

# Using Trail Cameras to Detect Small Mammals

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1. *Small mammals often move too fast to be clearly detected by a traditionally set trail camera. Often, the result is a streak in the photo.*

Many studies on small mammal occupancy often use live trapping methods such as box or pitfall traps. Extreme environments, such as deserts or high altitudes, challenge live trapping by temperature exposure (i.e., daytime highs, nightly lows, and sudden swings in temperature) and weather exposure (sudden hailstorms, severe windstorms). Additionally, monitoring small mammals using these methods requires constant vigilance to ensure trapped animals do not starve or become depredated before researchers detect them. Alternately, passive methods such as track plates and trail cameras have become popular in detecting occupancy and abundance of small mammals.

Remote cameras are often used to passively survey large wildlife, such as bear (*Ursus americana*), elk (*Cervus canadensis*), and deer (*Odocoileus spp.*). A remote camera is attached to an object (tree, post, etc.) 1 m (3.28 ft) aboveground to detect these species. Particularly in mammals, as the size of the species decreases, this traditional method becomes increasingly inadequate. At a height of 1 m (3.28 ft), the trail camera can miss detecting small-sized animals. Additionally, the remote camera often cannot detect the small animal as the individual moves too quickly for a photographic “capture” (Figure 1) and may not have a large enough heat signature to set off the camera’s infrared light sensor while moving. This failure may result in an incorrect understanding of a target species’ occupancy within an ecosystem.

To date, the small mammal method includes lowering the trail camera to less than 1 meter and providing a runway or shelter to attract the small mammal to that location.

To improve small mammal detection, my students and I made adjustments in the traditional manner (Roadman, 2014, Frey et al., 2020). To date, these include lowering the trail camera to less than 1 m (3.28 ft) and providing a runway or shelter that entices the small mammal to stop within the detection angle of the trail camera. For many small mammals, such as mice (*Peromyscus spp.*), one must know the animal’s size to correctly identify it to species. Therefore, we added an element to camera detection methods that allows us to approximate the size of small mammals captured on camera. Using all the adjustments mentioned above, we call this the “**small mammal method**” of trail camera surveys. We describe these methods in detail below.

## The Small Mammal Method

Figure

1. **Find a location:** To make your camera the most effective at capturing images of wildlife, rather than placing the camera facing a random direction, take advantage of local features such as any game trails present, natural funnels in vegetation, logs, or signs of wildlife (scat, tracks, etc.). A small clearing beside a fallen log, boulder, or thick brush is ideal.
2. **Find a focal point:** We use a corrugated plastic tube called a “small mammal tube” as a focal point for our camera surveys. The corrugated plastic tube (see the next section for details) is situated under the fallen log, next to the brush pile, or a similarly logical place for a small mammal to investigate and rest. The tube provides a tunnel for small mammals to travel through or on (to which you can aim your camera). It simultaneously serves as a shelter or perch for small mammals and a size reference to aid in measuring the detected small mammal. If you do not have a small mammal tube, simply decide where your focal point is in the small clearing.
3. **Set the camera:** First, adjust the camera’s time and date. Select if you would like photos or videos. If the option is available, set the detection to *low* or *medium*. This will reduce getting photos of moving grass or shadows on logs. Insert your SD card and ensure it is working.
4. **Program the camera:** Set the cameras to record three photos at every motion trigger on a *low* or *normal* sensitivity and then remain inactive for a 30-second interval before becoming sensitive again. The three-photo burst allows

a better chance to detect small mammals and create a clear photo that allows for identification. Sometimes, you need all three photos to make a correct identification. The 30-second pause eliminates repeated photos from a small mammal that may be taking time to investigate the tunnel. The low to normal sensitivity decreases false detections such as leaves blowing or insects flying across the tunnel.



Figure 2. Aiming a trail camera toward a log or running surface will increase detections of small mammals.

1. **Deploy the camera:** Aim the camera toward a clearing, especially toward a log or other running surface (Figure 2). We recommend using 76-cm (30-in.) green garden stakes as mounting surfaces for your camera. However, a tree trunk will do. Ensure that the mounting point is steady and does not move in the wind. Additionally, consider where the sun rises and sets and avoid placing the camera directly at the sun. Using the straps provided with the camera or webbing, bungee cords, etc., attach the camera to the mounting surface. Sometimes, it is good to put a small rock between the mounting surface and the camera to adjust the camera angle. Clear away grass, leaves, and small branches from up to 1 m (~3 ft) around the camera. This reduces obtaining photos of leaves and grass blowing in the wind rather than small mammals.
  - a. **Test the camera angle:** Turn the camera on and close the camera cover. Toss a rock or twig in the view field of the camera next to your focal point, imitating a small mammal. Do this once or twice from different angles.
  - b. **Adjust the camera angle:** On many trail cameras, there is a display screen inside the camera cover to quickly view acquired photos and videos. Open the camera cover and review the photos captured when you tossed the object to ensure you obtain the photo as intended. Adjust the camera angle or height and repeat this process until you

get a usable mock photo. If you do not have a trail camera with a screen, you can use a smartphone with an SD card adapter to quickly ensure you capture your intended field of view.

- c. **Address security:** If you are deploying a camera in an area many people visit, you might consider deploying it inside a security case that locks the camera inside.

## Small Mammal Camera Tube

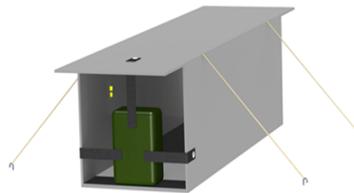


Figure 3. Illustration of a small mammal camera tube with optional camera and four lines for stability. Note the black webbing attaching the camera to the tube.

Providing small mammals with a log or board to run along can increase species' detection using trail cameras (Figure 2). Additionally, providing small shelters that animals can rest under can improve our ability to photograph small mammals. By using a tube inside the detection angle of a trail camera, we provide both a linear running surface and a shelter. The tubes are used and investigated by various avian and mammal species, which can be informative and entertaining.

The small mammal tube is a collapsible corrugated plastic tube measuring 15.25 cm x 15.25 cm x 61 cm (6 in. x 6 in. x 24 in.) with overhanging lips to protect from rain and sun. Four lines, one tied through a hole at each corner, stake the tube to the ground to combat wind gusts (Figure 3, Roadman, 2014).

Using this method with a second trail camera is optional but will increase detections. However, we do not recommend using the secondary camera with the tube in interior settings or a dark, enclosed space. The secondary camera flash will create too much light, and most photos will be overexposed, severely decreasing the ability to determine the species detected (Figure 4).

We attach this second camera to the end of the tube using polypropylene webbing and metal snaps secured to the plastic walls (Figure 3). This camera detects animals that venture inside the tube. Once an animal is inside the

tube, the primary camera does not detect it. An animal venturing inside the tube often stops to rest, which allows our attached camera to take close-up photos of the animal. Using the scale of the tube—15.25 cm a side (6 in.)—we can estimate the size of the animal, which aids in identification.

### What You Need



**Figure 4.** When the camera is too close to a hard surface, it can reflect and cause overexposure.

#### For the Tube

- Sheet of corrugated plastic (similar to those used in campaign signs)
- Sharp knife or box cutter
- String for support lines
- Small washers (optional)
- Nails or eye hooks

#### For the Camera

- Remote motion-activated camera (trail camera) with batteries
- Webbing
- Small folder clamps

### Making the Small Mammal Tube

1. **Create the tube:** Cut the corrugated plastic to 71 cm (28 in.) long and 61 cm (24 in.) wide. Using the shorter side, bend the plastic to create a 15.25-cm (6-in.) square tube. Determine the “top” of the tube. Unfold the tube and remove 5 cm (2 in.) from the sides and bottom of the tube on each end. This creates a 61-cm (24-in.) long tube with a 5-cm (2-in.) overhang on each end. Using duct tape, create the tube by taping the two long ends (the sides) together. This can be done in the field; traveling with a folded tunnel is easier than traveling with a fully constructed tunnel.
2. **Make the support lines:** Cut four holes in the top of the tube, one on each side, on each end (see Figure 3). Tie a knot on the end of a string (~ 61 cm [24 in.] long), and starting from the inside, feed

it through the side of the tube. You can adjust the length of the string once you are at your location. Repeat the process so you have four lines to hold down the tube. Optionally, you can place a small washer on your string before pulling it through the hole so that the knot is less likely to pull through in strong winds.

#### 3. *Attaching an Optional In-Tube Camera*

#### 4. **Make attachments for the camera (optional):**

This is an advanced step. Figure 3 shows a camera attached with webbing. If this is not within your capacity, you can simply place the camera on the ground at the back of one end of the tube.

- a. **Test webbing length:** There is a place on the back of the camera to feed webbing through. For the first tube, use your desired camera to test the length of webbing you will need. Feed the webbing through the camera so that there is a bit on each side. Place the camera on the back edge of the tube. Measure how much webbing will be needed to reach the side of the tube and then add 2.5 cm (1 in.) to each side. Cut the webbing.
- b. **Cut slits in the tube’s sides:** Cut a 2.5-cm (1-in.) slit on each side of the tube for inserting the webbing. Feed the webbing through (about an inch) and then place a folder clamp on the end, touching the side of the tube. Repeat on the other side.
- c. **Attach webbing to the camera:** Open the camera cover. Place the end of the webbing inside the case and close it. Measure how much webbing you need to touch the top of the tube plus 2.5 cm (1 in.). Cut the webbing.
- d. **Cut a slit in the top of the tube:** Holding the webbing straight up from the camera as a guide, cut a slit in the top of the tube. Feed the end of the webbing through the slit and place a folder clamp over the edge, close to the top of the tube.
- e. **Stabilize the camera:** The camera should be stable. Adjust the webbing as necessary to get a stable camera.
- f. **Prepare webbing in advance, if desired:** Using these measurements, webbing can be cut in advance to construct the tubes when out in the field.

## Deploying the Small Mammal Camera Tube



**Figure 5.** *Uinta chipmunk*

(*Neotamius umbrinus*) running through a small mammal tube, showing deployment without the secondary camera and lines anchored to the ground. Knowing the tube is 6 in. wide, we can estimate the chipmunk's size.

Once you determine where you will set your trail camera (i.e., your small clearing near a rock or bush), you will use your small mammal tube as your focal point. First, determine where you will put your primary trail camera. Then, determine the position of the small mammal tube such that the primary trail camera points directly at the entrance to the tube.

1. **Set up the tube:** Put the small mammal tube together if needed. Install the string lines and attach them to the ground using the small hooks (Figure 5). The front of the tube (the end without the additional camera) should face the clearing.
2. **Install the primary trail camera:** The height of this camera can be anywhere from on the ground to 76 cm (30 in.) aboveground. Often, it is easier to mount the camera on a garden stake to achieve the desired height than attempting to find a tree trunk in the correct location. If you are placing trail cameras in rocky areas, placing the trail camera securely among rocks is ideal.
  1. The trail camera should be approximately 2 m (6 ft) from the entrance to the small mammal tube and focused on the entrance to the tube. The further from the tube, the wider variety of species one will detect.
  2. If using this method indoors, positioning the camera close to the tube may result in the camera flash reflecting off the tube. Position the camera 3 m (9.8 ft) from the small mammal tube in this situation.
  3. If deploying the camera indoors, one can use boxes or other common materials to achieve the correct height for the camera.
3. **Install the small mammal tube camera:** Use webbing and refer to the instructions in the "Attaching an Optional In-Tube Camera" section.

## Using Lures or Bait



**Figure 6.** *Woodrat*

(*Neotoma* sp.) investigating a scent lure in a small mammal tube.

When using trail cameras to attract large mammals, it is not uncommon for people to use bait or scents to lure the focal animal to the camera. Baiting is using food to entice an animal to the area, such as placing corn in a clearing and focusing a trail camera on the corn. Lures are scent-based attractants, resembling food or other animals. Scents are placed on a stick or in a small container (lure), and the trail camera is then focused on the lure. Lures and bait may also be used to attract small mammals; however, one should be aware that using bait to attract animals is not legal in U.S. National Parks and is discouraged when using trail cameras to detect small mammals in interior spaces. Using a lure to attract small mammals into the small mammal tube has proven to be effective (Roadman & Frey, 2019). We recommend using an essential oil that is attractive to a wide variety of animals, such as orange or rose. While an herbal scent may seem like a good choice, many herbs can be repellant to different species of small mammals.



**Figure 7.** *California*

*condor* (*Gymnogyps californianus*) investigating a small mammal tube, probably attracted by the scent lure. Place a few drops of the essential oil on a cotton ball or swab. Once the small mammal tube is set, place the cotton ball or swab on the ceiling or side of the tube, attaching it with a small amount of tape. Animals will be curious about the scent and linger inside and around the tunnel (Figure 6), increasing the opportunity for detection and identification. Sometimes larger animals may be curious about the lure, and it is possible they may disturb the camera set (Figure 7). Food lures tend to attract any animal that might eat that food, including bears, deer,

foxes, etc. However, the author has rarely experienced curious large animals destroying a small mammal tube camera set when we have used a scent lure. However, carefully selecting scent lures can eliminate most curiosity of undesirable animals.

## Conclusion

Trail cameras are a noninvasive technique for inventorying small mammals in an area or identifying small mammals in problem areas. With a few adjustments to a more traditional approach used to detect large mammals, one can improve the small mammal detection rate and increase the ability to identify small mammal species. Small mammal tunnels provide a focal point for trail cameras and small mammals alike, additionally increasing the ability to detect and identify small mammal species.

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