may vary in different parts of the world, and for the logistical tradeoffs of cost versus effort.

A TEAM camera trap sample consists of **60–90 camera trap points, distributed among two to three camera trap arrays**. Each point is sampled over a **30-day period, once a year**, during the **dry season** and **no bait is used** to attract animals to the points. Ideally, all 60–90 points should be sampled simultaneously; however, this is precluded by cost and logistical constraints. Therefore, the sampling points have been divided into two or three (depending on the particular site) camera trap arrays. Each camera trap array contains **20–30 camera traps at a density of one trap per 2 km<sup>2</sup>**. Each array is **sampled sequentially**, not simultaneously; however, **all arrays must be sampled within the same dry season**. This means that the first array of camera traps is deployed and remains in the field for 30 days. Immediately thereafter, the camera traps are picked up, the batteries and memory cards are replaced, and the replenished camera traps are immediately moved to the second array, remain there for 30 days, etc. (see Figure 2).

**TEAM  
administrative  
step**

The specific spatial layout of the points for camera trap placement in each array is flexible, but the **camera trap density must equal one camera trap per 2 km<sup>2</sup>**. In very exceptional cases (e.g., where access to a site is very limited or the study area size is too small) camera traps might be placed at a density of one camera trap per 1 km<sup>2</sup>. This is a very exceptional situation and needs to be thoroughly justified in advance by the TEAM site manager and approved by TEAM technical director.

Figure 2 illustrates some examples of potential spatial layouts for a TEAM camera trap array. The specific design chosen for a particular site will depend on local conditions at the site such as elevation gradients, topography, ease of access, physical barriers such as rivers, and other logistical constraints. A GIS is needed to design the precise configuration of points for each array. The design must be submitted by the site and approved by the TEAM technical director before field implementation (see Section 3). During deployment, the camera traps are placed as close as possible to these idealized locations. In the best case, the camera traps are placed in the exact idealized location; however, in some instances, the camera traps will need to be placed not at the exact location, but at the nearest possible feasible location where animals are likely to travel. In sites with obvious elevation gradients, camera trap arrays should be oriented along the elevation gradient from lowest to highest (Figure 2). If this scheme is followed, the spatial distribution of the camera trap points should be sufficient to ensure adequate sampling of the ground-dwelling, terrestrial mammal and bird communities at the site.

**3 YEAR 1 DEPLOYMENT PLAN**

**GIS expertise  
required**

Using the sampling design principles and guidelines (Section 2), the site manager develops a Protocol Deployment Plan, which must be approved before any sampling is implemented. The site manager will need to collaborate with a GIS technical expert (from the site institution or the TEAM Network office if required) to map the site, assemble the various spatial layers, and generate the camera trap

points. The Deployment Plan should be submitted to the TEAM Terrestrial Vertebrate Protocol manager at least 3 months before camera traps are deployed in the field. The required steps for developing the Deployment Plan are as follows:

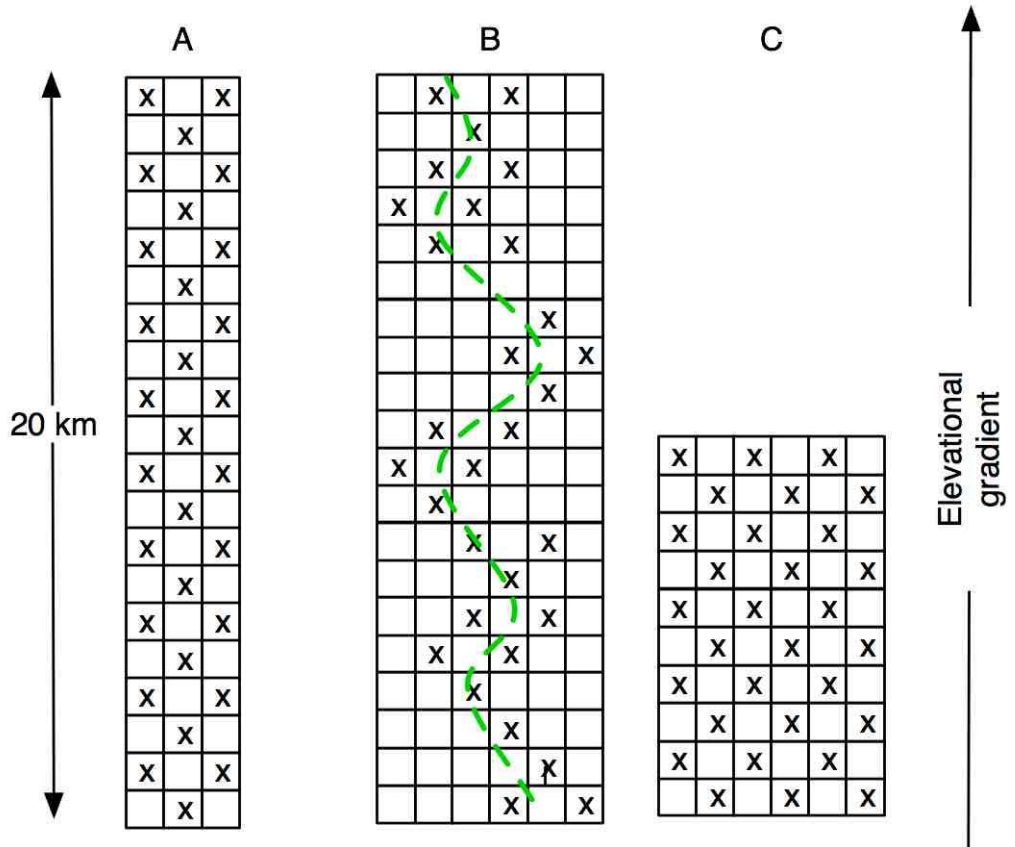


Figure 2. Examples of potential TEAM camera trap arrays. Each small square is one kilometer on a side and the X represents the ideal location of a camera trap. A) 20 x 3 km array with camera traps placed regularly along the array. B) Camera traps are located close to an access trail (broken green line) but placed at the predetermined density of 1 camera per 2 km<sup>2</sup>. C) 10 x 6 km array with camera traps placed regularly. In places where there is an altitudinal gradient, the arrays should be oriented along the altitudinal gradient.

1. **Map the site.** Use the map of the core study area as the basis for selecting suitable locations for the camera trap points. The map will display the anthropogenic, administrative, land use/land cover, and natural characteristics of the site. The core study area identifies where sampling will occur. The area will have been selected on the basis of multiple criteria. Potential problem areas such as rocky outcroppings, steep slopes, edges, seasonally inundated areas, and large streams will have been identified and omitted. All access routes, including rivers and trails, should be identified in the core study area.

**GIS expertise  
required**

2. **Generate regularly spaced points or grid cells.** To identify potential camera trap arrays and points it is necessary to first generate regularly spaced points or grid cells over the core study area. Follow the steps outlined in Section 5 of *Generation of the Sampling Design for All*

*Protocols* to generate regularly spaced points or square grid cells in a GIS at a density of (a) one point per 2 km<sup>2</sup> or (b) one grid cell per 2 km<sup>2</sup> over the entire core study area (if using a modified study area the points or grid cells will be generated over this extent instead). These regularly spaced points or grid cells provide the basis for the location of the camera trap points within the camera trap arrays.

3. **Determine access points to sample arrays.** Use the map and local knowledge to identify access points. Access points are defined as places where the field crew can access a array of camera trap points from a road, river, trail, or any other access way. These access points should include recognizable landmarks such as a mileage post, a dock, or a geographic positioning system (GPS) waypoint. Enter these into the GIS.
4. **Identify potential camera trap arrays and points.** Once the various access points within the core study area have been identified, select 2–3 arrays of 20–30 points or grid cells to represent potential camera trap points such that (1) they sample a representative portion of the core study area; (2) they are accessible using the access points identified above; (3) they will be accessible year round; (4) they are not located along river banks or other edges; and (5) if possible, they are located in areas with existing trail systems to minimize disturbance and the need to cut new trails. The points should be placed at the center of the cells.
5. **Extract the camera trap points from the GIS.** Once 2–3 arrays of 20–30 points or grid cells have been identified (see Point 2 above), use the GIS system to produce a list of latitude and longitudes, one for each point, in decimal degrees using the WGS84 datum. If mesh grid cells have been used up to this point, a center point per cell will first need to be extracted. Remember that these latitude and longitude locations represent only estimates of the **potential locations** and not the final locations for the camera trap points. Program these points into a GPS unit to take to the field.
6. **Conduct a reconnaissance survey.** With the list of potential locations for the camera traps loaded into the GPS unit, the site manager should visit the proposed sampling area to estimate how many camera trap points the deployment crew will be able to deploy in a day. This number will vary depending on the habitat structure at the site; in particular, the structure and density of the understory and the local topography at the site. Where the understory is relatively open and the terrain is even, more camera trap points can be visited in a day than sites with a dense understory and hilly terrain. To obtain a rough estimate of the number of camera trap points that can be visited (deployed) in a day select a subset of 5–10 points in the array and attempt to visit the selected subset the same day with the help of the GPS unit without cutting any new trails. Using the number of points that could be visited in a day, the site manager should be able to roughly approximate the number of camera trap points that can be deployed by day. With this information, the site manager should be able to realistically plan the deployment of camera trap points, including the

order in which points will be deployed, the locations of temporary camps to optimize travel time to potential points, and the schedule (see below).

7. **Preparation of the deployment plan.** After completing the reconnaissance survey, the site manager should have in hand all the elements to prepare and submit a deployment plan to implement the Terrestrial Vertebrate Protocol at the site. **Remember that Year 1 deployment plans must include mapped locations for 60 camera trap points distributed in 2–3 sampling arrays.** The deployment plan consists of the following documents or files:
  - **Written deployment plan.** Summarize and justify the rationale for the chosen locations of the camera trap arrays and points. Prepare a chronology of activities with proposed occurrence dates. Include the names of personnel who will conduct each activity within the deployment plan (see below for field crew personnel requirements).
  - **Maps and shape files.** For each array, submit a map and a shape file containing the locations of the camera trap points together with relevant shape files of each layer (roads, elevation, rivers, vegetation, etc.).
  - **Locations of points.** For each array, submit a list of the points with their latitude and longitude.

The deployment plan must be submitted to the TEAM Terrestrial Vertebrate Protocol manager (email: TEAMVertebrates@conservation.org) at least 3 months before the proposed implementation date.

**Important:  
a critical  
step/process**

**The final number of camera trap points and camera trap arrays to be used in subsequent years will be determined by statistical analysis once the data from the Year 1 implementation are available.** The TEAM Terrestrial Vertebrate Protocol manager will perform these calculations and communicate the results to the site.

## **4 FIRST YEAR FIELD DEPLOYMENT**

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Once the TEAM technical director has approved the deployment plan the first-year field deployment of camera traps can begin. This process involves 1) assembling an adequate field crew, 2) preparing and calibrating the equipment, 3) traveling to each proposed camera trap point and choosing the best site for each camera trap point, 4) obtaining latitude and longitude readings for each camera trap point, 5) installing the camera trap in the field, 5) leaving each camera trap for 30 days, 6) recovering all camera traps and memory cards, and 7) organizing and uploading all photographs and data according to the TEAM Data Management Protocol.

Figure 3 depicts the major steps in first-year field deployment. The text in this section is structured accordingly.

### **4.1 Assemble a Deployment Crew**

The site manager in consultation with TEAM technical director should assemble a deployment crew consisting of the following individuals:

**TEAM  
Administrative  
step**

1. **Deployment crew leader** whose primary responsibility is to guide the other crew members and decide where to set up the camera traps. This person should:
  - Have >2 years experience setting up camera traps in the field
  - Be prepared to spend several days in the field (including weekends and holidays)
  - Be trained by the TEAM remote sensing specialist to read spatial coordinates in the field following the specified standards in the **Sampling Unit Placement Protocol** found on the TEAM Web site
  - Be able to coordinate, manage, and work with field personnel
  
2. **One to three technicians** who will accompany and assist the crew leader to set up the camera traps. These technicians should preferably:
  - Be local people who live in and are familiar with the area
  - Have extensive field experience
  - Are prepared to spend several days in the field (including weekends and holidays) without seeing their families

#### **4.2 Equipment Preparation and Calibration**

The Terrestrial Vertebrate Monitoring Protocol depends on the equipment being in proper functioning order; thus, adequate care and maintenance of the camera traps is essential. To ensure the highest possible quality and integrity of the data, close attention must be paid to preparing and calibrating the camera traps before they are deployed in the field. Start these preparations 1 week in advance of leaving for the field. The leader of the camera trap deployment crew must follow these steps to ensure this happens.

TEAM requires the use of **Reconyx** digital camera traps model **RM45** (see Section 8, Equipment List). Due to their rapid response time, infrared flash, multifire capabilities and unique design for field conditions, these are the only camera traps approved for the TEAM Terrestrial Vertebrate Monitoring Protocol. **The TEAM Network office does not approve the use of any other equipment to collect TEAM Terrestrial Vertebrate Protocol data.**

**Before you go  
to the field...**

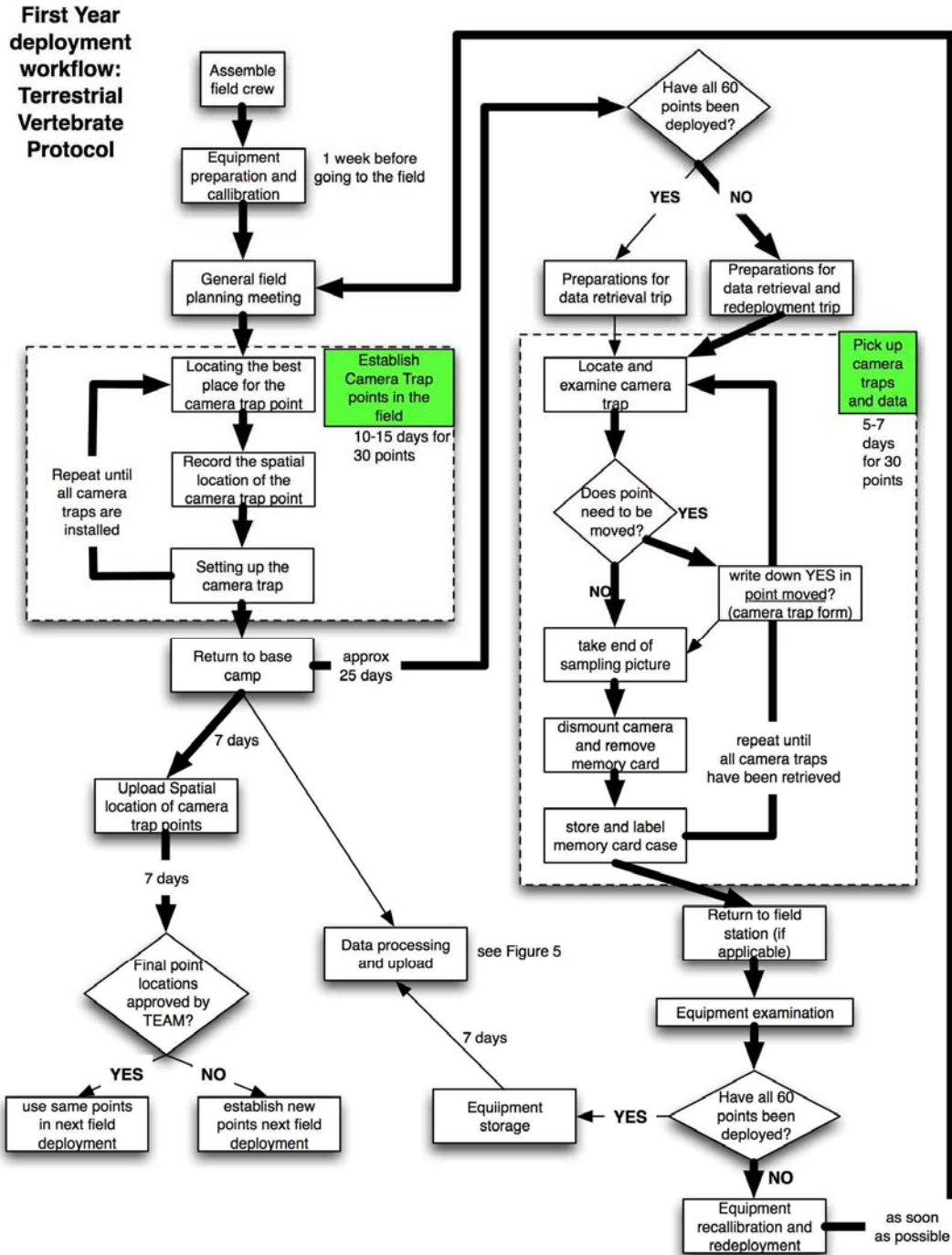


Figure 3. Workflow illustrating the main steps during the first year of deployment of the Terrestrial Vertebrate Protocol. The thick arrows show the main steps in the workflow during the first cycle of deployment and pickup of camera traps.

**Before you go  
to the field...**

4.2.1 Battery preparation

Each camera in the camera trap unit requires six Type “C” rechargeable nickel metal hydride (NiMH) batteries to power the camera.

1. **Charging the batteries for the first time.** If this is the first time the type “C” rechargeable batteries are being used for a given year, **put them in a discharging-recharging cycle (conditioning cycle) at least 48 hours before leaving for the field assignment.** This ensures that the battery “memory” is properly set and prolongs the life of the rechargeable battery. Refer to the battery charger for instructions on how to put the batteries in this **conditioning cycle.** Only use battery charges that have this specification built in (see Section 8, Equipment List). To minimize the amount of time the batteries need to charge, TEAM recommends using four to six battery chargers in parallel, each holding the maximum number of batteries.
2. **Subsequent battery charges.** If this is not the first time these batteries are being used, discharge them first and recharge them for at least 24 hours prior to leaving for the field assignment. **DO NOT charge the batteries more than 24 hours before taking them to the field assignment.** Rechargeable batteries tend to lose their charge very quickly, even if they are not being used.
3. **Do not use these batteries for camera set up.** Use only a set of six alkaline type “C” batteries to calibrate the cameras (see next step).

4.2.2 Preparation of the camera trap

**Before you go  
to the field...**

It is crucial that all camera traps are set up correctly and with the same settings to ensure standardization of the data being collected. Before taking the camera traps to the field, every single camera trap must be checked, as described below.

**Forms needed during these steps:**

- *Camera Trap Checklist* (Appendix A2). The *Camera Trap Checklist* needs to be filled out and signed by the crew leader (or delegate) and site manager (or delegate). The site manager should not authorize the camera traps to go to the field until the *Camera Trap Checklist* has been signed and turned in.
- *Camera Trap Form* (Appendix A3). Use this form to record the serial number of the camera trap and the serial number of the memory card in each camera.

**Steps:**

1. **Wash your hands.** Always make sure your hands are clean before handling the camera traps and memory cards. Small bits of dirt may easily become lodged in the contact points resulting in a poor connection to the camera and card failure.

2. **Mark the camera trap.** Each camera trap should be externally marked with a unique identification number. TEAM recommends using the numbers 01, 02, 03, etc. Clearly write down the number in the back of the camera using a nonerasable, water-resistant pen marker. Write down this number in the Camera Trap Number column on the *Camera Trap Form*.
3. **Set the date and time.** Remove the front cover of the camera trap and insert six regular or alkaline type “C” batteries (not the rechargeable ones to be used in the field). Turn the camera on using the ON/OFF switch. If this is the first time the camera has been turned on, enter the corresponding year, month, day, hour, and minute, and press the OK button after each step (see Appendix A5, the Camera Trap Manual). To set the time, use the time from a standardized time server such as <http://www.timeanddate.com>. Enter the name of the city (or closest city) for the field site location to receive the official standardized time.

**Important:  
a critical  
step/process**

**VERY IMPORTANT!!!!!!**  
**DATE & TIME SETTINGS: IMAGES ARE USELESS WITHOUT AN  
ACCURATE DATE AND TIME STAMP.**  
**MAKE SURE THE CORRECT DATE AND TIME ARE SET IN THE  
CAMERA TRAP. WITHOUT THIS, ALL RESULTING PHOTOS WILL BE  
USELESS!! REFER TO APPENDIX 5, TO LEARN HOW TO SET/VERIFY  
THE CURRENT DATE AND TIME ON THE CAMERA TRAP.**

4. **Record the serial number of the camera trap.** Navigate to the **Camera Info** menu by using the << or >> buttons, and then press the OK button. This will display the serial number and firmware version of the camera. Write down the serial number in the Camera Trap Serial Number column in the *Camera Trap Form*.
5. **Record information about the memory card.** Take out a memory card from its case and locate its serial number. The serial number is an 8–9 digit number usually found on the back of the memory card close to the electronic contacts. Write down the serial number in the column Memory Card Serial Number (*Camera Trap Form*) in the corresponding row of the Camera Trap Number column (same form). Insert the memory card in the slot located in front of the panel below the buttons.



6. **Set up the camera trap.** Navigate to the **Change Setup** menu of the camera trap and using a combination of the OK, <<, and >> buttons, set it up with the following settings (see Appendix A5 for details):

Setting	Set it to:
Trigger/Motion sensor	ON
Trigger/Sensitivity	HIGH
Trigger/Number of photos per trigger	3
Trigger/Interval between photos	RapidFire
Trigger/Quiet period	No delay
Time lapse	OFF
Date/Time	Current date and time, temperature in °C
User label	Two-letter TEAM site code – dash – CT (e.g., CX-CT) (complete other details in the field; see Section 4.3.3)
Resolution	HIGH

When finished, check the Correct Date and Time? and Correct Camera Settings? columns (*Camera Trap Checklist*).

7. **Erase the memory card.** If there are any images in the memory card, erase them. Go back to the **Main Menu** and navigate to **Erase Card** (make sure not to lose any valuable information!). Check the Is memory card empty? column (*Camera Trap Checklist*).
8. **Replace the batteries.** Turn the camera off and remove the six regular type “C” batteries. Replace them with six fully charged type “C” NiMH rechargeable batteries. Check the Camera Batteries Fully Charged? column (*Camera Trap Checklist*).
9. **Test the camera trap unit.** Turn the camera trap on, navigate to **Arm Camera** in the main menu, and select OK (the camera will be active in 10 seconds). Place the camera vertically (e.g., on a bench) and stand in front of it at a distance of 2 meters; it should take a few photographs (navigate to **Check Status** to see how many photographs were taken). If the shutter clicks, check the column Camera trap working? (*Camera Trap Checklist*). Otherwise, go back to Step 6 and make sure the camera is set up correctly. This step can be performed with several camera traps simultaneously by placing the camera traps along a bench and walking in front of them.
10. **Install desiccant.** Finally, every camera trap case needs to be fitted with a pillow of desiccant or moisture control packets (e.g., Zorb-Ir, 2 × 2 cm; see Section 8, Equipment List). Place the pillow on top of the LCD screen, turn off the camera trap, and replace its front cover.

**Before you go  
to the field...**

4.2.3 Case inspection

With the camera and the control unit programmed and set, the final preparation step is to inspect the camera trap case to make sure it is ready to be deployed to the field. Follow these steps to ensure the case is in proper conditions.

1. **Check the camera trap case seals.** Closely inspect the case and look for cracks or other anomalies. Make sure the case is solid and the seals are in good condition to prevent water entry to the interior. Check all the places where water can enter (e.g., junction points where the sensor lens, flash and lens windows, and lock handle touch the case) to make sure the camera case will withstand wet weather. If junction points seem open or weak, use silicone sealer to seal them. Only after the case and seals are in proper shape check the column Case, Seals and Locking Bracket in Good Condition? (*Camera Trap Checklist*).
2. **Prepare locks.** In addition to the bungee cord provided, each camera trap should have a corresponding cable lock to fasten it to a tree in the field. Make sure to have the appropriate number of locks and the corresponding keys for each lock (usually, one set of keys will open three different cable locks). Test locks and keys to determine which keys open which locks. Check the column Locks and Keys Marked and Checked? (*Camera Trap Checklist*).

**TEAM  
Administrative  
step**

4.2.4 Final review of settings and paperwork

The crew leader should review the *Camera Trap Checklist* to ensure that for each camera trap all functions are properly set, memory cards are in place, the batteries are functioning, and so on. The crew leader (or his or her delegate) must review, sign, and date the checklist and obtain the signature of the site manager (or the site manager's delegate). The crew leader gives the signed checklist to the site manager who will properly archive it. Without this review and signature, the site manager may not authorize deployment of camera traps to the field. During site visits, the TEAM regional manager or TEAM technical director may request inspection of these forms (or any other forms described in this document).

**Before you go  
to the field...**

4.2.5 Other equipment and supplies

The following additional field equipment and supplies (in addition to the camera traps themselves) need to be ready and packed before the team leaves for a field assignment:

- **GPS unit.** To ensure the maximum precision possible, the TEAM Network office will arrange for the crew leader to obtain access to a GPS unit so that each camera trap point can be geo-referenced. Only use GPS models that have been approved by the TEAM Network office.
- **Aluminum tags.** Take 30–60 aluminum write-on tags to the field (see specifications in the equipment list). Once a camera trap point is established and geo-referenced it needs to be marked (see Section 4.3.2).
- **Cutting equipment.** Use light-weight cutting equipment (e.g., garden clippers or a small machete) in case small access trails need to be cleared

to access potential camera trap point locations and to clear the vegetation around a camera trap point.

- **Compass and maps.** Take a few compasses and good plasticized maps of the area at the appropriate scale (i.e., array) to help orient the crew in the forest.
- **A small whiteboard.** Take a small whiteboard (e.g., 23 × 35 cm), 2–3 dry-erase pens, and a cloth rag to mark the beginning and end of the sampling period at each camera trap point.
- **One to two open-frame backpacks.** Use these to carry camera traps in the field. Each backpack can hold up to 5–6 camera traps.
- **Field forms.** Bring the following field forms:
  - *Camera Trap Forms* (Appendix A3): Take the forms that were already partially completed during the camera trap setup and preparation steps (Section 4.2.2) with the Camera Trap Number, Camera Trap Serial Number, and Memory Card Serial Number. Record other information on this form when installing the camera trap in the field.
  - *Camera Trap Point Form* (Appendix A1): Take blank copies of this form to complete all appropriate data about the camera trap points (i.e., latitude and longitude, camera trap point identification number, date, time, etc.).

#### 4.2.6 General field guidelines

Before leaving for a field assignment, the crew leader should meet with the other crew members to review the deployment plan and schedule. This meeting should explain the setup and movement of temporary camps as the field crew deploys the camera trap points, the order in which various camera trap points will be visited, and other general logistical issues (e.g., water acquisition and food preparation and schedule). These are some general recommendations:

- Use maps of the study area with the expected locations of the camera trap points to explain to the field crew the deployment plan. Each point in the array should have a unique number (between 1 and 30, depending on the number of points in the array). This number will be part of the camera trap point ID used when marking the camera trap location.
- The number and location of temporary camps will depend on the local conditions at the site, but TEAM recommends establishing one or two camps to minimize travel to and from the camera trap points.
- The field crew should be prepared to spend several days sleeping in these temporary camps under sometimes harsh field conditions (high humidity and heat, rain, mosquitoes, etc.).
- TEAM highly recommends establishing temporary camps close to water sources to avoid carrying large amounts of water. Food should be very basic and include mostly nonperishable items.
- Setting up camera traps is hard and arduous work and the field crew should be physically and psychologically prepared to spend all day working in the field over several consecutive days. Spending an entire day in the field is crucial for minimizing the amount of time that camera traps should be deployed. Therefore, each crew member should carry enough

water and food for the working day. Going back to the camp for lunch is inefficient and will waste valuable time.

- When packing the camera traps to take in the field **do not store them with food** or any other substances that might attach odors to the camera trap. Food or other smells might attract animals to the camera trap in the field, biasing the estimates of detection probability.
- When carrying camera traps in the field use an open backpack frame to which the camera traps can be strapped using the bungee cords that accompany each camera. **Do not carry camera traps and food in the same bag** to avoid impregnating them with smells that might bias the sampling.

### **4.3 Field Trip to Establish and Geo-reference Camera Trap Points**

The following sections describe the steps for establishing and geo-referencing potential camera trap points and installing the camera traps in the field. Follow these steps carefully, because the successful placement of camera trap points is crucial to the quality and number of photographs expected.

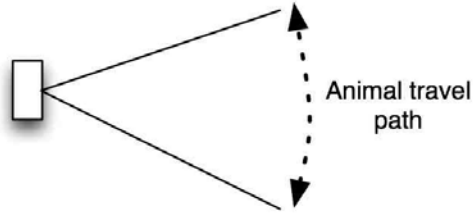
#### 4.3.1 Locating the best place for the camera trap point in the field

Using the Proposed Deployment Plan and a GPS unit, navigate to the proposed camera trap point location where a camera trap is expected to be deployed. This is the **potential location** that was determined during the deployment plan. Once the deployment crew reaches this location, the crew leader needs to find the best possible location as close as possible to the predetermined coordinates. **Choose the exact location to give the highest probability of obtaining useful photographs within 10 meters of the original point.** Often this will be a game trail or ridge top. Different species have unique travel habits, and trail characteristics affect the species that use those trails. Select the location that is likely to yield photos of the largest number of species. **DO NOT** choose the location on the basis of behavior of any single species. It is the crew leader's responsibility to decide the final location of the camera trap.

1. **Choose a "wildlife-friendly" site.** Once in the vicinity of the predetermined coordinates, the crew leader should search for the nearest location such as trails, dirt roads, creek banks, and paths to water that animals use on a regular basis and with a good chance of animal visitation. Look for signs (tracks, scrapes, game trails) nearby.
2. **Try to determine the travel path.** The crew leader should choose a site where the travel path is limited to the area that the camera trap can photograph (Figure 4, A and C). An open area is a poor choice because animals may cross it at any point and travel in any direction (Figure 4D). A single trail with evidence of use and limited travel alternatives is optimal for placing camera traps (Figure 4C). In some cases it may be necessary to pile brush to restrict the options for movement on a wide trail.

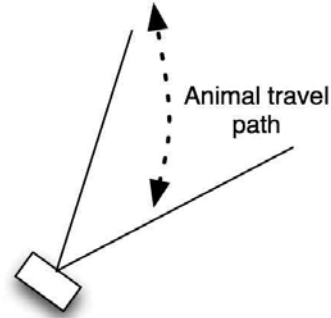
**Recommended**

**A.** Camera perpendicular to animal travel path

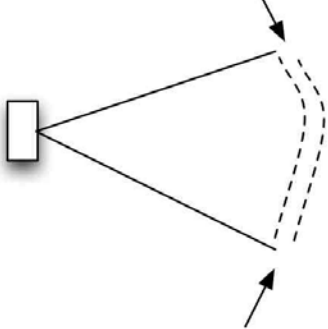


**Not Recommended**

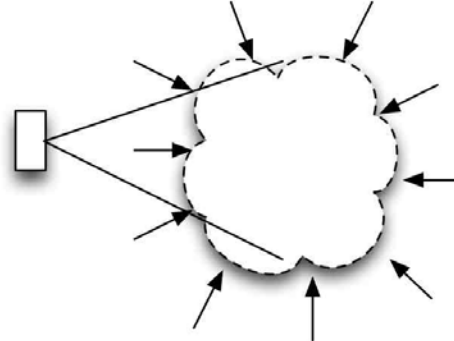
**B.** Camera parallel or diagonal to animal travel path



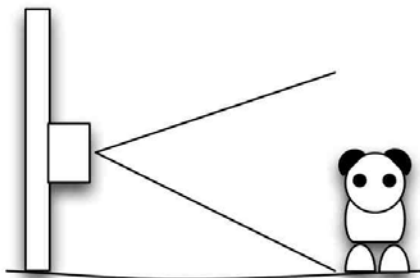
**C.** Animal travel restricted to narrow path directly across camera



**D.** Wide open area: animals may enter anywhere and in any direction



**E.** Terrain between camera trap and travel path is leveled



**F.** Terrain between camera trap and travel path is sloped; higher chance of not detecting animals

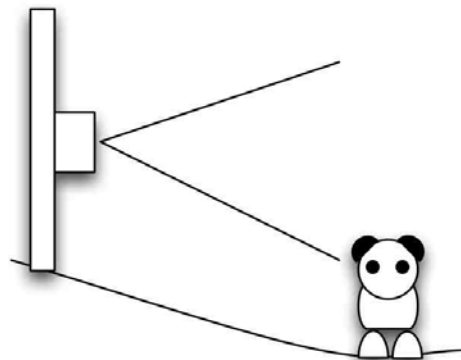


Figure 4. Recommendations for camera trap placement. Camera traps should be placed perpendicular to animal travel paths (A), rather than parallel or diagonal to them (B). Travel paths should be fairly restricted (C) rather than open (D). Terrain between camera trap and travel path should be leveled (E) and not sloped (F).

3. **Consider the sensor's range and field of view.** A wide trail has more places at which wildlife can cross a sensor and thus, the greater the area that must be covered by the sensor's field of view. The maximum distance to the far side of the trail should not be farther than the distance covered by the flash. The distance should also be considerably less than the maximum range of the sensor.
4. **Consider the terrain.** The ground under the camera trap unit needs to be reasonably level (Figure 4E). Trails with ruts or slopes can result in the ground obscuring a traveling animal from the sensor beam, and might cause the camera trap to miss photograph opportunities. A path with a pronounced slope on one side can result in a sensor beam that is at shoulder height when wildlife walk on the upside of the path, but miss the animal entirely if it walks on the down slope of the path (Figure 4F). Be aware of all the possibilities of travel in front of the camera traps. If it is impossible to find level terrain then make sure to angle the camera accordingly, so that it is reasonably parallel to the ground.
5. **Find a suitable tree in which to set the camera.** Finally, find a spot with a suitable tree or post perpendicular to the trail. Affix the camera trap to the tree approximately 30–50 centimeters off the ground and parallel to it. Suitable trees have trunks that are reasonably straight; thin enough to tie a chain or wire around; but not so thin that wind, people, or other animals can shake it excessively. Try to minimize direct sunlight exposure to the camera trap because excessive heat can reduce the sensitivity of the heat sensor. Camera traps should be set back at least 2 meters from the nearest point at which wildlife might travel across the sensor. This allows for clear, focused pictures and a large enough field of detection from the sensor. The longer an animal is in the detection zone, the less chance of missing a photographic opportunity.
6. **Set up the "stage" for the camera trap.** Occasionally, limitations in terrain or suitable trees hamper complete coverage of a trail. Cut some brush as needed to maximize detection within the field of view of the camera trap. Try not to disturb the trail or lay down too much vegetation to force animals to pass in front of the camera because some animals will turn around if faced with obstructions. Try to keep the stage as natural as possible.

4.3.2 Record the spatial location of the camera trap point and mark its location

**Use of a GPS  
is required**

1. **Record the spatial coordinates of the location.** Once the final location for the camera has been chosen, record the longitude and latitude of the final placement of the camera trap in decimal degrees using the **GPS unit**. It is crucial to take a GPS location for each camera trap point before beginning any sampling. This location should be as close as possible to the actual tree or post in which the camera will be mounted. Write down the latitude and longitude in decimal degrees with at least six decimal points in the Latitude and Longitude columns (*Camera Trap Point Form*).

Fill in the Year, Month, Day, Time, First name of the person taking the reading, Last name of the person taking the reading, GPS Make and Model, and Number of Points columns (*Camera Trap Point Form*).

**Important: a critical step/process**

2. **Mark the location where the camera trap will be set.** Mark an aluminum tag with the camera trap point ID using the TEAM convention:

#### **CT - Site abbreviation – Array number – Point number**

The first two letters refer to the protocol (CT for Terrestrial Vertebrates Protocol); the second two letters are the abbreviation for the TEAM site; the third number is the array number, and the final two digits are the point number. For example, when setting up point # 15 in array # 1 at Manaus, use the following camera trap point ID: CT-MN-1-15. **Strictly follow this naming convention for all camera trap points.** Attach the aluminum tag to the tree where the camera trap will be mounted. Fill in the Point ID column in the *Camera Trap Point Form*.

#### 4.3.3 Setting up the camera trap at the location

Once the specific location for the camera trap is geo-referenced and marked, the camera trap can be installed at the camera trap point. Follow the guidelines outlined here and in Figure 4.

1. **Roughly calculate the field of view.** Although camera traps can in theory detect movement up to 30 meters away, this distance is dependent on the local temperature and humidity. More realistically, and because vegetation in tropical forests tends to be dense, camera traps should be aimed 2–4 meters from animal trails. Because the camera lens has about a 40 degree field of view, the width of the field of view can be roughly approximated as 70% of the distance from the camera trap to the trail. For example, a camera that is about 3 meters away from the trail will capture a field of view of about 2.1 meters ( $0.7 \times 3$ ) in the trail. See below for a more precise determination of the field of view using the **Walk Test** mode in the camera trap.
2. **Clear debris from the camera trap field of view.** Clear big leaves and other obstructions between the camera trap location and the travel path. Anything that obstructs the beam reduces the detection ability of the camera and could result in poor quality photographs. Large leaves can result in false triggers when the sun heats up a frond blowing in the wind.
3. **Fix the camera trap to the designated tree.** Attach the bungee cord through the large handles (ears) of the camera trap and around the previously marked tree where it will be located. The sensor beam should be approximately shoulder high on wildlife and set approximately 30–50 centimeters off the ground and parallel to it. Use freshly cut sticks and branches to help prop up and secure the camera trap to the tree trunk or other anchor. A well-placed twig between the camera trap housing and the tree trunk can help adjust the angle at which the sensor is pointed.

Always use live wood to brace cameras and adjust camera angles because dead wood is too brittle. Try to avoid pointing the camera trap at objects in direct sunlight such as large rocks or sunlit streams that may absorb heat and trigger sensors.

4. **Turn the camera on and type in the camera trap point ID.** Remove the front cover and turn the switch of the camera to the ON position. Navigate to the **Change Setup Menu** and then to the **User Label Menu**. Using the << and >> keys to type in the camera trap point ID (the same ID in the aluminum tag at the camera trap point; e.g., CT-CX-1-3). All the photos taken by this camera trap will have that identifier in its pictures.
5. **Activate the Walk Test mode.** Navigate to the **Main Menu** and select the **Walk Test** mode. With this option, the camera flashes an indicator light when an object enters its detection zone without triggering any photos. Test the aim of the camera trap by crossing in front of it. Do this on both the edges and the middle of the path. A human who crawls or crouches while moving is a good imitation of wildlife walking in a relaxed fashion. Make sure that every conceivable angle at which wildlife can pass in front of the camera trap is tested, and that the sensor triggers in each instance (watch the light in front of the camera trap). If necessary, adjust the angle and height of the camera to maximize the field of view in front of the trail. **The camera trap will arm itself after a 2-minute period of no motion in front of the sensor.** This will ensure the camera has been properly set up.
6. **Replace the front cover.** Once the camera has been satisfactorily positioned, put the moisture control packet back inside and carefully replace the front cover of the camera trap.
7. **Secure the camera trap to the tree.** Pass the cable lock through the small ears of the camera trap over the front cover and around the tree. Secure the lock and do not leave the key. Write down the number of the key in the Key Number column (*Camera Trap Form*).
8. **Prepare the whiteboard for a test/start photo.** Take out the whiteboard and write down the following data:
  - a. **The camera trap point ID** that corresponds to this particular point (e.g., CT-MN-01-10)
  - b. **The date** in ISO standard format (yyyy/mm/dd); write this below the camera trap point ID
  - c. **The time** in ISO standard format (hhmm; e.g., 1600, 1235)
  - d. **Complete** first and last name of the responsible field crew leader (do not use abbreviations, nicknames, or initials)
9. **Take a test picture.** After 2 minutes of inactivity in front of the sensor the camera will self-arm. As soon as this happens, position yourself 2 meters in front of the camera trap and hold up the labeled whiteboard. **Make sure the camera takes a photograph** (watch for the lens to open and close). The camera trap is set. Fill in the Start Date column (*Camera Trap Form*): year, month, day, hour, and minute (the same date and time that



appear on the whiteboard). Also write down the First Name and Last Name of the leader of the crew setting the camera trap (*Camera Trap Form*).

10. **Go to the next camera trap point.** Walk to the next camera trap point and start the entire process described in Sections 4.3.1, 4.3.2, and 4.3.3. Repeat until all camera traps have been installed.

#### 4.3.4 Return to the base camp/laboratory

After all the camera traps have been deployed at the corresponding camera trap points, each point needs to be sampled for a minimum of 30 days. When returning from the field, the next step is to upload all the spatial information of the camera trap points to the TEAM data repository. The steps below outline this process in detail.

### 4.4 Upload the Spatial Location of Camera Trap Points

#### Data entry/upload

When returning from the field, upload all the spatial location information of the camera traps that have been deployed. It is crucial that this information is uploaded as soon as possible to the TEAM data repository for adequate checking to ensure the quality of the data and that the camera trap points are properly spaced according to the standard sampling design. While in the laboratory or base camp, transcribe all the data in the *Camera Trap Point Form* to the appropriate worksheet in the *Camera Trap Excel Template*. Follow the instructions below.

#### 4.4.1 Transcribe the data from the camera spatial form

Transcribe all the information from the *Camera Trap Point Form* to the *Camera Trap Point Worksheet* (use the *Camera Trap Excel Template*). If there are problems with the spatial data, the locations will need to be re-established or geo-referenced again in the field by the crew leader at the TEAM site (see Section 4.3.2).

1. **Open the template and save the file using the TEAM standard convention.** Open a blank copy of the *Camera Trap Excel File*. Save the file using the TEAM standard convention:

**Site name abbreviation–Protocol abbreviation–From date\_To date–NEW.xls**

For example, a file from Volcan Barva where camera trap points were measured between January 16 and January 23, 2007, should be named as follows: VB-CT-2007-01-16\_2007-01-23.NEW.xls.

2. **Transcribe the data.** Navigate to the *Camera Trap Point Worksheet* in the file and enter all the information row by row (record by record). Make sure all the values in each column conform to the standard data dictionary for this form (available at the TEAM Web site). Save the file **EVERY TIME** a

new record is entered (by doing so, only one record will be lost if a power failure occurs).

3. **Make a backup copy.** When finished entering the information or at the end of the day, make a backup copy of the file (ideally, an external removable hard drive). This hard drive should be stored in a different location than the computer.

#### 4.4.2 Upload information to TEAM data repository

### Data entry/upload

Once all the information for a particular camera trap array has been transcribed to the *Camera Trap Point Worksheet* in a corresponding *Camera Trap Excel File*, upload it to the TEAM data repository: <http://www.teamnetworkdata.org>. You will receive an e-mail confirmation that the file has been uploaded a few days later, and an explanation of whether the data in the file comply with TEAM minimum data standards.

The TEAM remote sensing specialist will evaluate the data only if the data comply with TEAM minimum standards. She or he will communicate within 7 days of acceptance of the file and approve or reject the spatial data. If the spatial data are approved, then the points just deployed can be used for subsequent sampling. Otherwise, the TEAM remote sensing specialist will discuss with the site manager the problems with the spatial data, and whether a new field trip is required to re-establish and geo-reference camera trap points.

### 4.5 Data Retrieval and Subsequent Redeployment of Camera Traps

After the first-deployed camera traps have been in the field for at least 30 days, the data (photographs) need to be retrieved and the camera traps moved to new camera trap points if points still remain to be sampled in the season. Remember that in the first year a total of 60 camera trap points need to be sampled for a minimum of 30 days each. Because the number of camera traps at each site is usually between 20 and 30, the camera traps need to be deployed at one set of points, left there for 30 days, moved to the remaining set of points, and left there for another 30 days.

At some TEAM sites it might be possible to retrieve the memory cards, replace the batteries, insert fresh memory cards, and relocate the camera traps without having to return to the permanent base camp or laboratory. At other sites, the field crew might have to bring back all camera traps to the laboratory before redeploying to the remaining set of camera trap points. The site manager can adjust the steps below depending on whether the field crew is expected to return to the laboratory after pickup and before redeployment. However, it is important to minimize the time between picking up the camera traps and redeploying them to a new set of points because all sampling needs to occur within the same dry season, otherwise the sampling period will include dry and wet seasons, which can affect the number of photographs being taken and the quality and comparability of the data with other TEAM sites.

Follow the steps below if the camera traps are to be redeployed almost immediately without their being returned to the field station or permanent base

camp. Otherwise, steps 1 and 2 in Section 4.5.1, “Preparations for the data retrieval and redeployment trip” and all steps in Section 4.8, “Redeployment of Camera Traps in the Field” can occur in the base camp before redeployment.

**Before you go to the field...**

4.5.1 Preparations for the data retrieval and redeployment trip

1. **Charge the new batteries.** Using Section 4.2.1 as a guide, charge and bring fresh type “C” rechargeable NiMH batteries to replace the ones that have been in the field (a few more than six times the number of camera traps deployed to have some extras). Allow 24 hours to charge the batteries before traveling to the field.
2. **Prepare fresh memory cards.** Bring new memory cards to insert into the cameras to replace the ones that will be retrieved. Before traveling to the field, make sure each memory card is empty by inserting it into a card-reader drive connected to a computer (any USB drive compatible with the memory card; see Section 8, Equipment List). Pack the memory cards in their original plastic cases to avoid soiling. If the original cases are not available, bring one small, zipper-like plastic bag for each memory card.
3. **Keys for the cable locks.** Bring all the keys to unlock the cable locks securing the camera traps in the field.
4. **Six to 12 type “C” alkaline batteries.** Bring some alkaline batteries in case a camera needs to be reprogrammed or reset. Do not use the fresh rechargeable batteries for this to avoid using any of their energy.
5. **Replacement camera trap.** Bring an extra camera trap in case some have been stolen from the field or need to be replaced because of malfunction. Follow the calibration and preparation steps in Sections 4.2.1 to 4.2.3 before taking it to the field.
6. **Small whiteboard and erasable markers.** This is crucial for testing the camera trap and documenting the end of the 30-day sampling period.
7. **Bring the following forms:**
  - a. The *Camera Trap Form* that was filled out when the cameras in the array were deployed a month ago. This form should already have the first 6 columns filled in. Fill in the remaining columns when the camera traps are picked up in the field.
  - b. A new blank *Camera Trap Form*, which will need to be filled in when the cameras are redeployed to new locations.
  - c. A new *Camera Trap Points Form* if camera points need to be relocated in the field.
  - d. A blank *Damaged Camera Trap Form* to log information about camera traps that malfunction.
  - e. A blank *Camera Trap Checklist* to recheck and recalibrate the equipment before camera traps are redeployed to new locations.
8. **Take blank aluminum tags for new camera trap points.** Take a few blank aluminum tags in case camera trap points need to be relocated. Use them to mark the location of the new camera trap point.
9. **Pack in a small water canteen and a small towel.** To avoid damaging the contacts of memory cards when picking them up in the field, each crew

member should pack a water canteen with a small clean towel and use them to clean their hands before handling memory cards.

#### 4.5.2 Picking up the camera traps and memory cards

To ensure each camera trap is sampled for at least 30 days, the field team must plan to return to each camera trap point to retrieve the memory cards and the camera traps. Follow the steps below to ensure all information is collected in a standardized way.

1. **Locate and examine the camera trap.** Upon reaching the location where the camera trap was installed, examine it without getting in its line of vision (e.g., from one side) and look for obvious signs of external damage.
  - a. If the camera is missing write YES in the Camera missing? column and NA in the Camera working?, Case damage?, Camera damage?, and Card Damage? columns (*Camera Trap Form*). If the camera is not missing write NO in the Camera missing? column (same form).
  - b. If the case appears damaged write down YES in the Case damage? column (*Camera Trap Form*), otherwise write NO.
  - c. If a tree has fallen in the path of vision of the camera trap and it will be difficult to easily remove the camera trap from the line of vision (e.g., without using a saw) then **this camera trap point will need to be moved**. Do not do this now. Instead, write YES in the column point needs to be moved? (*Camera Trap Form*). Explain the reason in the Notes column (same form). Complete all the steps below and do not worry about moving the camera trap point now. This will occur the next time this point is visited for subsequent redeployment next year (see Section 6.2).
2. **Prepare the whiteboard for the test/end photograph.** Take out the whiteboard and follow the steps outlined in Section 4.3.3, Point #8. The whiteboard needs to be properly labeled with the camera trap point ID, date, time, and first and last name of the camera trap field crew leader.
3. **Take a test/end of sampling period photograph.** Position yourself about 2 meters in front of the camera trap holding up the previously labeled whiteboard. **Watch to see whether or not the camera takes a photo** (i.e., watch for the lens opening and closing).
  - a. **If the camera does NOT take a picture**, write NO in the column Camera working? (*Camera Trap Form*). At the end of the day (or back in the field station), follow the steps in Section 4.6 to determine the possible cause of the camera malfunction.
  - b. **If the camera DOES take a picture**, write YES in the column Camera working? (*Camera Trap Form*).
  - c. Write the year, month, day, hour, and minute corresponding to the End Date column (*Camera Trap Form*). These values should be the same as those written on the whiteboard.
  - d. Write down the first name and last name of the person responsible for picking up the camera (i.e., the field crew leader) in the First

Name and Last Name—Person picking up the camera columns (*Camera Trap Form*). These values should be the same as those written on the whiteboard.

4. **Dismount the camera from the tree.** Unlock the cable and dismount the camera from the tree. The camera might take a photo while doing this. Do not worry about this.
5. **Clean your hands.** Before opening the camera trap and handling any memory cards clean and dry your hands thoroughly using water and a towel to avoid damaging the contacts of the memory card.
6. **Open the camera trap case.** Open the camera trap and turn the ON/OFF switch to OFF.
7. **Retrieve the memory card.** Make sure the camera trap is OFF. Pull out the memory card from its slot in the front of the case.
8. **Store the memory card in the appropriate case/bag.** Store the memory card in the corresponding plastic case previously labeled with the camera trap point ID for that particular camera trap point (e.g., CT-MN-2-04). Double check that the memory card has been stored in the correct case by comparing the **camera trap point unit ID written on the case** with the **camera trap point unit ID written on the aluminum tag at the camera trap point**. If plastic cases for the memory cards are not available, place the card in a pre-labeled, plastic zipper-type bag. You may have dozens of memory cards from 20–30 different camera trap points and it is vital to know precisely which memory card corresponds to which camera trap point.
9. **Close the camera trap case.** Replace the front cover of the camera trap. Properly pack the camera trap in a bag and go to the next sampling point. Repeat the entire process outlined in Section 4.5.2 until the last camera trap of the day has been picked up.

#### **4.6 Equipment Examination**

At the end of each day in the field, or if all the camera traps are returned to the main field station or laboratory, examine the camera traps that are believed to be defective and prepare the equipment for redeployment to points that have not yet been sampled. Use the following steps to ensure that by the time the last camera trap is picked up from the current sampling array, most of the equipment will be ready to be redeployed to a new sampling array.

1. **Separate functioning camera traps from defective camera traps.** Using the results of the photo test at the time of retrieval, separate the camera traps **THAT DO NOT WORK** from the camera traps **THAT DO WORK**.
2. **For the cameras that DO NOT WORK:**

- a. Open the camera trap and replace the rechargeable type “C” batteries in the camera with six regular type “C” batteries. Insert a blank or test memory card. Re-arm the camera trap (**Main Menu/Arm Camera**).
- b. Test the camera trap by walking in front of it. If the camera triggers, open the camera trap and check the display status to make sure the camera took a photo. This means the batteries the camera was running on while in the field were depleted.
- c. If after following Steps a and b above the camera trap does not take a photo, the trap needs to be replaced with a new unit. Fill in all the columns in the *Damaged Camera Trap Form*.
- d. Examine the camera trap externally and internally looking for signs of damage (cracks, loose seals, water, etc.). Write down anything unusual in the Notes column of the *Damaged Camera Trap Form*.
- e. If new batteries and a memory card were inserted in the camera trap, take them out.
- f. Take this camera trap back when returning to the permanent base. Instructions on what to do with these damaged cameras appear below.

**3. For cameras that DO WORK:**

- a. Open the camera trap and take out the rechargeable type “C” batteries.
- b. Check the camera trap and camera for any external damage. Write down YES or NO in the column Case damage? as appropriate (*Damaged Camera Trap Form*). If the case appears to be damaged, describe it briefly in the Notes column (*Damaged Camera Trap Form*). If the damage is major (e.g., a large crack) such that water may seep into the camera trap, it needs to be repaired right away (Section 4.2.3) or taken back to the laboratory and repaired there. In the latter case, replace the camera trap with a spare one. Fill in the column Case damage? in the *Camera Trap Form*.
- c. If the case is not damaged, make sure the ON/OFF switch (control unit and sensor) is turned OFF.
- d. Store the camera traps in a dry place until redeployment. If the camera traps are not being taken back to the laboratory or permanent base before being redeployed in the field, store them closed in the coolest and driest place available in the temporary base camp.

**4.7 Equipment Recalibration**

**Before you go to the field...**

Once all camera traps have been collected from a particular sampling array and examined, they need to be moved to the next sampling array. Before the camera traps are redeployed in the field cameras need to be recalibrated, with new batteries and memory cards installed. Depending on logistical conditions at the TEAM site, this step may occur in a temporary camp in the field before the cameras are redeployed to another sampling array or at the permanent laboratory

or field station. In both cases, follow the steps below to ensure this process is standardized.

**Field Forms needed:** A blank copy of the *Camera Trap Checklist* form.

All camera traps need to be refitted with new batteries and memory cards and rechecked at least 24 hours before field deployment. A new *Camera Trap Checklist* form needs to be filled out and the field deployment crew leader (and site manager if this happens at the permanent laboratory or field station) must sign the list before the camera traps can be redeployed. Make sure to follow the requirements in the following sections:

1. Follow Steps 1 and 3–10 in “Preparation of the camera trap” (Section 4.2.2). If a new camera trap is being used to replace a missing or malfunctioning one, be sure to follow Step 2 as well.
2. “Case inspection” (Section 4.2.3).
3. “Final review of settings and paperwork” (Section 4.2.4).

The camera trap settings should not change from one field deployment to the next within the same sampling year. It is important to make sure all the equipment has the same settings to ensure data standardization.

#### **4.8 Redeployment of Camera Traps in the Field**

Before returning to the field the crew should meet to review the deployment plan for the remaining camera trap points that need to be established and geo-referenced. Follow the guidelines in Section 4.2.6.

Follow the exact same guidelines in Section 4.3 under “Field Trip to Establish and Geo-reference Camera Trap Points.”

##### **4.8.1 Return to the laboratory/permanent base camp**

After all camera traps have been redeployed, the field crew will return to the laboratory or permanent base camp. Upon return, process all the memory cards that were collected from the first deployment. The next section explains how to accomplish this. All camera traps that were found damaged need to be given to the site manager in conjunction with the *Damaged Camera Trap Form*. If the camera trap is still under guarantee, the site manager must mail it back to the manufacturer for a replacement (see the Reconyx manual in Appendix A5). If the camera is not under guarantee, then the site manager will need to order a replacement and include that cost in the budget for next year.

#### **4.9 Processing and Uploading of Spatial Data**

Following the guidelines outlined in Sections 4.4.1 and 4.4.2, transcribe all the new spatial information for the camera trap points that were just deployed and upload it to the TEAM data repository for proper technical evaluation. As described before, a TEAM remote sensing specialist will approve or reject the points within 7 days of uploading. If points are rejected, these points will need to

be re-established the next time camera traps are deployed. If the points are accepted then camera traps can be deployed at these points the next field season.

#### **4.10 Processing and Uploading Data from a 30-Day Deployment Cycle**

**Data  
entry/upload**

All photos and data from the 30-day camera trap deployment cycle need to be processed and uploaded to the TEAM Web site (<http://www.teamnetworkdata.org>) **within 7 days of returning from the field. Do not wait until all the sampling for the season has been completed.** Follow the steps below to ensure this occurs in a standardized and efficient fashion. This process is outlined in Figure 5.

##### **Excel templates needed for this process:**

1. *Camera Trap Excel Template* to transcribe all information on the *Camera Trap form*.
2. *Photo Data Excel Template* to transcribe all information from photos taken by the camera traps in the field.
3. *Damaged Camera Trap Excel Template* to transcribe all information on the *Damaged Camera Trap Form*.

All Excel templates are included in different tabs (or worksheets) within the same Excel template file. The current English version of the Excel template file is named “CT-ET-EN-3.0.xls” and can be downloaded directly from the TEAM Web site. Refer to the Data Management Protocol at the TEAM Web site for an explanation of the naming conventions of the TEAM Excel templates.

##### 4.10.1 Transcribe the data from the Camera Trap Form

**Data  
entry/upload**

Follow these steps to transcribe all the data from the *Camera Trap Form* to the *Camera Trap Excel File*.

1. **Open a copy of the *Camera Trap Excel Template*.** Open the computer file “CT-ET-EN-3.0.xls.” It should contain no data. Navigate to the *Camera Trap Worksheet* (or tab).
2. **Save this template as a new *Camera Trap Excel File*.** Save the file with a new name using “Save As.” The name of the file should follow TEAM standard convention:

**Site name–CT–From date\_To date–NEW.xls**



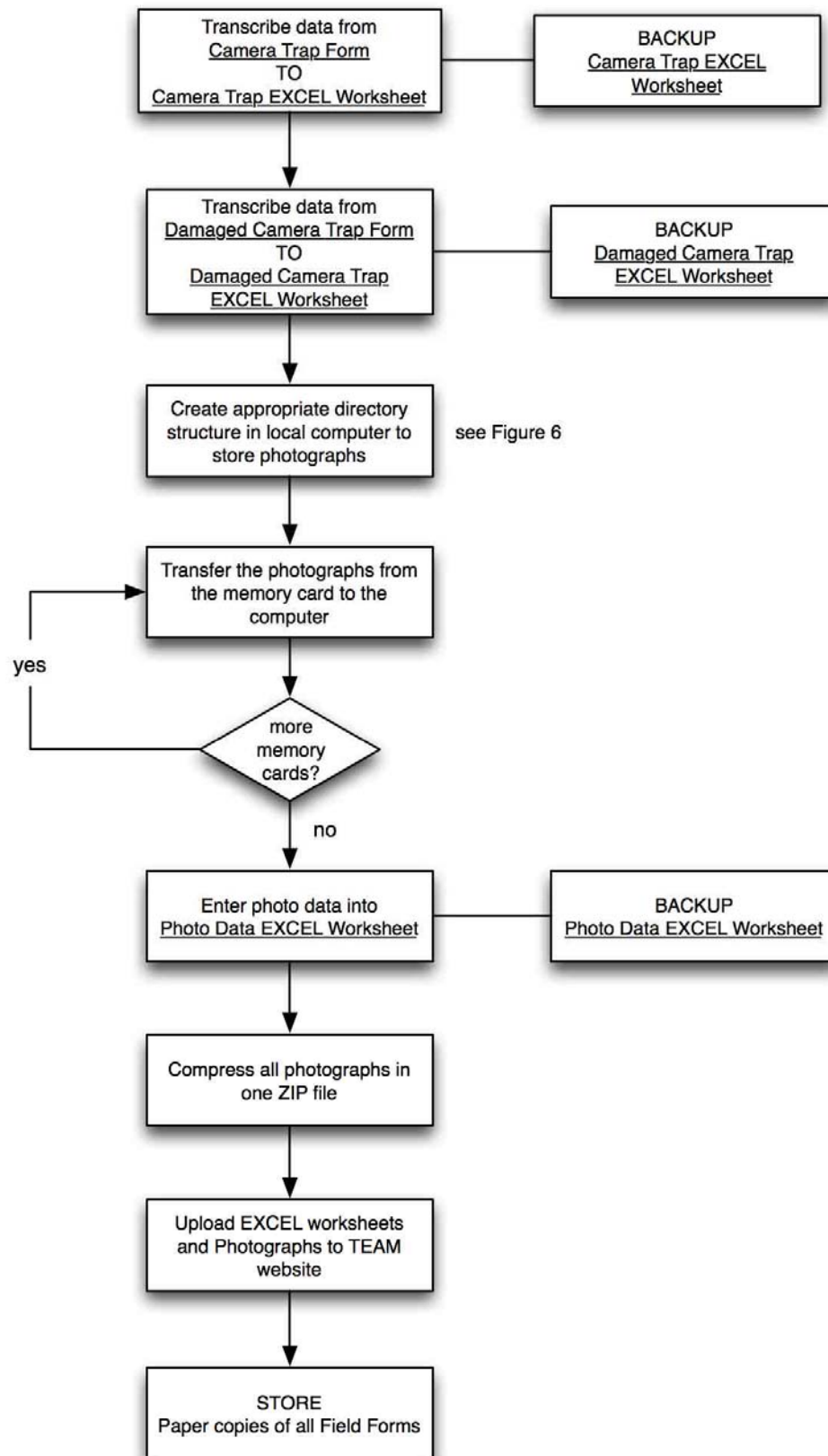


Figure 5. Workflow illustrating data processing, transcription and upload.

Use the two-letter abbreviation for the TEAM site, the two-letter abbreviation for the protocol name (CT stands for the Terrestrial Vertebrate Protocol), the **from date** in ISO format (yyyy-mm-dd), the **to date** (yyyy-mm-dd), the word NEW (means this is a new file), and the extension (xls).

**Example:** A file from Manaus, with Terrestrial Vertebrate data collected between January 1 and January 30, 2007, should have the following name: MN-CT-2007-01-01\_2007-01-30-NEW.xls

3. **Transcribe the data.** Transcribe all the information from the *Camera Trap Form* to the *Camera Trap Worksheet* in the *Camera Trap Excel File*, row by row (record by record). Make sure all the values in each of the columns follow the Standard Data Dictionary for this form (the data dictionary for the Terrestrial Vertebrate Monitoring Protocol is available at the TEAM Web site). Save the file **every time** a new record is entered (by doing so only one record will be lost if a power failure occurs).
4. **Make a backup copy.** When all information has been entered (or at the end of the day), make a backup copy of the file (ideally, on an external, removable hard drive). Store this hard-drive file in a location other than on the computer.

#### 4.10.2 Transcribe the data from the Damaged Camera Trap Form

**Data  
entry/upload**

If malfunctioning camera traps or camera traps with damaged cases/seals were returned from the field, transcribe all information from the *Damaged Camera Trap Form* (Section 4.6) into the current *Camera Trap Excel File*:

1. **Open the file.** Open the current *Camera Trap Excel File* being used to store the information for this sampling cycle.
2. **Transcribe the data.** Navigate to the *Damaged Camera Trap Worksheet* in the file and enter the information row by row (record by record). Make sure all the values in each column follow the standard data dictionary for this form.
3. **Save the file frequently.** Save the file **every time** a new record is entered (by doing so only one record will be lost if a power failure occurs).
4. **Make a backup copy.** When all information has been entered (or at the end of the day), make a backup copy of the file (ideally, on an external, removable hard drive). Store this hard-drive file in a location other than on the computer.

#### 4.10.3 Create the appropriate computer directory structure to store the photographs

**Data  
entry/upload**

Create a directory structure (a series of folders and subfolders nested in a particular way) before transferring photographs from the memory cards to the

computer so that photographs from each camera trap point at each sampling period can be easily found. Follow the steps below to ensure this directory structure is standardized.

1. **Create a folder for the sampling period.** In the folder where the data from the Terrestrial Vertebrate Protocol are usually stored, create a folder with the name of the sampling period. Because the Terrestrial Vertebrate Protocol happens only once a year, the name of this folder should be the year the sampling took place (e.g., 2007).
2. **Create a subfolder for the camera trap array number.** Inside the sampling period folder create a folder named “Array,” followed by the corresponding camera trap array number sampled (e.g., Array 1).
3. **Create subfolders for the camera trap points IDs.** Inside the Array number folder, create folders named for each camera trap point. For example, folders that will contain photographs from camera trap points 1, 2, and 3 from sampling array 1 in Manaus will be named “CT-MN-1-01,” “CT-MN-1-02,” and “CT-MN-1-03,” respectively.

Figure 6 illustrates this folder hierarchy and shows how the photographs should be stored. **It is intended to serve only as an example.** Use the appropriate abbreviations and numbers depending on the year of sampling and TEAM site.

#### 4.10.4 Transfer the photographs from the memory card to the computer

### Data entry/upload

Gather all the memory cards that were brought back from the field and put them in an open box or container. Label this box “Cards not transferred.” The memory cards should be individually packed in premarked plastic cases or plastic bags with the camera trap point ID from which they came. Label another box or container (it should be empty at this point) “Cards transferred.”

1. **Connect a card reader to the computer.** Connect a card reader capable of reading Compact Flash (CF) cards to the USB port in the computer (see Section 8, Equipment List).
2. **Take a memory card with its case from the “Cards not transferred” box.** Notice the camera trap point ID written down in the case or bag where the card is stored. This camera trap point ID will be needed when transferring the files to the computer. Open the case (or bag) and take out the card. Do not open other cases/bags at the same time to minimize the risk of mixing up cards from different camera trap points.
3. **Insert the memory card in the card reader.** Insert the memory card with the metal contacts facing in and down. Pay attention to the orientation of the card; the contact side should be oriented downward.

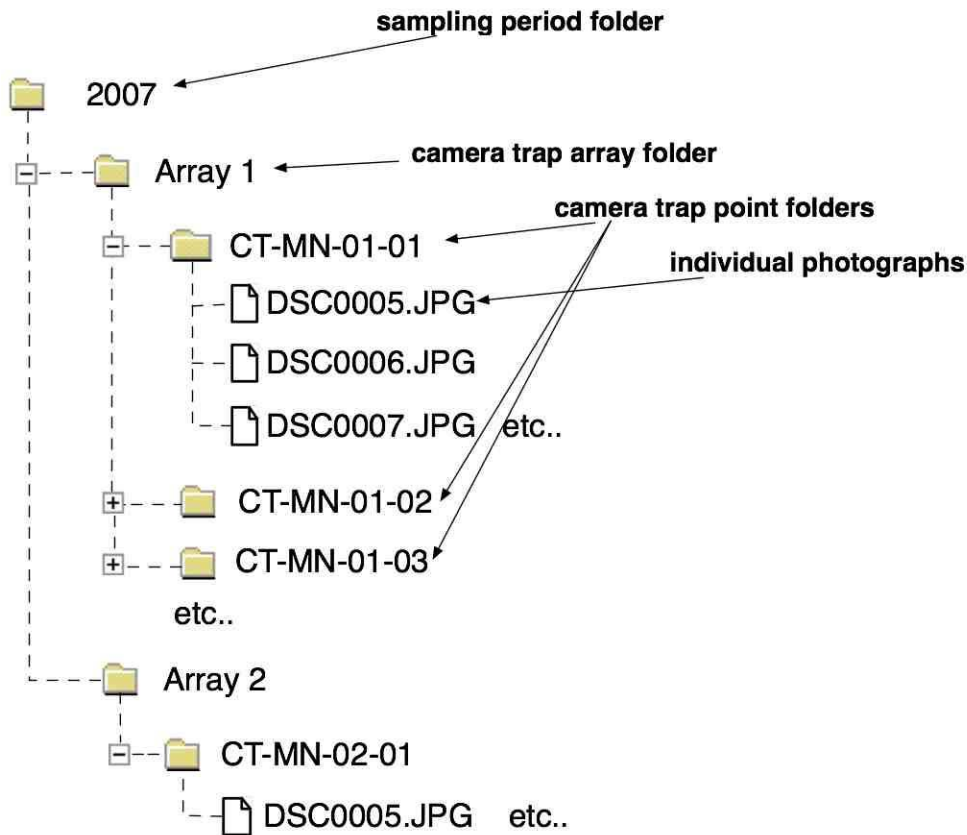


Figure 6. Example of the directory structure created when storing the photos in the computer. The top level is the sampling period folder, the next level is the camera trap array folder, inside these are the camera trap point folders, and inside each of these are the individual photograph files.

4. **Examine the contents of the memory card.** Once the memory card has been properly mounted and read by the computer double-click on the appropriate drive letter to examine the contents of the memory card. Files will have names such as DSC0001.JPG, DSC0002.JPG, etc. Open one or two of these files to make sure these are photographs from the camera trap. **If files do not appear**, the memory card might have been damaged or erased. Follow these steps to determine the problem:
  - a. Remove the card reader from the computer by using the “Safely Remove Hardware” command in Windows.
  - b. Reconnect the card reader to the computer and repeat Steps 3 and 4 above.
  - c. If the contents of the memory card still cannot be examined repeat Step a) above. Go to the next step.
  - d. Find a spare camera trap. Insert the memory card in that camera and take 2–3 photographs with the camera trap and verify they have been stored in the memory. If they have not, the card is damaged. Go to Step g).

- e. If photographs are not visible, there might be a problem with the card reader. Find another card reader. Start again from Step 3 above.
  - f. Open the *Camera Trap Excel File* used for this 30-day sampling cycle. Navigate to the *Camera Trap Worksheet*, and enter YES in the column Card Damage in the appropriate row for this card. Save the file.
  - g. If the memory card is damaged, write down “Damaged” on the front side of the card. Return it to the case it came from and store it in a different box labeled “Damaged Memory Cards” to minimize the risk of taking it back to the field and losing valuable information.
5. **Copy the files from the memory card to the computer.** Select all the photographs from the memory card and copy them into the folder labeled with the same name as the camera trap point ID written on the case or bag. **Be careful! Do not risk mixing up photographs from different camera trap points.**
  6. **Remove the memory card.** Once all photographs have been copied from the card, use Windows Explorer and select the USB drive that corresponds to the memory card. Right click on it and select “Eject” to safely remove the card. **Do not yet erase the photographs from the card.**
  7. **Place the memory card back in its case.** After ejecting the card, IMMEDIATELY return it to the case (or bag) from which it came and drop it in the “Cards Transferred” box.
  8. **Process another memory card.** Repeat Steps 1 through 7 in this section until all photographs from all cards have been transferred to the computer and the “Cards Not Transferred” box is empty. When finished (or at the end of the day) make a backup copy of the entire folder containing all photographs from all camera trap points in a separate drive (ideally, a removable hard drive). Store this drive securely in a place other than where the computer is housed.

#### 4.10.5 Process the photographs

### Data entry/upload

At this point all photographs should be stored in computer folders that correspond to their camera trap point ID. Several pieces of information now need to be extracted from each photograph and stored in the *Photo Data Worksheet* in the *Camera Trap Data Excel File*. Follow the steps below to ensure that photographs are processed correctly with all necessary information.

1. **Open the Excel file.** Open the current *Camera Trap Excel File* used to store all information for this 30-day sampling cycle. Go to the worksheet labeled *Photo Data*.
2. **Locate and open a camera trap point folder.** Open the sampling period folder (e.g., 2007) and choose the next subfolder in the list (e.g., CT-CX-

01-01) and open it. It should contain all the photographs that were taken at that camera trap point for the 30-day period. Enter the name of the sampling period (e.g., 2007) in the Sampling Period column and the Point ID in the Point ID column in the *Photo Data Worksheet*. All photographs from this folder should have the same sampling period and camera trap point ID.

**Data  
entry/upload**

3. **Order the photographs by date.** Using Windows Explorer, make sure the photographs are ordered by date from the earliest to the latest.
4. **Start entering data.** Follow these steps:
  - a. **Open a photograph file.** Open the next photograph in the list (if not the first one).
  - b. **Enter date and time.** The bottom right of the photograph contains the date and time the photo was taken. Separately enter the year, month, day, hour, and minute when the photograph was taken in the columns year, month, day, hour, and minute in the *Photo Data Worksheet*.
  - c. **Enter the name of the file.** Enter the name of the photograph file (e.g., DSC0005.JPG). Enter this name in the Raw Filename column in the *Photo Data Worksheet*. The next column (TEAM Filename) will be completed automatically.
  - d. **Identify what is on the photograph.** If the photograph contains the image of an animal identify it to genus and species. The Excel spreadsheet will have a drop-down list of all mammal and bird genera and species following the taxonomy given by *Mammals Species of the World* by Wilson and Reeder (2004) (<http://nrmhgoph.si.edu/msw/>) and *The Sibley/Monroe World List of Bird Names* by Monroe and Sibley (1997) (<http://www.ornitaxa.com/SM/SMOrg/sibley4.html>). Select the appropriate genus and species in the genus and species columns in the *Photo Data Worksheet*. If the animal can be identified to the subspecies, include the subspecies name with the species name in the same column. The next column in the worksheet (binomial) will be completed automatically. Follow these rules to ensure consistency in how this information is entered:
    - i. **If a photograph contains more than one animal**, fill in the column number with the number of animals the image contains.
    - ii. **If a photograph contains more than one species of animal** (this happens very rarely), complete a separate row of data for each species. All the data will be identical EXCEPT for the genus, species, and possibly number.
    - iii. **If the photograph is a test** to position the camera trap, for example, enter the word TEST in both the genus and species columns.
    - iv. **If the photograph contains the whiteboard with the start of the sampling cycle information**, enter the word START in both the genus and species columns.

- v. **If the photograph contains the whiteboard with the end of the sampling cycle information**, enter the word END in both the genus and species columns.
  - vi. **If the photograph is of a human** other than a field crew member (e.g., a hunter) enter **Homo** and **sapiens** in the genus and species columns.
  - vii. **If the photograph contains nothing** (sometimes a camera will take a photo in response to moving vegetation, a falling branch, or a bird quickly flying by), enter BLANK in both the genus and species columns.
  - e. **Enter the name of the person identifying the photograph.** Type in the first name and the last name of the person who identified the animal in the photograph in the First Name and Last Name columns in the *Photo Data Worksheet*.
  - f. **Save the file.** Save the file after entering each record (a row). By doing so only one record will be lost if a power failure occurs.
  - g. **Repeat steps a through g in this section** until the information for each photograph taken at this camera trap point has been entered. Start again at Step 2 (open the folder for a new camera trap point) and again follow all substeps in Step 4.
5. **Make a backup copy.** After entering all information (or at the end of the day), make a backup copy of the file other than on the current computer (ideally, an external, removable hard drive). Store the hard drive in a different location than the computer.

#### 4.10.6 Upload the information to the TEAM Web site

#### Data entry/upload

Once all data for a 30-day sampling cycle have been entered in the computer, these files (Excel templates and photographs) must be uploaded to the TEAM Web site. **Data must be uploaded to the TEAM Web site no later than 7 days after returning from a field assignment.**

1. **Prepare the information.** The following two files will need to be uploaded:
  - a. **The Camera Trap Excel file for a specific 30-day sampling cycle.** This includes four worksheets: *Camera Trap Data*, *Photo Data*, *Damaged Camera Traps*, and *Camera Trap Point Data*.
  - b. **A compressed file with all photographs that were taken during the same 30-day sampling cycle.** Using a file compressing utility (such as WinZip, <http://www.winzip.com>) compress the folder containing all the photographs for that sampling cycle (e.g., folder Array 1 in folder 2007). This will create a much smaller file that can be easily uploaded through the Internet. The compressed file will also preserve the directory structure so that when it is decompressed, the original folder, its subfolders (each with the camera trap point ID), and the photographs in each subfolder will be recreated exactly.
2. **Name these files using the TEAM standard convention.** Use the convention outlined in the TEAM Data Management Protocol to name these two files:

- a. **Camera Trap Excel Template file.** *Site abbreviation–Protocol abbreviation–Start date\_End date–NEW.xls.* For example, a file containing data from Manaus collected from July 1 to July 31, 2006, should be named **MN-CT-2006-07-01\_2006-07-31-NEW.xls.**
  - b. **Compressed file with photographs.** *Site abbreviation–Protocol abbreviation–Start date\_End date-PHOTOS.zip.* For example, a file containing all photographs from Manaus collected from July 1 to July 31, 2006, should be named **MN-CT-2006-07-01\_2006-07-31-PHOTOS.zip.**
3. **Upload files to the TEAM data repository.** Point the browser to the TEAM data repository Web site (<http://www.teamnetworkdata.org>), log in, and follow the instructions to upload each file. You will receive a confirmation e-mail.

#### 4.10.7 Backup and store all field forms

**TEAM  
Administrative  
step**

After all data have been transcribed and uploaded make copies of all paper field forms and store them in a folder labeled with the name of the sampling period (e.g., TEAM Terrestrial Vertebrate Protocol—2007). Store the originals and copies in different places (preferably in different buildings).

### **4.11 Last Field Trip of the Season and Camera Storage**

**Before you go  
to the field...**

Before the end of the last sampling cycle (30 days) of the season, plan one last field trip to return the camera traps and the memory cards to the laboratory or permanent base where the equipment is stored when not in use. The camera traps will not be redeployed in the field until the next dry season. Follow the guidelines in this section to ensure equipment receives proper care when not in use.

#### 4.11.1 Preparations for the last field trip of the season

Take no fresh batteries or memory cards on the last field trip. Follow steps 3, 4, 6, 7 and 9 in Section 4.5.1, “Preparations for the data retrieval and redeployment trip”. Follow Step 7, but do not bring blank *Camera Trap Forms* or *Camera Trap Point Forms*; you will not need them.

#### 4.11.2 Picking up the camera traps and memory cards for the last time in the season

Follow the guidelines in Section 4.5.2 (“Picking up the camera traps and memory cards”). When all camera traps have been collected, bring them back to the laboratory or permanent base where equipment is stored. See the section that follows for checkup and final storage of the equipment.

#### 4.11.3 Equipment check-in

**TEAM  
Administrative  
step**

When camera traps have been returned to the laboratory or permanent base, they need to be checked and cleaned before storage. Follow the steps in Section 4.6



(“Equipment examination”) to separate working cameras from nonworking camera traps. Fill in the *Damaged Camera Trap Form* and give it to the site manager so that these cameras can be repaired or replaced before the next sampling season.

#### 4.11.4 Camera storage

All camera traps that are in proper working condition must be cleaned and stored in a dry place until they are needed again. Follow the steps below:

1. **Remove batteries.** Check again and remove any remaining type “C” batteries in the camera.
2. **Discharge the rechargeable batteries.** Discharge all rechargeable type “C” batteries using the discharge mode in the battery charger. This is essential to prolong battery life while the batteries are stored.
3. **Store the batteries.** If the batteries did not come with their own plastic case, store them in a zipper-like, re-sealable plastic bag. Write the beginning storage date on the bag. Store the rechargeable “C” batteries in a cold and dry place (an air conditioned room or a 4°C refrigerator are preferable).
4. **Clean the cameras traps.** Open the front cover and clean the interior of the camera trap with a dry rag (do not use a wet or damp cloth) making sure to remove all debris (dry leaves, dust, etc.). Clean the outside lens cover of the case, the cover of the sensor, and the flash cover. If any of these covers is too dirty to clean with a dry rag, use a barely damp cloth to remove the dirt. Make sure to thoroughly dry these parts afterward.
5. **Check the seals.** Replace the front cover of the camera trap making sure it gives some resistance. If it closes easily, inspect the seals to make sure they are not wasted or run down. If they are, apply a thin layer of silicone rubber around the edge of the camera trap case to improve sealing. Do not close the case until the silicone rubber is dry (~12 hours).
6. **Store the camera traps.** Place a moisture control packet inside each camera trap and replace the front cover. Store the camera traps in an air conditioned room, a dry closet, or an airtight container. The moisture control packets do not need to be oven-dried or put in the microwave.

## 5 POWER ANALYSIS TO DEFINE SAMPLE SIZE

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After all data from the first field season have been collected and uploaded to the TEAM data repository, the TEAM Terrestrial Vertebrate Protocol manager will determine whether the initial number of camera trap points (60) is enough to detect the minimum level of change in the terrestrial vertebrate community required by the TEAM network (Figure 1). The TEAM Terrestrial Vertebrate Protocol

manager will produce a report showing the results from this analysis 15 days after receiving the data.

If the report determines that the initial number of camera trap points is enough, then deployment of the protocol in subsequent years will continue using 60 camera trap points. If the report determines the number of camera traps is insufficient, then additional camera traps points will need to be established at the site at the beginning of the next sampling period. In this case, with data from the power analysis report, the site manager will need to prepare a deployment plan for these new points using the same guidelines from the first-year deployment plan and submit it to TEAM Terrestrial Vertebrate Protocol manager at least 3 months before deployment to the field. Follow all the steps in Section 3.

## **6 PROTOCOL IMPLEMENTATION FOR SUBSEQUENT YEARS**

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The process of field deployment, data processing, and data upload for subsequent years of the TEAM Terrestrial Vertebrate Protocol is similar to the first-year implementation except for the following:

- No deployment plan needs to be submitted **UNLESS** additional points need to be deployed as detailed in the power analysis report submitted by TEAM Terrestrial Vertebrate Protocol manager.
- Because the camera trap points have already been located in the field, the process of establishing new camera trap points will be needed only if a point needs to be moved from its location from the previous season or if new camera trap points need to be established (see Section 5).
- Uploading spatial data from camera trap points is necessary only if a camera trap point is moved from its previous season location or if new camera trap points need to be established (see Section 5).

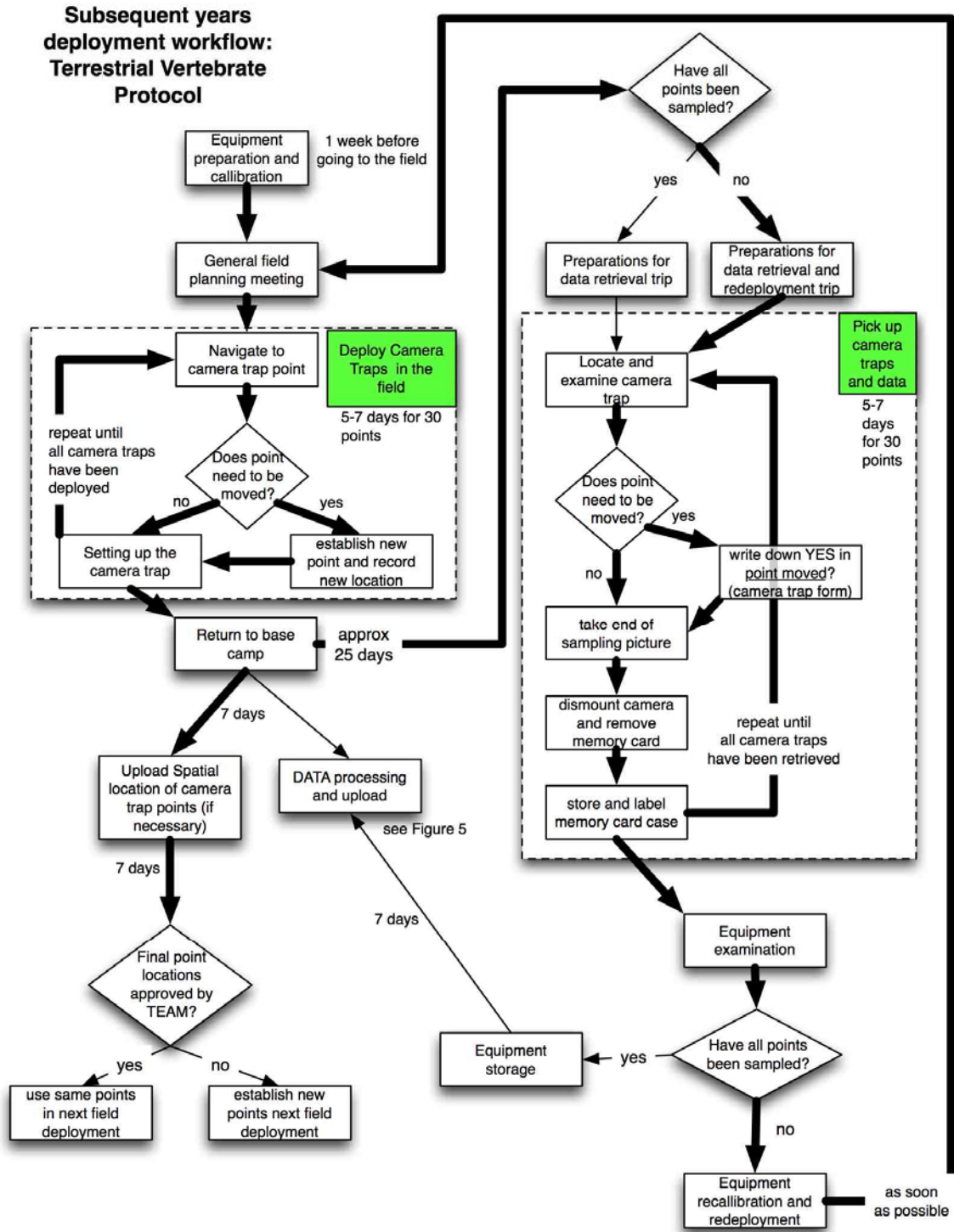


Figure 7. Workflow illustrating the main steps during subsequent years of deployment of the Terrestrial Vertebrate Protocol. The workflow moves from deployment of camera traps to pick-up and redeployment if necessary. The thick arrows show the main steps in the workflow during the first cycle of deployment and pickup of camera traps.

A detailed workflow for deployment of the TEAM Terrestrial Vertebrate Protocol in subsequent years appears in Figure 7. The main steps are described below with emphasis on the differences between deployments in the first year and subsequent years. The steps below assume that no new camera trap points are to be installed. If this is true, follow all the steps in Section 4.3 after a new deployment plan has been approved (Section 3).

### **6.1 Determine Whether Camera Trap Points Need to be Moved**

The site manager should examine the camera trap forms from last season and determine whether any Point needs to be moved? columns have been checked. The site manager should do this at least 3 months before the field crew expects to travel to the field.

**Before you go  
to the field...**

### **6.2 Equipment Preparation and Calibration**

Follow Section 4.2 with the following modification:

**If camera trap points need to be moved**, the following extra items need to be taken to the field:

- A blank *Camera Trap Point Form* to record information for the new points for the camera traps that need to be relocated, and
- A TEAM-approved GPS unit.

### **6.3 General Field-planning Meeting**

The crew leader should meet with the field technicians to plan the deployment of camera traps in the field. Because camera traps are being taken to points that have already been established, much less time and effort should be needed to deploy the camera traps. Nevertheless, follow the general guidelines in Section 4.2.6, recognizing differences in the effort and number of temporary camps needed to successfully deploy the camera traps. In general, the crew should aim to finish this process in 5–7 days of intensive field work.

### **6.4 Deployment of Camera Traps in the Field**

The crew should follow the guidelines outlined in Section 4.3.3, assuming the points do not need to be relocated. If the points need to be moved from their original established location follow these steps:

**Use of a GPS  
is required**

1. **Establish and geo-reference the new point.** Find a new location as close as possible to the original location and geo-reference it. Follow all the steps in Sections 4.3.1 and 4.3.2.
2. **Mark this point with a new camera trap point ID.** Use the old camera trap point ID, followed by a dot (".") and a sequential numeral. For example, if the camera trap point ID that needs to be relocated is CT-CX-3-23, then the new camera trap point ID will be CT-CX-3-23.1. If this camera trap point ID needs to be moved again in a future season, then keep increasing the number after the "." (e.g., CT-CX-3-23.2). Write this ID on

a blank aluminum tag and affix or nail it to the tree where the camera trap will be mounted.

3. **Fill in all the relevant information.** Fill in all the information in the *Camera Trap Point Field Form*. When returning from the field this information will need to be transcribed and uploaded to the TEAM data repository (even if it is only for one point).

#### **6.5 Return to the Base Camp**

When returning to the base camp, follow all the steps in Section 4.4. If new camera trap points were established, immediately transcribe the information from the *Camera Trap Point Field Form* to the *Camera Trap Point Excel Worksheet* and upload this information to the TEAM data repository (follow all steps in Section 4.4).

#### **6.6 Pick Up the Cameras and Redeploy to New Locations**

After camera traps have completed their sampling time (30 days) in the first set of points deployed, they need to be picked up, memory cards collected, and camera traps redeployed to the remaining set of points (if any). Follow all the steps in Sections 4.5, 4.6, 4.7, and 4.8.

#### **6.7 Data Processing and Upload**

**Data  
entry/upload**

Follow all steps in Section 4.10 to appropriately process the data from the first camera trap array and upload all data to the TEAM data repository. Do this as soon as memory cards return from the field to the laboratory. **Do not wait until all camera trap points have been sampled to process and upload the data.**

#### **6.8 Last Field Trip of the Season**

After the sampling time of the second (or third) camera trap array has been completed, plan a last field trip to pick up the camera traps and collect all memory cards. Follow Sections 4.11.1 and 4.11.2.

#### **6.9 Equipment Check-in and Storage**

Follow all steps in Sections 4.11.3 and 4.11.4 to check in and properly store all the equipment.

## 7 ROLES AND RESPONSIBILITIES IN THE TERRESTRIAL VERTEBRATE PROTOCOL

Role	Responsibilities
Site Manager	<ul style="list-style-type: none"> <li>• Prepare and submit deployment plan and sampling design</li> <li>• Assemble deployment crew</li> <li>• Approve equipment for field deployment</li> <li>• Upload spatial location of camera trap points</li> <li>• Maintain and oversee equipment</li> <li>• Upload data and photographs</li> <li>• Maintain backups for field forms and digital data</li> <li>• Prepare camera trap points that need to be moved</li> <li>• Supervise proper equipment check-in and storage</li> </ul>
Field Crew Leader	<ul style="list-style-type: none"> <li>• Supervise equipment preparation and calibration</li> <li>• Convey planning meetings before field deployment</li> <li>• Establish camera trap points</li> <li>• Record spatial location of camera trap points</li> <li>• Supervise setting up of camera traps in the field</li> <li>• Supervise and train technicians to transcribe data from field forms</li> <li>• Supervise and train technicians to examine and recalibrate equipment</li> </ul>
Technicians	<ul style="list-style-type: none"> <li>• Prepare and calibrate equipment</li> <li>• Complete camera trap checklist</li> <li>• Implement field work to establish, deploy, and collect camera traps</li> <li>• Transcribe information from field forms to Excel templates</li> <li>• Process photographs and transfer memory card data to computer</li> <li>• Create backups of all data (digital and paper)</li> <li>• Examine and recalibrate equipment</li> <li>• Adequately process damaged camera traps</li> <li>• Prepare camera traps for storage</li> </ul>
TEAM Regional Manager	<ul style="list-style-type: none"> <li>• Evaluate protocol implementation through periodic site visits</li> <li>• Ensure original field forms and backups are properly stored</li> <li>• Ensure all digital data are properly backed up</li> <li>• Answer questions about protocol implementation</li> <li>• Ensure data comply with TEAM minimum data standards</li> <li>• Ensure all TEAM personnel read and sign the TEAM Data Use Policy</li> </ul>
TEAM Remote Sensing Specialist	<ul style="list-style-type: none"> <li>• Evaluate deployment plan and sampling design</li> <li>• Evaluate all new camera trap points</li> </ul>
TEAM Information Systems Manager	<ul style="list-style-type: none"> <li>• Ensure data comply with TEAM minimum data standards</li> </ul>
TEAM Technical Director	<ul style="list-style-type: none"> <li>• Evaluate deployment plan and sampling design</li> <li>• Ensure consistent protocol implementation at the site</li> <li>• Revise protocol documents and communicate changes</li> <li>• Evaluate site changes in initial planned sampling schedules</li> </ul>

**8 EQUIPMENT LIST**

Item	Quantity	Manufacturer	Model	Supplier	Contact Info
Camera Trap	32	Reconyx	RM45	Reconyx	<a href="http://www.reconyx.com">http://www.reconyx.com</a>
Cable locks	30	Master Lock	Phyton	Reconyx	<a href="http://www.reconyx.com">http://www.reconyx.com</a>
Memory cards	60	SanDisk	1 GB Compact Flash	Flash Memory Store	<a href="http://www.flash-memory-store.com/">http://www.flash-memory-store.com/</a>
C NiMH batteries—20 pack	18	Total Energy	C NiMH 5000 mAH	Battery.com	<a href="http://www.all-battery.com">http://www.all-battery.com</a>
Battery charger	10	Vanson	BC1HU	Battery.com	<a href="http://www.all-battery.com">http://www.all-battery.com</a>
Card reader	2	SanDisk	Imagemate 12-in-1 USB reader	Flash Memory Store	<a href="http://www.flash-memory-store.com/">http://www.flash-memory-store.com/</a>
Aluminum tags (box)	2	Forestry Suppliers	79260	Forestry Suppliers	<a href="http://www.forestry-suppliers.com">http://www.forestry-suppliers.com</a>
Moisture control packets	60	Zorb-it	2-inch × 2-inch packets	Zorb-it	<a href="http://www.zorb-it.com">http://www.zorb-it.com</a>

## 9 GLOSSARY OF TERMS

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- **Camera trap.** A piece of equipment installed in the field to automatically take photographs of animals passing in front of it. The camera trap consists of the camera, a control unit, a sensor and a memory card.
- **Camera trap array.** A set of camera trap points (usually 20–30) distributed at a density of 1 camera trap every 2 km<sup>2</sup>. All camera traps in the array sample during the same 30-day period.
- **Camera trap checklist.** A paper form to check the status and maintenance records of camera traps before they are deployed in the field. A blank camera trap checklist appears in Appendix A2.
- **Camera trap Excel file.** A file in Microsoft Excel containing camera trap data that can include camera trap point data, camera trap metadata, photo data, and damaged camera trap data.
- **Camera trap Excel template.** A blank Excel file with predetermined worksheets and columns used to create camera trap Excel files.
- **Camera trap form.** A form used in the field to record camera trap data such as date and time the camera is set, camera trap number and serial number, name of person setting up the camera trap, etc. A blank camera trap form appears in Appendix A3.
- **Camera trap point.** A particular point in space (latitude and longitude) where the camera trap will be located during sampling.
- **Camera trap point form.** A form used in the field to record camera trap point information such as latitude and longitude of camera trap point, date and time the camera trap point was geo-referenced, who collected this information, with which equipment, etc. A blank camera trap point form appears in Appendix A1.
- **Camera trap point ID.** A unique code, assigned on the basis of a standard convention to a particular **camera trap point** (i.e., the location, **not** the camera trap itself). See Section 4.3.2 (and the Data Management Protocol) for the specific convention TEAM uses to label camera trap point IDs.
- **Control unit.** An electronic board with a small central processor unit that turns the camera on and off in response to a signal provided by the sensor. The control unit can be programmed by a user to specify the level of sensitivity to movement, the number of photographs the camera takes when it is activated, etc.
- **Damaged camera trap form.** A form used in the field to record information about damaged camera traps such as nature of the damage, camera trap serial number, etc. A blank damaged camera trap form appears in Appendix A4.
- **Deployment plan.** A plan describing when, where, and how the protocol will be implemented at a specific TEAM site. The plan must contain the proposed sampling design, including the proposed geo-spatial location of each camera trap array, potential locations of the camera trap points within each array, relevant geographic information system (GIS) layers (shape files) for each array (e.g., topography, access, water drainages), and a detailed chronogram of activities.



- **Field forms.** Paper forms used to collect information about camera traps and camera trap points. The Terrestrial Vertebrate Protocol uses four field forms: camera trap form, camera trap point form, damaged camera trap form, and camera trap checklist.
- **Memory card.** A small electronic card that stores the photographs taken by the camera. The memory card must be installed inside the camera or the camera will not record photographs; however, it can be temporarily removed from the camera so that photographs can be transferred to the TEAM Information Management System.
- **Motion sensor.** A small device mounted in front of and on the outside of the camera trap that detects movement within the area in front of the camera. Signals from the motion sensor travel to the control unit, which in turn, controls the camera.
- **Sampling cycle.** A period of 30 days during which a set of camera traps is active (sampling) in a given area.
- **Sampling design.** Refers to the number of camera traps (sample size), their locations (spatial distribution), the time of year and frequency of successive sampling periods (temporal distribution), and the length of time the cameras are deployed in the field during each sampling period (effort).
- **Sampling period.** A specified period of time (e.g., week, month, climatic season) during which all camera trap points are sampled. The TEAM Terrestrial Vertebrate Monitoring Protocol has only one sampling period per year (during the dry season, see below).

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# 11 APPENDIX A1. CAMERA TRAP POINT FORM

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Tropical Ecology Assessment and Monitoring Network  
Camera Trap Point FIELD FORM

Site ID: \_\_\_\_\_

Point ID	Latitude	Longitude	Date of reading yyyy/mm/dd	Person Taking the reading		GPS Make and Model	Number of Points	Notes
				First Name	Last Name			

## 12 APPENDIX A2. CAMERA TRAP CHECKLIST

Tropical Ecology Assessment and Monitoring Network  
Camera Trap CHECKLIST

Site: _____
Date (yyyy/mm.dd): _____
Name of Person checking: _____
Signature: _____

Camera Number	Camera Serial Number	Memory Card Serial Number	Is memory card empty?	Camera batteries FULLY charged?	Correct DATE and TIME?	Correct Camera Settings?	Case, Seals and Locking Bracket in good condition?	Zorb-it packet included?	Locks and keys marked and checked?	Notes

**13 APPENDIX A3. CAMERA TRAP FORM**

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Tropical Ecology Assessment and Monitoring Network  
Camera Trap FIELD FORM

Site ID: \_\_\_\_\_  
Sampling Period: \_\_\_\_\_

Point ID	Camera Trap Number	Camera Trap Serial Number	Memory Card Serial Number	START DATE yyyy/mm/dd	Name of Person Setting the Camera First & Last Name	Key number

Tropical Ecology Assessment and Monitoring Network  
Camera Trap FIELD FORM

Site ID: \_\_\_\_\_

Sampling Period: \_\_\_\_\_

END DATE	Name of Person Picking-up the Camera	Point ID	Fill these columns when picking up camera trap from the field					Notes	
			Camera working?	Camera missing?	Case damage?	Camera damage?	Card damage?		

**14 APPENDIX A4. DAMAGED CAMERA TRAP FORM**

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Tropical Ecology Assessment and Monitoring Network  
 Damaged Camera Trap FIELD FORM

Site ID: \_\_\_\_\_

Camera Trap Number	Camera Trap Serial Number	Date damage was noticed yyyy/mm/dd	Date of first deployment yyyy/mm/dd	Person reporting damage First & Last Name	Case damage?	Notes	Is Camera Firing?	Notes

Tropical Ecology Assessment and Monitoring Network  
Damaged Camera Trap FIELD FORM

Site ID: \_\_\_\_\_

Camera Trap Number	Camera Trap Serial Number	humidity inside camera?	Notes	Follow-up step	Additional Notes



## 15 APPENDIX A5. INSTRUCTION MANUAL FOR RECONYX RM45

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### RapidFire™ and RapidFire™ Professional Digital Infrared Camera Instruction Manual



**Table of Contents**

<b>I.</b>	<b>Camera Overview .....</b>	<b>1</b>
<b>II.</b>	<b>Battery &amp; Memory Card Installation .....</b>	<b>4</b>
<b>III.</b>	<b>Initial Setup &amp; Programming .....</b>	<b>9</b>
<b>IV.</b>	<b>Mounting &amp; Aiming Your Camera .....</b>	<b>15</b>
<b>V.</b>	<b>General Information .....</b>	<b>18</b>
<b>VI.</b>	<b>Troubleshooting.....</b>	<b>19</b>
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## **Camera Overview**

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Congratulations on purchasing a RECONYX camera. RECONYX has been the leader in digital wildlife cameras since 2003. Your RapidFire™ camera includes a state-of-the-art digital camera, an integrated Passive InfraRed (PIR) motion detector, and a night time infrared illuminator all contained in a secure, rugged, and weather-resistant case.

Whether you are using the camera for scouting deer or studying wildlife, you will quickly find that using the RapidFire™ camera in conjunction with MapView or BuckView software will be one of your most valuable tools in gathering and analyzing data.

Thank you for putting your trust in us!

### **Contents of this package**

1. RapidFire™ Game Camera & Software
  - RM45, RC55, or RC60
  - BuckView™ Image management softwareor RapidFire™ Professional Camera & Software
  - PM75, PC85, or PC90
  - MapView Image Management Software
2. Adjustable bungee cord for mounting camera.
3. This instruction manual.

## Camera Comparison

<b>Cameras &amp; Specifications</b>	<b>RC55 &amp; PC85</b>	<b>RM45 &amp; PM75</b>	<b>RC60 &amp; PC90</b>
<b>Images</b>	<i>Day:</i> 3.1 MP color images <i>Night:</i> 3.1 MP monochrome images	<i>Day and Night:</i> 1.3 MP monochrome images	<i>Day:</i> 3.1 MP color images <i>Night:</i> 3.1 MP monochrome images
<b>InstaOn™ Trigger Speed</b>	1/5 second	1/10 second	1/5 second
<b>RapidFire™ NearVideo™</b>	Up to 1 frame per second	Up to 2 frames per second	Up to 1 frames per second
<b>Capacity with 2 GB card</b>	3000 to 5,000 images	10,000 to 15,000 images	3000 to 5,000 images
<b>Range at night</b>	50 to 60 feet	50 to 60 feet	30 to 35 feet



## **BUCKVIEW™**

Included with your game camera (RM45, RC55, RC60) is BuckView mapping and image management software. BuckView offers you the ability to geographically organize and access your images, helping you to pattern and better understand animal movements and behaviors. Refer to the *BuckView User Guide*, accessible within the software, for more information. BuckView requires a personal computer running either Windows XP® or Windows Vista®.



## **MapView Professional**

Included with your professional camera (PM75, PCC85, PC90) is MapView Professional software that offers you the ability to geographically organize and access your images. It also supports data analysis with user-defined metadata and export capabilities and allows you to change the advanced settings on your Professional Camera. MapView requires a personal computer running either Windows XP® or Windows Vista®.

## Battery & Memory Card Installation

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### Removing and Replacing the Camera's Cover

Before installing batteries or a memory card, you need to remove the camera's cover. To do this, open the clasp at the bottom of the camera using the thumb grip in the middle of the bottom edge. Then, lift the cover from the bottom, rotating it upward until you can remove it from the camera.



To replace the camera's cover, insert the cover along the bottom edge of the camera's faceplate and rotate it downward until it's flush with the camera. Snap the clasp, pressing firmly in the middle of the clasp, to secure the cover.



It's good practice to make sure the gasket and camera lenses are clean each time you open and close your camera.

## Battery Specifications and Installation

Your RECONYX RapidFire™ camera runs on six C-cell batteries (Alkaline, Nickel Metal Hydride (rechargeable), or 3V Lithium (in Professional models only). Batteries load vertically (three on each side) into the two battery trays. *Note:* Be sure to load batteries in the proper orientation (positive end in first).



**Warning!** Do not mix battery types!

Damage to the camera can result and your warranty will be voided if you mix battery types.

Alkaline batteries work well at temperatures above freezing. If you want to use your camera when the weather turns cold, you should get a set or two of NiMH rechargeable batteries. They will run your camera at temperatures down to -20°F or colder. With the Professional model, Lithium C-Cell batteries work very well down to -40°F. You can purchase NiMH rechargeable batteries and chargers at [www.reconyx.com](http://www.reconyx.com).

Because camera settings, animal activity, and temperature all vary, there is no way to precisely predict a camera's *run time*, the total number of images that can be taken, or the temperature at which the camera will operate on any given set of batteries. Therefore the following table shows *approximate values* to be used as a guide in determining what type of batteries will best suit your needs.

<u>C Battery Type</u>	<u>Operating Temperature</u>	<u>Run Time</u>	<u>Number of Images</u>
Alkaline (disposable)	20° F (-7° C) and above	6 – 12 weeks	10,000 to 20,000 or more
Nickel-Metal Hydride (rechargeable)	-20° F (-29° C) and above	4 – 8 weeks	7,500 to 15,000 or more
Lithium (3V) (disposable)  (supported in Professional models only)	-40° F (-40° C) and above	8 – 16 weeks	15,000 to 30,000 or more

**TIP:** AA batteries can also be used in your RapidFire camera – provided you use AA to C-Cell battery adapters. Since AA's and C-Cells are the same length, you can run AA's in your camera with these adapters. Check [www.reconyx.com](http://www.reconyx.com) for a set of adapters that will allow you to do this. Be aware that run time with AA's will not be as long as with C-Cells.



## CompactFlash® (CF) Card Specifications and Installation

The CompactFlash (CF) card is used to store the pictures your camera captures. These images may be transferred to your computer using standard image viewing software or RECONYX MapView or BuckView™ mapping and image management software.

### Inserting and Removing the CompactFlash Card

Insert CF card as shown. Make sure the orientation is correct and that the card is aligned properly. Then press gently to seat the card in the holder.



To change CF cards in the field:

1. Press <OK> to disarm (the camera will then show you status)
2. Turn the power off.
3. Remove the card by pulling it straight out of the receiver port.
4. Insert the new CompactFlash card into the receiver slot under the control buttons as shown.
5. The card must be inserted face up with the connecting ports in first.

**Note:** Always disarm and turn the power off before removing or inserting the CompactFlash card.

CompactFlash cards have various speeds and capacities. Larger capacity cards are capable of storing more images. The following table shows approximate number of images for a 2GB CF card.

Camera / Capacity	RC55 & PC85	RM45 & PM75	RC60 & PC90
Capacity with 2 GB card	3000 to 5,000 images	10,000 to 15,000 images	3000 to 5,000 images

**TIP:** We recommend that you purchase two CF cards per camera so that you can swap cards in the field. SanDisk cards have worked well for us. You can purchase RECONYX certified CF cards at [www.reconyx.com](http://www.reconyx.com).

Cards with higher speed ratings are capable of reading and writing images faster. This is advantageous when taking RapidFire™ NearVideo™ sequences of images.

## Initial Setup & Programming

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With the CF card inserted in the camera, turn your camera on using the **On/Off** switch. If this is the first time you've used your camera, it will automatically display the **Date/Time** setup change option, beginning with **Enter Year**.



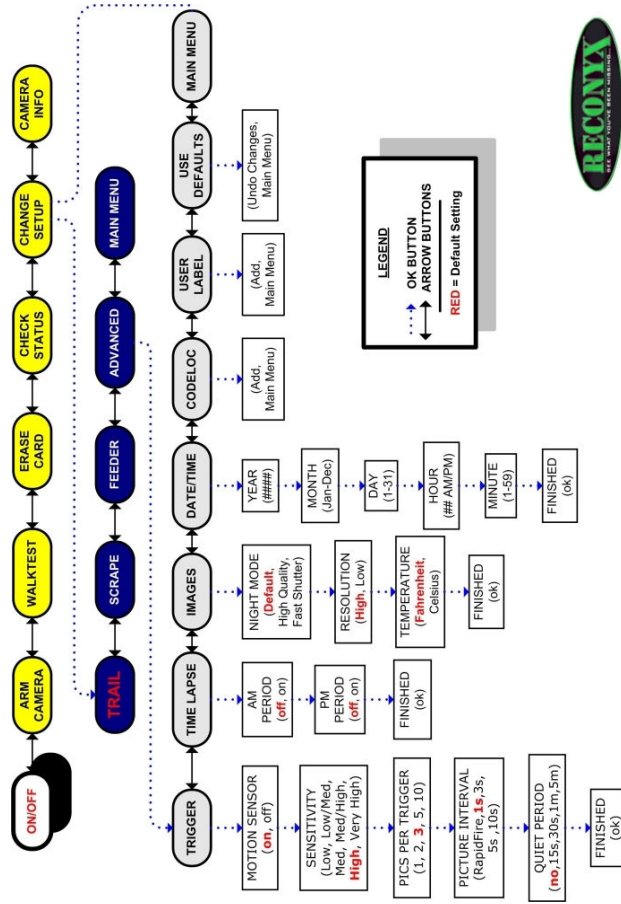
Press the << and >> buttons to set the date (year, month, and day) and time (hour and minute); press the **OK** button after each part of the date and time are correct.

Your RECONYX RapidFire™ camera comes pre-programmed with factory default settings. By default the camera will take 3 pictures per trigger with a 1 second pause between pictures and no delay between triggers.

If you wish to change your camera's settings you can do so easily in the field at any time. Changes are made using the control buttons and display that are located under the **Removable Cover**. Once you make selections, they are retained by the camera – even when the camera is off and the batteries are removed – so that you don't need to make selections again unless you want to change something.

If you purchased a Professional model camera you can use the MapView software to access additional features that are only available on the professional series cameras. See the MapView User's Guide for more information.

# RAPIDFIRE™ PROGRAMMING MENU



Your camera includes three major levels of options: **Main** menus, **Change Setup** menus, and **Selection** options. As with the date and time, you can move through any of these menus and options by pressing the << and >> buttons; the >> button displays menus and options in order, and the << button reverses the order. When the menu or option you want to select is displayed, press the **OK** button.

The display area above the <<, >>, and **OK** buttons includes two lines of information. The top line generally displays the menu, setting, or option you are currently accessing; after you make a selection, it may also display additional information. The bottom line displays the available selections for the menu, setting, or option displayed in the top line. Selections you can choose from are always displayed in highlighted text, within single brackets.

You can change your camera settings any time you like, either prior to using the camera or in the field. Likewise, you can switch CompactFlash cards as needed, and check the remaining space on your CF card as well as your remaining battery power.



### **Main Menu**

**Arm Camera** – When you select this option, your camera arms in ten seconds, unless you cancel it before the countdown is complete. If you forget to arm the camera it will automatically arm itself after 2 minutes.

**WalkTest** – When you select this option, your camera flashes an indicator light so that you can test its aim by walking in front of it. The WalkTest mode

shows you exactly where the camera's active motion detection zones are located. The tilt of the camera is critical, as slight changes are magnified at greater distances from the camera. The camera will arm itself if left in WalkTest mode (after 2 minutes with no triggering events). This allows you to set the camera up, check its aim using WalkTest, and then just walk away.

**Erase Card** – When you select this option, your camera wipes your entire CF card clean, removing all images and other information from the card. You should **not** select **Erase Card** unless you are absolutely certain you want to remove everything from the card.

**Check Status** – When you select this option, your camera displays the number of pictures it has taken, the percent of space remaining on your CF card, and the percent of battery power remaining.

**Camera Info** – When you select this option, your camera displays its firmware version number (V) and serial number (S). You may need this information when contacting RECONYX with questions about your camera.

**Change Setup** – Allows you to change the way your camera functions. Note: default settings are shown in **RED CAPITAL** letters. Professional series cameras have additional settings that can be programmed (configured) using the MapView software on your PC (see additional notes below).

**QuickSet** – When Change Setup is selected the QuickSet options are displayed (**TRAIL**, Scrape, Feeder, and Advanced). This allows you to quickly select pre-programmed settings that are optimized for particular situations. Selecting Advanced takes you to the settings listed below.

The pre-programmed QuickSet settings are:

**Trail** – 3 pictures, 1 second interval, no quiet period

**Scrape** – 5 pictures, RapidFire, no quiet period

**Feeder** – 3 pictures, 5 second interval, 15 second quiet period

**Trigger** – Use this option to turn your camera's motion sensor on or off, select the sensitivity level of the PIR motion detector, set how many photos you want your camera to take per trigger, the interval between pictures, and

the quiet period (the time period after a trigger during which the camera will not respond to motion events).

1. **Motion Sensor** – **ON**, off
2. **Sensitivity** - low, low/medium, medium, medium/high, **HIGH**, or very high
3. **Pics Per Trigger** – 1, 2, **3**, 5, or 10
4. **Picture Interval** – RapidFire, **1 SEC**, 3 sec, 5 sec, or 10 sec
5. **Quiet Period** – **NO DELAY**, 15 sec, 30 sec, 1 min, or 5 min

**Time Lapse** – Use this option to control your cameras time lapse photography, select the starting and ending times, and the interval between pictures taken.

1. **AM Period** – on, **OFF**
2. **PM Period** – on, **OFF**
3. **Time Lapse starting and ending times** – one hour increments
4. **Interval between pictures** – 1, 5, 15, or 30 minutes, 1 hour

**Images** – Use this option to adjust the night time exposure, set the resolution, and the temperature scale.

1. **Night Mode** – **DEFAULT**, high quality, fast shutter
  - Default - best combination to balance image quality, shutter speed and flash range
  - High Quality - higher quality images, reduced flash range
  - Fast Shutter - reduced blur on fast moving objects, lower image quality
2. **Resolution** – **HIGH**, low
3. **Temperature Scale** – **FAHRENHEIT**, Celsius

**Date/Time** – Use this option to select the date (year, month, and day), time (hour and minute).

**CodeLoc™** – Use this option to add a four-digit security code to prevent unauthorized use of your camera, or change or remove an existing code.

**User Label** – Use this option to add a label (up to 16 characters) that will be included with all photos taken by your camera. You can also view, change, or clear an existing label.

**Use Defaults** – Use this option to remove any changes you've made to your camera's settings and restore the factory default settings (shown above in **RED CAPITAL** letters).

**Main Menu** – Use this option to switch back to the **Main** menu options; see preceding page for more information.

### Programming RapidFire Professional Cameras with MapView

There are many more set-up options available for the Professional model cameras when using MapView. See your MapView User Guide for details on the additional setup options.

When you do program (configure) your Professional cameras using MapView, your camera will display "SAVING PRO CONFIG" when you boot the camera with the CF card used to program it. The camera will remember these settings even when shut off, so you do not need to reprogram the camera unless you want to change its behavior.

If you are using a Pro Config and you go into the Change Setup option using the camera's menu, it will prompt you with PRO CONFIG with options of GO BACK or CONTINUE. If you continue, the settings from your PRO CONFIG from the PC will be overwritten with the settings you select on the camera.

Your new MapView software is still fully compatible with our older Silent Image PM35 and RM30 series cameras. You can program old and new cameras as well as import, view, tag, and export image data from the new RapidFire Professional series cameras and the older Silent Image cameras.

**Tip:** Setting the date and time on the new RapidFire Professional cameras is easier to do right on the camera than it is through the MapView software.



## Mounting & Aiming Your Camera

---

Your RECONYX RapidFire™ camera can be mounted to a RECONYX VersaMount™ (see [www.reconyx.com](http://www.reconyx.com) for more information) or a camera tripod by utilizing the threaded insert on the back of the camera housing.

It may also be mounted to a tree by using the included adjustable bungee cord (shown below). **It is highly recommended that you use a theft deterrent device** such as a cable and lock to help secure your camera against possible theft when it is in the field. Theft deterrent cables and locks are available from RECONYX (see [www.reconyx.com](http://www.reconyx.com) to order).

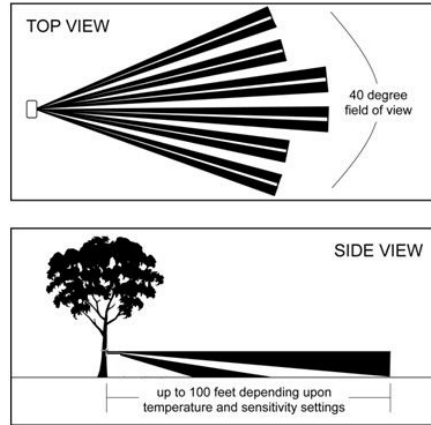
### ***Mounting Camera with Adjustable Bungee Cord (included)***



**TIP:** We recommend that you mount your camera about chest height and angle it slightly downward. This is optimal for detecting animals in the field of view of the camera as well as for accessing the camera's card, batteries, and controls. If you are concerned about the slight red glow of the non-covert illuminator spooking animals, you can mount the camera a bit higher and angle it down a little more. Most animals do not often look up and therefore are less likely to notice the camera if it is mounted a few feet higher.

## Aiming the Camera

### PIR MOTION DETECTOR COVERAGE AREA



### Walktest Mode

Learning to use the Walktest mode is critical to being as successful as possible with your RECONYX camera. The Walktest mode allows you to precisely determine your camera's active motion detection zones – insuring your camera is aimed exactly where you want to capture animal activity.

All RECONYX cameras will self-arm from Walktest mode after a two minute period during which they do not detect motion.

**Optional Locking Methods (not included)**



Python™ style lock

Standard cable and lock

RECONYX sells an array of accessories for securing your camera and protecting your investment. From Heavy Duty bear boxes to Python locks. Please see [www.reconyx.com](http://www.reconyx.com) for more on security accessories.

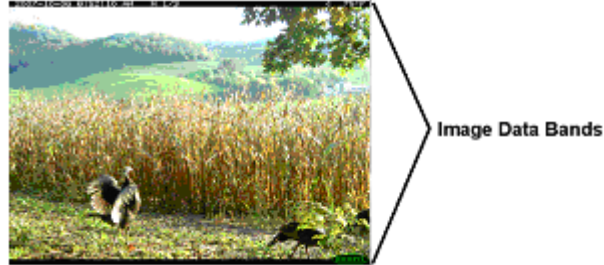
## General Information

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### Image Data

Your RECONYX RapidFire™ camera stores Image Data along with every picture it takes. Some of this information (date, time, trigger and sequence information, the infrared illuminator “flash” indicator, moon phase, temperature, and camera label) is displayed in *Image Data bands* above and below the image.

An “M” in the top data band indicates a motion event. “1/3” indicates the first in a sequence of three pictures for that event. If, instead, you see a “T” at the top of the image, this indicates a Time-Lapse event/picture.



Phases of the moon displayed in the image bands include: 🌑 (new moon), 🌒 (waxing crescent), 🌓 (first quarter), 🌔 (waxing gibbous), 🌕 (full moon), 🌖 (waning gibbous), 🌗 (last quarter), and 🌘 (waning crescent). Any time the infrared illuminator is used, 🔦 (the infrared illuminator “flash” indicator) appears in the Image Data bands.

There is a lot more Image data stored within the image itself that is accessible using either MapView or BuckView. The additional image data includes serial number, firmware version info, illuminator status, battery voltage and so on.

MapView (Professional) users can also define their own metadata keyword fields and values to tag image data for export and further analysis.

## Troubleshooting

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For answers to questions about your RECONYX RapidFire™ camera that you cannot find in this *Instruction Manual*, please check the RECONYX web site ([www.reconyx.com](http://www.reconyx.com)).

### **Firmware Updates**

You should also periodically check the RECONYX web site for firmware updates for your camera. We periodically release firmware updates with new features and/or performance enhancements. Updating firmware on the RapidFire series cameras takes just a few seconds, and is well worth the effort to ensure your camera is performing at the highest level possible.

### **Troubleshooting your camera**

#### **Focus Problems**

*If your images appear cloudy or out of focus*, first consider whether there was snow or frost on the camera lens; you may wish to check your camera after a fresh snowfall to be sure the lenses are not covered with snow. Next, check the lenses for dirt and water spots, and gently clean your lenses with a clean soft cloth and lens cleaner.

If you find that you are having issues with condensation inside the camera, you can use desiccant packs to absorb any moisture that is in the air that gets trapped inside the camera. Rechargeable desiccant packs are available on our web site ([www.reconyx.com](http://www.reconyx.com)).

#### **False Triggers**

*If you seem to be getting false triggers*, the first thing to do is put your camera back to default settings and try your camera again. This will ensure that you are running with known settings – with the motion detector ON at HIGH sensitivity and with Time-Lapse turned OFF.

If, after going back to default setting, you still seem to be getting false triggers, check the physical setup of your camera: the sun should not be shining directly on the face of the camera, and the camera's field of view should be cleared of as much moving vegetation as possible. False triggers

most often occur on sunny ,breezy days. Vegetation will soak up the sun's energy and it will becomes warmer than the ambient air temperature. Then, when the wind moves the vegetation, the camera sees this and cannot distinguish it from a warm blooded animal moving in the scene. For this reason, careful placement and setup of your camera helps prevent false triggers.

Only as a last resort should you turn down your camera's motion sensitivity; this reduces your ability to detect movement of warm-blooded animals, especially during the summer.

#### ***Camera Not Triggering on Animals***

The first thing to do is put the camera back to Default settings and try your camera again. This will ensure that you are running with known settings – it will turn the motion detector ON at HIGH sensitivity.

If, after going back to default settings, you are still having trouble, please refer to pages 15 and 16 for detailed information on Mounting and Aiming Your Camera, as well as using the WalkTest mode. Keep in mind that most animals are not 6ft tall, so when you use the WalkTest mode, do not just walk by the camera in a full upright stance. The camera may be triggering on your upper torso or head and not on your legs (where most animals are likely to be). There is an inactive zone (see side-view photo on page 16) that you need to be aware of so that you don't aim the inactive zone precisely on a trail – if you do, you will not pick up animal activity on the trail.

It is important to keep in mind that there are other factors can also affect the ability of your camera to detect motion. Wind can have a detrimental effect. Body heat from an animal can be quickly dispersed away from the animal on a breezy day, making it more difficult for the camera to detect the animal. Also movement directly toward and away from the camera is less likely to trigger the camera than side-to-side movement. And, finally, if an animal is moving very slowly, it will sometimes not produce a strong enough signal within the sensor to trigger the camera.

**CF Card Problems**

*If your camera won't start up properly and/or displays a CF card error, try a different CF card. If the problem persists, you may have to try a different brand of CF card. We have found that some of the cheap CF cards are very slow (even if they say they are fast) and do not always run well in our camera. Note: SanDisk® CF cards are the RECONYX recommended brand for use with your camera.*

**Cold Weather Problems**

*If your camera shuts down in the cold, it may be too cold for the batteries. Refer to the battery chart on page 6 of this manual for recommended operating temperatures for various battery types. Alkaline batteries do not run well in the cold.*

**Other Battery Questions**

*If you charged your NiMH batteries and they only read 88%, it is because rechargeable batteries do not reach a full 1.5 volts - even when fully charged. This is normal. NiMH batteries have a very flat discharge curve. What this means is they run a long time without dropping much in voltage until they reach a point, around the fifty to sixty percent level, where they will drop off very quickly. For this reason it is good to recharge your NiMH batteries when they get down into the sixty percent range.*

*Alkaline batteries will normally read 99% when new and will run down to mid teens or so – except when cold. When alkalines get cold, their % will drop dramatically, even if they are brand new. You will notice that as your Alkaline batteries run down, your night time range will decrease a bit as well. When you notice this happening, it is a good idea to change the batteries.*

**Other**

*If you have read this manual and checked our web site, and you still need assistance, please contact us at 866-493-6064 or e-mail at [support@reconyx.com](mailto:support@reconyx.com).*

## Warranty & Safety Information

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### Limited Warranty

RECONYX hardware products are warranted for one (1) year. If during this period, through normal use, a hardware product becomes defective due to defects in materials or workmanship, RECONYX will either repair or replace the product. This warranty is void if a product failure results from accident, abuse, improper use by Buyer, disassembly, or unauthorized maintenance and repair.

Software products are licensed to Buyer under the terms of the applicable RECONYX software license (contained within installation programs). If Buyer wishes to review the software license agreement before purchasing products from RECONYX, a copy of the software license may be obtained by request.

Buyer must obtain a Return Material Authorization (RMA) number from RECONYX before returning any product(s) for repair or replacement. If RECONYX concludes that a returned product is not defective, Buyer will be notified, the product will be returned to Buyer at Buyer's expense, and Buyer may be charged for RECONYX's examination and testing of the product.

This limited warranty is the sole warranty for hardware and software products offered by RECONYX and RECONYX shall not be liable for any amounts for said products except in compliance with this warranty.

### Safety Precautions

Before using the camera, please ensure that you read and understand the following safety precautions. Always ensure that the camera is operated correctly.

The safety precautions noted in this guide are intended to instruct you in the safe and correct operation of the camera and its accessories to prevent injuries or damage to yourself, other persons, and equipment.

### Preventing Malfunction

#### ***Avoid Strong Magnetic Fields***

Never place the camera in close proximity to electric motors or other equipment generating strong electromagnetic fields. Exposure to strong magnetic fields may cause malfunctions or corrupt image data.



### **Avoid Condensation**

Moving the camera rapidly between hot and cold temperatures may cause condensation (water droplets) to form on its external and internal surfaces. You can avoid this by placing the camera in an airtight, resealable plastic bag and letting it adjust to temperature changes slowly before removing it from the bag.

### **If Condensation Forms Inside the Camera**

Stop using the camera immediately if you detect condensation inside the camera. Continued use may damage the camera. Remove the CF card and batteries from the camera and wait until the moisture evaporates completely before resuming use.

### **Warnings**

- Store this equipment out of the reach of children and infants. Accidental damage to the camera or batteries by a child could result in serious injury.
- Be particularly careful to keep the date (coin) battery used in the camera away from children. Seek medical assistance immediately if a child swallows a battery.
- Do not allow water or other liquids to enter the interior of the camera. The interior has not been waterproofed. If the exterior comes into contact with liquids or salt air, wipe it dry with a soft, absorbent cloth. In the event that water or other foreign substances enter the interior, immediately turn the camera's power off and remove the camera batteries. Continued use of the equipment may result in fire or electrical shock. Please consult your camera distributor or the closest RECONYX Customer Support Help Desk.
- Use of power sources not expressly recommended for this equipment may lead to overheating, distortion of the equipment, fire, electrical shock, or other hazards. Use only the recommended power accessories. Any use of non-RECONYX power sources will void the warranty on your camera.
- Do not mix battery types. You may run your camera on Alkaline, Lithium (Pro model only!), or Nickel Metal Hydride (NiMH), but you should NEVER MIX BATTERY TYPES! Damage to the camera can result and your warranty will be voided if you do so.
- Do not place the batteries near a heat source, expose them to direct flame or heat, or immerse them in water. Such exposure may damage the batteries and lead to the leakage of corrosive liquids, fire, electrical shock, explosion, or serious injury.
- Do not attempt to disassemble, alter, or apply heat to the batteries. There is serious risk of injury due to an explosion. Immediately flush with water any area of the body or clothing that comes into contact with the inner contents of a battery. If the eyes or

mouth contact these substances, immediately flush with water and seek medical assistance.

- Avoid dropping or subjecting the batteries to severe impacts that could damage the casings. It could lead to leakage and injury.
- Do not short-circuit the battery terminals with metallic objects, such as key holders. It could lead to overheating, burns, and other injuries.
- Use of batteries not expressly recommended for this equipment may cause explosions or leaks, resulting in fire, injury, and damage to the surroundings. Use only recommended batteries and accessories.
- Avoid using, placing, or storing the equipment in places subject to strong sunlight or high temperatures, such as the dashboard or trunk (boot) of a car. Exposure to intense sunlight and heat may cause the batteries to leak, overheat or explode, resulting in fire, burns or other injuries. High temperatures may also cause deformation of the casing.
- Be careful not to bang the camera or subject it to strong impacts or shocks that could lead to injury or damage the equipment.
- When using desiccant, the following precautions should be followed: Keep out of reach of children, do not eat, and do not inhale desiccant dust. If the desiccant packet tears or breaks, wash your hands if they come in direct contact with the desiccant. Desiccant may cause eye, skin, and mucous membrane irritation. Prolonged inhalation may cause lung damage. Asthma can be aggravated by exposure to desiccant.
- If you know or suspect desiccant has been ingested, seek medical assistance for further treatment, observation, and support if necessary. For eye contact, flush with water for at least 15 minutes. For skin contact, wash affected area with soap and water. For inhalation of desiccant dust, move affected person into an environment with fresh air. For accidental ingestion, drink at least two glasses of water.
- Check your state/local laws concerning the use of this product.

## Copyright & Trademark Information

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**RapidFire™ Instruction Manual** Copyright March 2008

RECONYX , LLP, 3828 Creekside Lane, Suite 2, Holmen, WI 54636

This manual provides detailed instructions for getting started with the RECONYX RapidFire™ and RapidFire™ Professional IR cameras, changing the camera settings, and troubleshooting common problems.

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