Alberta Biodiversity

Monitoring Institute

www.abmi.ca

Terrestrial ABMI Autonomous Recording Unit (ARU) and Remote Camera Trap Protocols

Version: 2021-04-21

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GENERAL INFORMATION

- At baseline survey sites, four remote cameras and four automated recording units (ARUs) are placed in a square, approximately 600m apart, centered on an ABMI site (i.e., near the corners of the original bird point count stations; Figure 1). These units are used to record mid- and large-sized mammals (cameras), and bird and amphibian vocalizations (ARUs).
- In the green zone, cameras and ARUs are placed within 50m of each station in a habitat similar to that of the grid corner (Figure 1).
- If possible, the ARUs are placed at the exact same locations as the cameras
- If required, the camera and ARU at a station may be **up to 10m** apart.
- Generally, units are deployed between mid-fall and March 31st and are retrieved in July.
- If a site has been previously surveyed with cameras and ARUs, the coordinates collected at the time of the initial survey will be used for all subsequent surveys. A case by case assessment will be made if the Access Team is unable to secure access to any of these previously visited locations.
    - When conducting a revisit, look for the exact location where units were previously deployed (i.e., look for old screw holes in tree trunks at a treed site). If the exact location cannot be found or is no longer suitable (e.g., the original tree has grown too wide for the ARU, is now dead, or is otherwise compromised), mount the units at a suitable location as close as possible to the coordinates provided.
- Cameras and ARUs are programed before deployment with the settings in Appendix 1 and 2 respectively.
- Scent is placed at the NE and SW stations at deployment (Figure 2).
- If scent placement at the NE or SW raises a safety concern (i.e., if human or vehicular traffic is expected in the area), the scented location is moved clockwise to the next available station until a suitable station is found (i.e., if scent cannot be placed at the NE location, scent is moved to the SE and the SE and SW locations are scented instead of the NE and SW).
- Scent **must** be moved clockwise to the next available corner if the original scent location falls within:
    - 200m of a residence, industrial or recreational facility, or campground
    - 100m of an active trail (i.e., a hiking trail)
    - 50m of a road

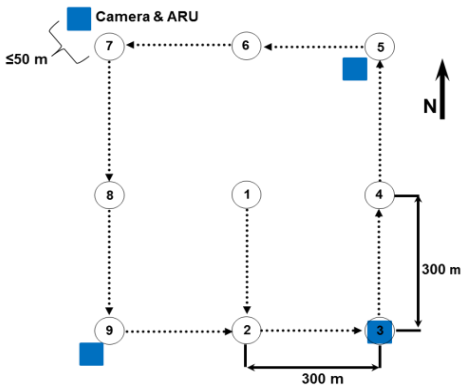


Figure 1. Placement of camera traps and ARUs relative to ABMI bird point count stations.

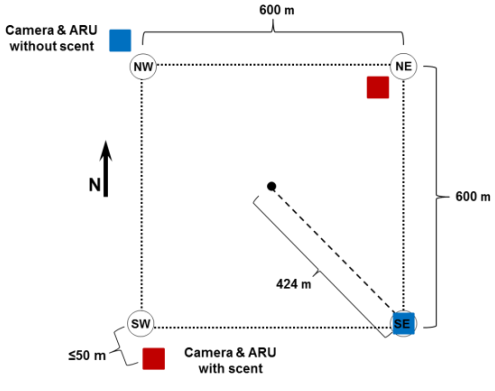


Figure 2. Baseline Survey: Cameras and ARUs are placed near the corner of a 600 x 600m square centered on an ABMI site. The NE and SW corners are scented.

- A painted stake is placed 5m in front of the camera at the NW and SE corners to aid with photo interpretation and analysis.
- All data collected during the deployment and retrieval of units (e.g., station photos, GPS coordinates, etc.) must follow standard ABMI naming conventions as listed in Appendix 3: ABMI Naming Conventions.

SITES IN PRAIRIE, CROP FIELDS, PASTURE & OPEN WATER: SELECTION CRITERIA

In forested sites, cameras/ARUs are moved a maximum of 50m to a new location that is in a habitat similar to the grid corner (i.e., if the grid corner is under the canopy, the new location must be under the canopy, or, if the grid corner is on a cutline, the new location must be on a cutline). Crop fields present a unique challenge since these areas are often ploughed, seeded, and sometimes cleared during our field season. As a result, we aim to move the original camera/ARU point location to the closest edge (e.g., fence row, road edge, field break, etc.) with the goal that units will not be disturbed while deployed and that moving the station will not bias the data. Since stations that fall in pasture are less likely to be disturbed than those that fall in a crop, our goal is to not move stations in pasture from their original location unless absolutely necessary. Regardless of where units are moved to, when deployed, they should face the original habitat type (e.g., a crop field), and not the new habitat type (e.g., a shrubby fence line).

Existing camera/ARU point stations are moved in the lab pre-deployment using the general criteria below. Location suitability is verified when units are deployed:

- If possible, stations should be moved to a location with habitat as similar as possible to the original location
- Stations should not be moved more than 500m from their original location
- There should be a minimum distance of 500m between stations
- Avoid moving stations to treed locations, if possible
- A station should not be moved to the edge of body of water (e.g., wetland, creek, etc.) or a clump of trees unless it originally falls on one

Open Water

- If a station is within open water but ≤ 500m from vegetation or the lake shore, then relocate the station to the nearest vegetation/shore.
- If a station is in open water and > 500m from vegetation or the lake shore, then it is not surveyed using cameras and ARUs.

PRAIRIE AND CROP FIELDS

- If possible, the new location should be in a similar habitat to the original location
- The following locations are listed in order of priority:
    1. An interface between two cultivated fields with little or no uncultivated ground at the interface (if in a crop field)
    2. Fence line adjacent to the cultivated area with as narrow a non-cultivated strip as possible
    3. Road adjacent to the cultivated area. In order of preference:

    a. Vegetated trail
    b. Narrow gravel road
    c. Narrow paved road
    d. Large paved road (e.g., highway)
- Avoid moving points to trees and large shrubs if possible

PASTURE

- If possible, the new location should be in a similar habitat to the original location
    - Even if there is a treed location nearby, a station is moved from its original location only if the landowner rejects its original placement
- If moving a station, the following are listed in order of priority:
    1. Pasture edge or a similar cleared area
    2. Fence line adjacent to the pasture
    3. Road adjacent to the pasture. In order of preference:
        a. Vegetated trail
        b. Narrow gravel road
        c. Narrow paved road
        d. Large paved road (e.g., highway)
- Avoid moving points to trees and large shrubs if possible

Maps with several options are created in the lab (Appendix 4: Maps for Sites in Crop Fields & Pasture) showing the primary station locations and the alternate placement options for each point.

DEPLOYMENT: STANDARD FIELD EQUIPMENT

You will need to bring the following equipment to every site, regardless of what setup is required. Setup specific equipment lists can be found later in this document.

- Personal equipment (weather, safety, etc.)
- Reconyx PC900 or HP2X camera unit with 12 lithium AA batteries and one 8 GB SDHC memory card
    - Unit will be programmed ahead of time using SD card and Reconyx software to the settings described in Appendix 1: Remote Camera Trap Settings
    - Manual
- ARU (SM3 or SM4) with 4 D batteries and either two 16 GB or two 32 GB SDHC memory cards, depending on the unit
    - Unit will be programmed ahead of time to the settings described in Appendix 2: ARU Settings and Schedule
    - Manual
- Protective laptop cases
- Desiccant packets (tubes provided by Reconyx)
- Spare SD cards
- Spare batteries
- Extra programming cards for ARU units
- Tablet

- Datasheet, clipboard, pencil
- Compass (set to appropriate declination)
- GPS (NAD83, decimal degrees)
- Digital camera
- Photo sheet and dry erase marker
- Mallet
- Conduit (1.3m) painted with alternating swatches of high contrast paint
- Lure stakes & PVC scent tubes
- Scent (O'Gorman's Scent)
- Nitrile gloves
- Screw drivers – Phillips head, square socket (Robertson) head, flathead
- Wire cutters
- Cable ties
- Measuring tape
- Folding saw
- Access package

RETRIEVAL: STANDARD FIELD EQUIPMENT

You will need to bring the following equipment to every site:

- Personal equipment (weather, safety, etc.)
- Protective laptop cases
- Tablet
- Datasheet, clipboard, pencil
- Compass (set to appropriate declination)
- GPS (NAD83, decimal degrees)
- Digital camera
- Photo sheet and dry erase marker
- Large ziplock bags and plastic grocery bag (for PVC tube retrieval)
- Screw drivers – Phillips head, square socket (Robertson) head, flathead
- Wire cutters
- Folding saw
- Access package

REMOTE CAMERA TRAPS

Remote camera traps are used to passively monitor wildlife in the field. Reconyx PC900 and HP2X cameras are used to collect data at our sites (Figure 3). The cameras are very user friendly, but it is still recommended that users read and bring a user manual into the field in case issues arise.

Figure 3. Remote camera traps (Left: PC900 Model, Right: HP2X Model, both from Reconyx).

ACTIVATING THE CAMERA

- Ensure the SD card is properly labeled. Record the card and camera unit number in the tablet
- Open the camera casing and attach a desiccant pack inside the camera closest to the batteries
- Turn the camera on
- Access the camera using the password
- Ensure the date and time are properly set on the camera (refer to the camera manual for any necessary adjustments)
    - The cameras are programmed for daylight savings time. After November 7th, 2021 and before March 13th, 2022 the units should be an hour ahead.
- **<u>In the HyperFire 2 ONLY:</u> Ensure the location is set to Latitude 54.40 N and Longitude 115.00 W**
    - **In the menu select "Change Setup" →"Location" →"Other" →"Set Lat/Long"**
    - **Validate Sunrise according to the date you set up the camera (it will auto adjust)**
        - **www.timeanddate.com**
- Change the user label to reflect where the unit will be deployed
    - PC900: In the menu select "Change Setup" → "Advanced" → "User Label" → "Add" and enter "ABMI-[SITE#]-[STATION]".
    - HP2X: In the menu select "Change Setup" → "User Label" → "Add" and enter "ABMI-[SITE#]-[STATION]
    - For example, the user label for a camera deployed at site 905 in the NE corner would be: ABMI-905-NE. *

  * We recommend programming the prefix for each unit ahead of time (i.e., before deployment). This saves a lot of time in the field, and the LCD screens work better at warmer temperatures.

- Select "WalkTest" mode from the camera's main menu, close unit, and affix to mounting location. Use either the eyebolt or the end of the Python lock through the lock channel (if needed) to temporarily keep the camera in place.
    - The "WalkTest" mode allows you to determine the active motion detection zones of the camera (Figure 4)
- Ensure that the bottom of the top detection band of the camera is about 80cm from the ground (Figure 4).
- Additionally, test the detection zone by walking through the target area at different distances, heights, and directions and ensure the red WalkTest light on the front of the camera flashes when detections are expected.

- Depending on the size and shape of the attachment tree/post, it may be necessary to use sticks, pieces of wood, or a custom A-bracket to help fine tune camera position and aim.
- The camera will automatically self-arm and begin taking pictures after a two-minute period during which it does not detect any motion

Figure 4. Remote camera detection bands relative to the location of the painted conduit.

DEACTIVATING THE CAMERA

- Open the camera cover
- Press the “Ok” button to disarm the camera
- Enter the camera password to show camera status
    - The display will show the number of pictures on the SD card, how full the card is (%) and the remaining battery (%)
    - Record this information in the tablet
    - If this information is missed during the initial display, you can also scroll to “Check Status” using the camera’s right arrow button to see the above information
- Record the camera user label (prefix) in the tablet exactly as it is displayed in the unit:
    - For the PC900, find the user label by navigating through the following headings: “Change Setup” → ”Advanced” → ”User Label” → “View”
    - For the HP2X, find the user label by navigating through the following headings: “Change Setup” → ”User Label” → “View”
- Slide the power switch to the “Off” position
- Record the camera unit ID and SD card number in the tablet and slide the card back into the camera

AUTONOMOUS RECORDING UNITS

Autonomous recording units (ARUs) are used to remotely survey a variety of species of birds and amphibians. Wildlife Acoustics Song Meters are designed to record autonomously for long periods of time. Our Song Meters are the SM3 and SM4 models (Figure 5). The basic operation of both models is the same, but there are a few programming differences to be aware of. Please familiarise yourself with both the Song Meter recording units and the software used to program them. Read the user manual for the Song Meter. The Wildlife Acoustics website is also a useful source of information.

a)

b)

Figure 5. Key ports and features of Autonomous Recording Units (ARUs): **a)** the SM3 model; and **b)** the SM4 model. Both units are produced by Wildlife Acoustics.

SM3 MODEL ACTIVATION & DEACTIVATION

ACTIVATING THE ARU

- Unscrew the memory bay and turn the unit on by moving the power switch DOWN
- Wait for the unit to initialize. If the unit does not turn on after a few seconds, press and hold the "Check Status" button for 2 seconds.
- Once the unit is on, push the "Check Status" button once to verify the date and time. Adjust if necessary.
    - The ARUs are programmed for daylight savings time. After November 7th, 2021 and before March 13th, 2022 the units should be an hour ahead.
- In the "Song Meter Main Menu" scroll to "Settings" and press "Enter/Menu"
- Scroll to "Location" and press "Enter/Menu"
- Select "Prefix"
- Change the file prefix to the site and station name using the directional arrow buttons. Use the format: "ABMI-[SITE#]-[STATION]". For example, the user label for an ARU deployed at site 905 in the NE corner would be: ABMI-905-NE. *
- Press the "Start Program" button. The unit will begin a 1-minute test recording and will then power down until it is scheduled to record again.
- During the test recording leave a voice stamp with the following information: Site #, Station, Date, Time, ARU Unit #, Crew Members
    - To help streamline the audio file analysis process, be sure to start the voice stamp with the site ID. This must be the first thing said on the recording and must be said using individual letters and numbers. For example, the voice stamp for the ARU at the SE station of site 907 would start with "A-B-M-I-Dash-Nine-Zero-Seven-Dash-Southeast". The rest of the required information can then be provided in any order.

* We recommend programming the prefix for each unit ahead of time (i.e., before deployment). This saves a lot of time in the field, and the LCD screens work better at warmer temperatures.

DEACTIVATING THE ARU

- Press the "Stop Program" button
- Wait for the unit to initialize. Press "Check Status" to review SD card information.
- In the "Song Meter Main Menu" scroll to "Settings" and press "Enter/Menu"
- Scroll to "Location" and press "Enter/Menu"
- Select "Prefix"
- Copy down the prefix that has been programmed into the ARU exactly as it is displayed.
- Unscrew the memory bay and turn the power switch to the off (UP) position
- Record the ARU unit ID and SD card numbers in the tablet and slide the cards back into the unit. Tighten the memory bay screws.
- If the ARU is mid-recording when you arrive, you can either wait for the recording to finish or press the "Program Stop" button to stop the recording and then follow the steps above.

SM4 MODEL ACTIVATION & DEACTIVATION

ACTIVATING THE ARU

- Open the unit casing and turn the unit on by moving the power switch DOWN. You will be using the internal battery (INT).
- Wait for the unit to initialize.
- Push the "Check Status" button once to verify the date and time. Adjust if necessary.
    - The ARUs have been programmed for daylight savings time. After November 7th, 2021 and before March 13th, 2022 the units should be an hour ahead.
- In the "Main Menu" scroll to "Settings" and press "Enter/Menu"
- Scroll to "Location" and press "Enter/Menu"
- Select "Prefix"
- Change the file prefix to the site and station name using the directional arrow buttons. Use the format: "ABMI-[SITE#]-[STATION]". For example, the user label for an ARU deployed at site 905 in the NE corner would be: ABMI-905-NE. *
- Press and hold the up and down arrow keys at the same time to make a test recording.
- During the test recording leave a voice stamp with the following information: Site #, Station, Date, Time, ARU Unit #, Crew Members
    - To help streamline the audio file analysis process, be sure to start the voice stamp with the site ID. This must be the first thing said on the recording and must be said using individual letters and numbers. For example, the voice stamp for the ARU at the SE station of site 907 would start with "A-B-M-I-Dash-Nine-Zero-Seven-Dash-Southeast". The rest of the required information can then be provided in any order.
- Press "Schedule Stop" to stop the test recording once you have finished recording your voice stamp
- Press the "Schedule Start" button to commence the programmed schedule. The following message will be displayed before the unit goes to sleep: "Going to sleep until <date and time>"
    - Date and time should correspond to the start time programmed into the .SM4S file. This may vary depending on the recording schedule.

* We recommend programming the prefix for each unit ahead of time (i.e., before deployment). This saves a lot of time in the field, and the LCD screens work better at warmer temperatures.

DEACTIVATING THE ARU

- Open the unit casing and press and hold the "Stop Program" button for several seconds.
- Wait for the unit to initialize. Press "Check Status" to review SD card information.
- In the "Main Menu" scroll to "Settings" and press "Enter/Menu"
- Scroll to "Location" and press "Enter/Menu"
- Select "Prefix"
- Copy down the prefix that has been programmed into the ARU exactly as it is displayed.
- Turn the unit off by sliding the power switch UP (EXT)
- Record the ARU unit ID and SD card numbers in the tablet and slide the cards back into the unit

- If the ARU is mid-recording when you arrive, you can either wait for the recording to finish or press the "Schedule Stop" button to stop the recording and then follow the steps above.

DEPLOYMENT IN TREED AREAS

FIELD EQUIPMENT

- Standard Field Equipment (see Deployment: Standard Field Equipment on page 3)
- Cordless drill with battery
- Square socket (Robertson) head drill bit
- C-bracket (1 per camera)
- Deck screws (4 per camera, 2 per ARU)
- ¼" flat washers (4 per camera)
- Knife/saw (if needed to trim branches/vegetation; gloves are required when using knives or saws)
- $^{3}/_{8}$ x 8" eyebolt with nut or Python cable lock and key

CAMERA DEPLOYMENT INSTRUCTIONS

- Identify a suitable attachment point for the camera in the vicinity of the target area (e.g., tree, fence post)
- Camera position should be determined following these guidelines:
    - Targeting a detection zone ~5m from the camera
    - A view, at least 5m wide and 10m long, that is not obstructed by shrubs or trees
    - Set at a height of 1m (ground to bottom of the camera lens) (Figure 6) and angled to hit a point 80cm above the ground, 5m away from the camera lens (Figure 4)
        - The goal is to maximize detections of mid- and large-sized mammals in the target area (no farther than ~10m from the camera), and not small animals right under camera
    - Ideally facing North, or alternatively South, to avoid visibility problems with direct sunlight from East and West.
        - **Note**: In forests and shrubby areas where direct sunlight is less of an issue due to canopy cover, achieving a 5m wide by 10m long view takes priority over what direction the camera faces.
- Dig down through the snow, if necessary, and mount the camera so it will be 1m above the ground surface.
    - If the tree is on a hill, measure a height of 1m from the high side.
- Holding the camera against the tree, determine the attachment location that will best capture the target area, and attach the C-bracket to the tree. Ensure that all 4 screws are tight to make it more difficult for bears to re-direct the camera. Use washers with each screw to prevent screw heads from slipping through the holes in the C-bracket.
- For non-scented locations (NW and SE points of baseline survey sites), drive a 1.3m painted conduit stake 0.3m into the ground, 5m in front of the camera in the target area
    - Ensure that after the snow melts no more than 1.0m of conduit will be visible (Figures 4 & 6)

- For scented locations (NE and SW points of baseline survey sites), hammer a red lure stake through a PVC scent tube. Smear 1 tablespoon of scent into the PVC tube
- If necessary, clear vegetation interfering with visibility of target area (e.g., branches, small shrubs). Try to anticipate vegetation growth as much as possible (i.e., remove saplings/branches that might grow/leaf/blow in front of camera).
- Follow the steps in *Activating the Camera*
- Loop the python cable lock (if using) through the hole in the camera unit and pull tight to secure the camera to the tree. Use the "cinch" setting on the lock when tightening. Move to "lock" and remove the key once tightened.
    - If using a python lock, secure with the lock opening facing down. This reduces the amount of debris and moisture that accumulates in the lock.
    - In areas where cameras are not locked, use an eyebolt and nut to hold the camera in place
- Fill out the photo sheet with the ABMI site number, Station, Camera #, and Date, and take a series of test photos (see Appendix 5: Data and Photo Sheets for an example photo sheet)
    - Wait for the camera to arm and take a test photo holding the photo sheet. Start at the painted conduit stake and walk slowly towards the camera, tilting the laminated sheet slightly downward to avoid sun glare on the shiny surface.
- Fill in all data fields in the tablet and any problems encountered in setting the camera
- Use the waypoint average feature on the GPS to create a waypoint (see GPS Coordinates on page 21 for more information) and record the GPS co-ordinates in a WordPad file on the tablet, or on your datasheet.
- Take a photo of the camera set-up (see Photos on page 21 for more information)
- Before leaving the camera, check that the clear plastic areas are clean and not covered in fingerprints or dirt. Clean these areas with a lens wipe if needed.

Before leaving site make sure:

- Camera is securely attached and armed
- Key is removed from cable lock (if applicable)
- Test photos with photo sheet have been taken
- GPS location is accurately recorded and all tablet fields are filled in
- Camera set-up photo has been taken

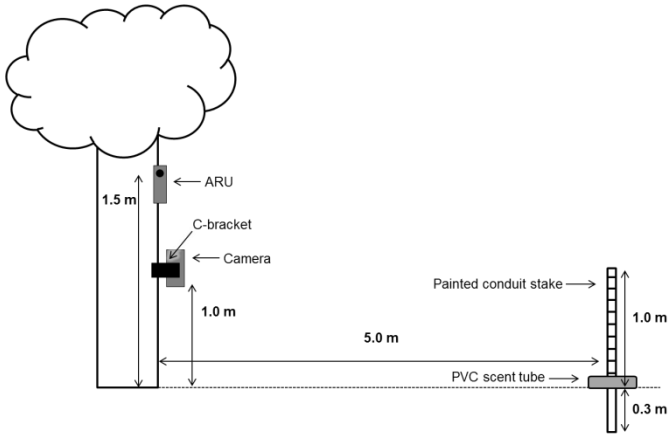


Figure 6. Camera and ARU set in a treed location. Ideally, both units should face north. PVC scent tube only present at NE and SW stations and anchored with a lure stake rather than the painted conduit.

ARU DEPLOYMENT INSTRUCTIONS

- Choose trees that are not wider than the ARU (tree diameter depends on the ARU model). A wider tree will interfere with sound reaching the microphones (Figure 7). Ensure that both microphones can be seen from behind the tree.
- Remove any branches that may interfere with the ARU microphones
- Mount the ARU on the NORTH side of the tree (+/-5° of 0°) to protect unit from direct sun and ensure more accurate temperature readings. The microphones should be pointing east and west.
- Mount ARU at a height of 1.5m (ground to microphone) (Figures 6 & 7). Screw in both top and bottom brackets.
    - If deploying an SM4: Be careful not to warp the unit's plastic casing during deployment. Over tightening screws or adding 2 screws to the upper or lower bracket for moderate directional adjustment can warp the unit's casing and damage its seal. A damaged seal allows snow and water to accumulate in the unit and can cause permanent damage. If units are being deployed for a multi-year stretch, remember that young aspens grow quickly and that this growth can add additional strain to the unit case. Whenever possible, deploy SM4s to coniferous trees or to mature deciduous trees where rapid growth is less common. If only young deciduous trees are available, use one screw in each of the top and bottom brackets to minimize the torque on the unit as the tree grows.
- Follow the steps described in *Activating the ARU*
- Lock the unit to the tree (if applicable)
    - If using a cable lock, make sure that the lock cable is not touching the microphones
- If using an SM4 unit, ziptie the front cover shut to prevent accidental opening, cut the end of the ziptie with wire cutters
- Fill in all data fields in the tablet and any problems encountered in setting the ARU
- Use the waypoint average feature on the GPS to create a waypoint (see GPS Coordinates on page 21 for more information) and record the GPS co-ordinates in a WordPad file on the tablet, or on your datasheet.
    - Only one point is needed if ARU and camera are in the same location. One point per unit is needed if camera and ARU are mounted on separate trees.
- Take a photo of the ARU set-up (see Photos on page 21 for more information)
    - Only one photo is needed if ARU and camera are mounted on the same tree. One photo per unit is needed if camera and ARU are mounted on separate trees.

Before leaving site make sure:

- ARU is securely attached and ready to record at the correct time
- Test recording has been made
- Nothing is touching the microphones
- Key is removed from cable lock (if applicable)
- GPS location is accurately recorded and all tablet fields are filled in
- ARU set-up photo has been taken

Figure 7. ARU placement on a tree. Microphones are wider than the trunk, thus ensuring that sound is not blocked by the tree.

DEPLOYMENT WITHOUT USING SCREWS

In areas where units cannot be mounted to trees using screws (e.g., protected areas such as provincial parks), it is necessary to mount units using less invasive means.

FIELD EQUIPMENT FOR ROPE/WEBBING ATTACHMENT METHOD

- Standard Field Equipment (see Deployment: Standard Field Equipment on page 3)
- Rope or webbing

CAMERA ATTACHMENT

- Identify a suitable location for deploying the camera
- Attach camera to tree by threading the rope through the camera lock channel and tie the camera to the tree
- Wrap the rope around the tree several times to ensure that the camera is securely attached
    - If necessary, HP2X cameras can be successfully mounted to a tree with the adjustable webbing straps supplied by Reconyx. Thread the webbing through the designated channel and cinch to tree. Wrap excess webbing around the tree and tuck in the tail to avoid it flapping in front of the camera.
- Once camera is deployed, thread a cable tie through each padlock loop in the camera, and zip closed to prevent accidental opening

ARU ATTACHMENT

- Identify a suitable location for deploying the ARU
- Secure ARU to tree at desired height by threading rope through the mounting brackets
- Wrap the rope around the tree several ties to ensure that the ARU is securely attached
- Once the ARU is deployed, thread a cable tie through the padlock loop in the ARU (SM4 only), and zip closed to prevent accidental opening

FIELD EQUIPMENT FOR ZIP TIE ATTACHMENT METHOD

- Standard Field Equipment (see Deployment: Standard Field Equipment on page 3)
- 24" UV Resistant Heavy-Duty Cable Ties

CAMERA ATTACHMENT

- Identify a suitable location for deploying the camera
- Attach a C-bracket to the tree using two heavy duty cable ties wrapped around both the trunk and bracket ensuring the ties cross each other (i.e., form an X) to minimize movement
- If the tree diameter is too large, two cable ties can be attached together to lengthen them
- Adjust the camera aim prior to fully tightening the zip-ties

ARU ATTACHMENT

- Identify a suitable location for deploying the ARU
- Secure ARU to tree at desired height by threading cable ties through the top and the bottom mounting brackets and then wrapping them around the tree
- Adjust the unit height and direction prior to tightening the cable ties
- Once the ARU is deployed, thread a smaller (7½" long) cable tie through the padlock loop in the ARU (SM4 only), and zip closed to prevent accidental opening

RETRIEVAL IN TREED AREAS

FIELD EQUIPMENT

- Standard Field Equipment (see Retrieval: Standard Field Equipment on page 4)
- Cordless drill with battery and square socket (Robertson) bit
- Screwdriver – square socket (Robertson) head
- Wire cutters
- **Python lock key** (at some sites)

CAMERA RETRIEVAL INSTRUCTIONS

- Once you locate the camera, fill out the photo sheet with the ABMI site number, Station, Camera # and Date and take a series of test photos.
    - Start at the painted conduit stake and walk slowly towards the camera, tilting the laminated sheet slightly downward to avoid sun glare on the shiny surface.
- Before dismantling the set-up, take a landscape photo as described under Photos on page 21
- Open the camera cover; this might require cutting zip ties, removing an eyebolt or python lock, and then sliding the camera out of the C-bracket beforehand
- Follow the instructions for *Deactivating the Camera*
- Place the camera in a secure location
    - Wrap the camera in bubble wrap or put it in a laptop case during transport
- Double bag scent tubes in two Ziploc bags; place in plastic grocery bag
- Tape painted conduit markers together for easier transport

ARU RETRIEVAL INSTRUCTIONS

- Before dismantling the set-up, take a landscape photo as described under Photos on page 21.
    - Only one set-up photo is needed if ARU and camera are mounted on the same tree, one photo per unit is needed if ARU and camera are mounted on separate trees.
- Follow the instructions for *Deactivating the ARU*
- Remove the ARU from the tree and place it in a laptop case for secure transport

If the ARU is mid-recording when you arrive, you can either wait for the recording to finish or press the "Program Stop" button

DEPLOYMENT IN PASTURE AND CROP FIELDS

Deploying cameras and ARUs in pasture and crop fields is similar in that in both cases units are attached to a post secured in the ground. The main difference between the two locations is that in a pasture, an agronomy cage is installed in order to prevent cattle from interfering with the units. Since cattle are not a major concern in crop fields, an agronomy cage is not used.

ADDITIONAL FIELD EQUIPMENT

- Standard Field Equipment (see Deployment: Standard Field Equipment on page 3)
- Steel post (7'/2.1 m; Dimensions: 1¼" x 1 ¼" x 0.100) with pre-drilled holes
- $^{7}/_{16}$" wrench
- $^{5}/_{16}$" socket wrench
- Custom A-bracket
- ¼ x 2½" carriage bolt (1)
- ¼ inch nut (2)

- ¼ inch flat washer (2)
- Hose clamps ($1^{1}/_{16}$ – 2”) (2)
- Post pounder
- Cable ties (7½” length)
- Tuck tape
- Python cable lock and key
- Agronomy cage (Four 6’1”/1.9 m x 3’6”/1.1 m panels) ***PASTURE SITES ONLY**

CAMERA & ARU DEPLOYMENT INSTRUCTIONS

- Ensure that the given location is suitable for deployment
- Dig a small clearing
    - Crop Field: ~ 0.1m^2 – just large enough for the post
    - Pasture: ~ 2.0m^2 – the agronomy cage will need to fit into the clearing
- Pound the 7’/2.1m steel post into the ground using the post pounder
    - Ensure that ~ 0.5m of the post is below the surface
    - Ensure that the post is positioned so that the camera will face the appropriate habitat, and the ARU will face North.
- Camera position should be determined following these guidelines:
    - Targeting a detection zone ~5m from the camera
    - A view, at least 5m wide and 10m long, that is not obstructed by shrubs and trees
    - Set at a height of 1m (ground to bottom of the camera lens) (Figure 6) and angled to hit a point 80cm above the ground, 5m away from the camera lens (Figure 4)
        - The goal is to maximize detections of mid- and large-sized mammals in the target area (no farther than ~10m from the camera), and not small animals right under camera
    - Ideally facing North, or alternatively South, to avoid visibility problems with direct sunlight from East and West.
        - **Note**: Ensure that the camera faces the habitat type of its original location (i.e., face the camera into a crop field rather than along the fence line it was moved to). **Facing units north/south is secondary to facing the units into the correct habitat type.**
- Dig down through the snow if necessary and mount the camera so it will be 1m above the ground surface.
- Place a nut and washer on the carriage bolt. Thread the bolt through one of the pre-drilled holes in the post and screw into the threaded inset on the back of the camera. Tighten the nut with a wrench.
    - To adjust the tilt of the camera: Add a custom A-bracket (with additional nut and washer) between the camera and post before the camera is bolted in place (Figure 8)
        - Slide the bracket up and down to adjust the tilt of the camera
        - Tighten nuts with a wrench
- Mount the ARU onto the steel post at a height of 1.5m (ground to microphones) using two hose clamps
- For non-scented locations (NW and SE points of baseline survey sites), drive a 1.3m painted conduit stake 0.3m into the ground, 5m in front of the camera in the target area
    - Ensure that after the snow melts no more than 1.0m of conduit will be visible
    - If there is not enough room to place a stake 5m in front of the camera, get as close to 5m as possible, but omit the conduit stake if it is closer than 3m.

- For scented locations (NE and SW points of baseline survey sites), hammer a red lure stake through a PVC scent tube. Smear 1 tablespoon of scent into the PVC tube
    - If the station is lured but the stake cannot be placed, scent should still be applied in front of the camera by digging a small hole and placing lure within it
- Follow the remaining instructions in *Deployment in Treed Areas* for both the camera and ARU
- To activate the units, follow the instructions in *Activating the Camera* and *Activating the ARU*
- Loop the python cable lock through the holes in the camera unit, the ARU, and the post. Use the "cinch" setting on the lock when tightening. Move to "lock" and remove key once tightened.
- Thread a cable tie through each padlock loop in the camera and ARU (SM4 only), and zip closed to prevent accidental opening of the unit
- Cover any open holes on the post with strips of tuck tape to prevent loud whistling noises from being recorded by the ARU in windy conditions
- Use the waypoint average feature on the GPS to create a waypoint (see GPS Coordinates on page 21 for more information) and record the GPS co-ordinates in a WordPad file on the tablet, or on your datasheet.
- In pasture only: surround the post with an agronomy cage and fasten panels with zip ties (Figure 9)
- Take a landscape photo of the set-up (see Photos on page 21 for more information)

Figure 8. Custom A-bracket attached between the post and camera to adjust the tilt of the unit.

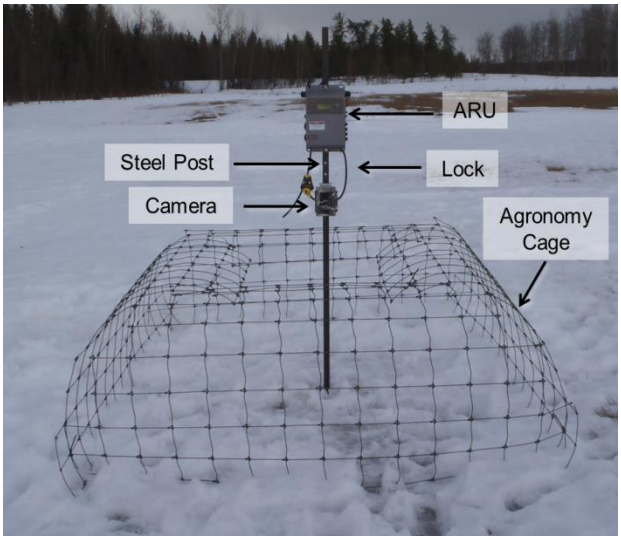


Figure 9. Camera and ARU deployed in a pasture. In a crop field, the set-up is not be surrounded by an agronomy cage.

RETRIEVAL IN PASTURE AND CROP FIELDS

ADDITIONAL FIELD EQUIPMENT

- Standard Field Equipment (see Retrieval: Standard Field Equipment on page 4)
- Flat head screwdriver or socket wrench (for ARUs)
- $^{7}/_{16}$" wrench
- **Python lock key**

SPECIFIC RETRIEVAL INSTRUCTIONS

- Before dismantling the set-up, take a landscape photo as described under Photos on page 21
- Fill out the photo sheet with the ABMI site number, Station, Camera # and Date and take a series of test photos.
    - Start at the painted conduit stake and walk slowly towards the camera, tilting the laminated sheet slightly downward to avoid sun glare on the shiny surface.
- In pasture only: Cut zip ties and remove cage panels (Figure 9). Flatten panels for easier transport.
- Follow the instructions for *Deactivating the ARU* and *Deactivating the Camera*
- While holding on to the ARU, unscrew the hose clamps holding it in place and remove the unit from the post. Place it in a laptop case for secure transport.
- Remove camera from post
    - Loosen the nut farthest away from the camera first
    - Unscrew the bolt from the threaded inset on the back of the camera
    - Remove custom bracket (Figure 8) if necessary
- Remove the 7'/2.1m steel post
- Pull the conduit or lure stake and PVC tube out of the ground

DEPLOYMENT IN WET, TREELESS LOCATIONS

Units deployed at wet sites (e.g., bogs and fens) where there are no suitable trees for unit attachment will need to be mounted to conduit and stabilised with a tripod (Figure 10).

ADDITIONAL FIELD EQUIPMENT

- Standard Field Equipment (see Deployment: Standard Field Equipment on page 3)
- Tripod
- Rebar (2m)
- Conduit; aluminum, ½" diameter (2m)
- Post pounder
- Mounting blocks
- Hose clamps (¾ – 1¼")

- $^{5}/_{16}$" socket wrench
- $^{7}/_{16}$" socket wrench with extension
- Cable ties (7½" length)
- Python cable lock and key

CAMERA & ARU DEPLOYMENT INSTRUCTIONS

- Identify a suitable location for deploying the camera and ARU
- Dig a clearing large enough so that when finished, the tripod legs will be standing on the ground (about $1m^2$)
- Pound the 2m rebar into the ground using the post pounder (Figure 10)
    - Ensure that at least 1.0m of the rebar is below the surface since this will act as an anchor when the ground thaws
- Slide the tripod and mounting block over the conduit, then slide the 2m conduit over the rebar
- Pound the conduit into the ground so at least 0.5m is below the surface
- Open the tripod legs, and ensure that all of them are resting on the frozen ground
- Camera position should be determined following these guidelines:
    - Targeting a detection zone ~5m from the camera
    - A view, at least 5m wide and 10m long, that is not obstructed by shrubs and trees
    - Set at a height of 1m (ground to bottom of the camera lens) (Figure 6) and angled to hit a point 80cm above the ground, 5m away from the camera lens (Figure 4)
        - The goal is to maximize detections of mid- and large-sized mammals in the target area (no farther than ~10m from the camera), and not small animals right under camera
    - Ideally facing North, or alternatively South, to avoid visibility problems with direct sunlight from East and West.
- Attach the mounting block to the threaded inset on the back of the camera using the socket wrench with extension, and tighten to conduit so that the camera lens is at a height of 1m above the ground (Figure 10)
- Mount the ARU onto the conduit at a height of 1.5m (ground to microphones) using two hose clamps
- For non-scented locations (NW and SE points of baseline survey sites), drive a 1.3m painted conduit stake 0.3m into the ground, 5m in front of the camera in the target area
    - Ensure that after the snow melts no more than 1.0m of conduit will be visible
- For scented locations (NE and SW points of baseline survey sites), hammer a red lure stake through a PVC scent tube. Smear 1 tablespoon of scent into the PVC tube
- Follow the remaining instructions in *Deployment in Treed Areas*
- To activate the units, follow the instructions in *Activating the Camera* and *Activating the ARU*
- Thread a cable tie through each padlock loop in the camera and ARU (SM4 only), and zip closed to prevent accidental opening
- Use the waypoint average feature on the GPS to create a waypoint (see GPS Coordinates on page 21 for more information) and record the GPS co-ordinates in a WordPad file on the tablet, or on your datasheet.
- Loop the python cable lock through the holes in the camera unit and the ARU. Use the "cinch" setting on the lock when tightening. Move to "lock" and remove key once tightened.
- Take a landscape photo of the set-up (see Photos on page 21 for more information)

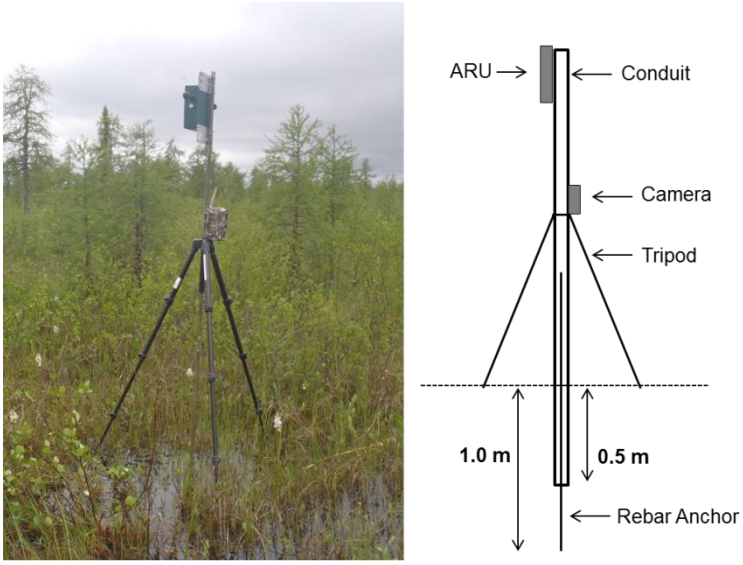


Figure 10. Camera and ARU set up in a wet area using a tripod mount

RETRIEVAL IN WET, TREELESS LOCATIONS

ADDITIONAL FIELD EQUIPMENT

- Standard Field Equipment (see Retrieval: Standard Field Equipment on page 4)
- Flat head screwdriver (for hose clamps)
- $^{7}/_{16}$" socket wrench with extension
- Wire cutters
- Python lock key (at some sites)

SPECIFIC RETRIEVAL INSTRUCTIONS

- Before dismantling the set-up, take a landscape photo as described under Photos on page 21
- Fill out the photo sheet with the ABMI site number, Station, Camera # and Date and take a series of test photos.
    - Start at the painted conduit stake and walk slowly towards the camera, tilting the laminated sheet slightly downward to avoid sun glare on the shiny surface.
- Unlock the camera and ARU from the tripod (if applicable)
- Follow the instructions for *Deactivating the ARU* and *Deactivating the Camera*
- While holding on to the ARU, unscrew the hose clamps holding it in place and remove the unit from the conduit. Place it in a laptop case for secure transport.
- Unscrew and slide the camera mounting block over the conduit
- Remove the mounting block from the threaded inset on the back of the camera using a socket wrench with extension
- Pull the tripod, tripod conduit, rebar, painted conduit or lure stake and PVC tube out of the ground

ARU AND REMOTE CAMERA DATA COLLECTION

Fill out ALL data fields every time you deploy or pick-up a camera/ARU. Do not rely on your memory to fill in information later. If for some reason you end up at a deployment or pick-up without your tablet or back-up datasheets (See Appendix 5 for an example of the required data and photo sheets), use your field notebook to record the correct information and transcribe the data into the tablet once you get to your truck or camp location.

GPS COORDINATES

You will be provided with Garmin GPSMAP 78 units to use in the field. You will have to mark the location of every camera and ARU deployed. Please use waypoint averaging when collecting coordinates to ensure that locations are as accurate as possible. Once the GPS point has been collected, record the GPS co-ordinates in a WordPad file on the tablet, or in writing on your datasheet. Double check that the co-ordinates have been properly transcribed. If saving in Wordpad, save the file to the tablet desktop as GPS_[Block Name]_[Block ID].rtf (e.g., GPS_ Edmonton_E27.rtf), and continue adding to it for each deployment point visited.

To Collect a Waypoint

- "Main Menu" → "Waypoint Avg." → "Create Waypoint"
- Lay the GPS unit on the ground or hang on a tree branch as close as possible to where the camera/ARU is deployed
- When the Sample Confidence reaches 100%, hit "Save"
- The waypoint will be automatically named. Rename the waypoint using the convention below or note the temporary name so that you can re-name it to something more informative at a later time.

To Re-name a Waypoint

- "Main Menu" → "Waypoint Mgr."
    - Select waypoint that you would like to re-name
- Re-name each waypoint using the following convention: [Site #]-[Station]-[CAM/ARU/BOTH]. E.g., 992-NE-BOTH

All camera and ARU naming conventions are listed in Appendix 3: ABMI Naming Conventions. Submit your GPS waypoint and WordPad text file once your deployment shift is complete.

PHOTOS

To do an assessment of vegetation and to keep a record of what every point looks like, photos are taken at every camera/ARU deployment location. Photos must be checked for quality while in the field and **must be retaken if unclear or of poor quality.**

- When checking photos, make sure they are not blurry and are not obscured by water droplets on the lens, blurry mosquitos in the foreground, or fingers at the sides. Make sure the photo is level, well framed, and taken in the appropriate direction. Photos must be clear and representative of the site at which they were taken to meet their intended purpose.

At Deployment

- Take one landscape photo of the camera and ARU set-up (or two photos if the units are attached to separate trees) using a digital camera
- Ensure the ground is visible at the bottom of the photo with the camera and ARU in the centre of the image
- Check the quality of the photos (see above). **Photos of poor quality MUST be retaken**.
- Label the photos with the year, site number, station, unit present, and SET (to indicate that you took a photo of the set-up): **ABMI_YEAR_[Site#]_[Station]_[ARU/CAM/BOTH]_SET**. E.g., a photo of the camera and ARU at the NE station at site 333 would be "ABMI_2021_333_NE_BOTH_SET"

At Retrieval

- Take seven photographs using a digital camera
    - *Transect Photos*: From the camera/ARU location, take landscape photographs at eye level in each of the four sub-ordinal directions (NE, NW, SW, SE).
    - *Representative Site Photo* – From anywhere near the camera/ARU; take a single photograph that best represents the physical and vegetation characteristics of the site (SITE).
    - *Canopy Photo*: Standing at the camera/ARU, take a photograph of the canopy from waist height with the digital camera pointing directly up (CANOPY).
    - *Set-Up Photo*: Take one landscape photo of the camera and ARU set-up using a digital camera. Ensure the ground is visible at the bottom of the photo with the camera and ARU in the centre of the image (SET).
- If the camera and ARU are attached to separate trees, take a total of 12 photos
    - Take four transect photos (one in each of the sub-ordinal directions), one set-up photo of the camera, one set-up photo of the ARU, one canopy photo at the camera only, and one representative site photo that depicts the general area surrounding both the camera and ARU locations.
- Check the quality of the photos (see above). **Photos of poor quality MUST be retaken**.
- Label the photos with the year, site number, station, unit type, and direction (NE/NW/SW/SE/SITE/CANOPY/SET): **ABMI_YEAR_[Site#]_[Station]_[ARU/CAM/BOTH]_[DIRECTION]**. For example, a transect photo facing NE at the NE station at site 333 where there is only a camera would be "ABMI_2021_333_NE_CAM_NE"

All camera and ARU naming conventions are listed in Appendix 3: ABMI Naming Conventions.

CONDITION

To help with camera/ARU inventory and repair before the following field season, record the physical and mechanical condition of each unit during retrieval. Circle the applicable physical and mechanical condition on the datasheet or select the appropriate condition from a drop-down in the tablet and **note any relevant details in the comments section**.

Physical

- Excellent: Unit appears to be in good working order and will be unlikely to need repair.
- Good: Unit may need some minor repair, but damage is unlikely to affect unit function. Examples include: bite marks that do not penetrate unit casing, broken infrared mask on camera, peeling paint.

- Fair: Unit may need some minor repair. Damage may affect unit function, or the quality of the data collected. Examples include: missing wind cover on ARU microphones or muddy/caterpillar encrusted camera lens.
- Poor: Unit will likely need major repair. Examples include: broken ARU microphones, shattered camera lens, bite marks that penetrate unit casing, water damage.

Mechanical

- OK: Unit operation as expected.
- CHECK: There was a mechanical error or malfunction when unit was retrieved. Examples include: unit did not turn on, error messages appeared, low photo count or SD content; basically, anything out of the ordinary.

IMPORTANT CARE INSTRUCTIONS

Always handle the ARUs and camera units with care. They contain sensitive electronic components that will not withstand crushing or heavy impacts.

Transport: Dropping the units or having them bounce around during transport can cause damage to the connections inside and destroy the outside as well. Sharp or abrasive materials can also damage the lens cover on cameras and blur the images. In the field, always transport the ARUs and cameras in a padded bag.

The ARU microphones are sensitive to impact and pressure. If microphones are wet when you pick up a recorder, make sure to dry them out before storing the unit.

Rain, Snow, and other wet stuff: Extra care is required when handling ARUs and cameras in wet weather and in wet locations (e.g., bogs and fens). When these units are closed, they are watertight and can withstand most weather conditions in the field. However, **do not get water onto the electronic components inside**. Water will short out the electrical circuits and may cause permanent damage to the units. Take extra care when activating or deactivating cameras and SM4 units in wet conditions. The following steps may be used to minimize the amount of time a camera or ARU is open if you need to deploy in heavy snow or rain.

Rainy day activation:

- Set up cameras and ARUs in your truck or room: Load SD cards (if necessary), check batteries, pre-program site and station prefixes.
- Record unit number, SD card number, and other information in the tablet ahead of time so that a minimum amount of time is spent with the unit open in wet conditions.
- CLEARLY LABEL each recorder with the site and station that it is programed for.
- In the field, minimize the time units are exposed to the elements.

Note: If possible, please do not start ARU recordings until you are at the correct station. Test recordings are used to verify date and time of deployment. If you do have to start the recording schedule early or if you have to do a test recording ahead of time, please mark this clearly on your data sheet or in the tablet!

TROUBLESHOOTING

If the ARU will not start or record or is not recording equally on both channels, there are several things to check before taking it out of service.

Screen freezes: Just as with any other piece of electronic equipment, the unit will occasionally freeze and not respond to any of the buttons. If this happens, use the power switch to turn the unit off. Let it sit for a minute and then turn it back on. This will mostly get it started again. Check the SET/PGM/SM4S file (and reload if necessary). Check all settings after a forced shutdown like this.

Song Meter won't turn on: This mostly happens due to an interruption of the power supply. Check that the power switch is moved to "INT" power source (down) on the SM3 and SM4 models. Also, check that the batteries are placed correctly in the battery bay.

Timer batteries: The timer batteries will also affect how the Song Meter works. If you cannot set the time or the unit won't turn on, the timer batteries may need to be replaced. We can replace timer batteries in SM4 units, but only Wildlife Acoustics can replace timer batteries in SM3 units.

SD CARD MANAGEMENT

The photos and recordings on SD cards are very valuable and great care must be taken to ensure that stations and sites are not mixed up when units are collected in the field. Managing SD cards during retrieval is a very important task.

- Once back at camp, remove SD cards from cameras and ARUs
- Place each camera SD card into a yellow coin (2.25" x 3.5") envelope
- Place each ARU SD card into a blue coin envelope
    - Please do not seal the coin envelopes!
- Fill out labels on SD card coin envelopes as you go
- Place coin envelopes from one site (8 envelopes in total - 4 camera, 4 ARU) into a larger envelope (~4.5"x6.75"), and label it with the site number (Figure 11)
- Place sites from the same block into a large envelope
- Submit envelopes to your supervisor at the end of shift so they can be transported to the University of Alberta for processing

Remote crews: Leave SD cards in the units. Send units and associated data files back to base and the logistics coordinator will manage SD cards.

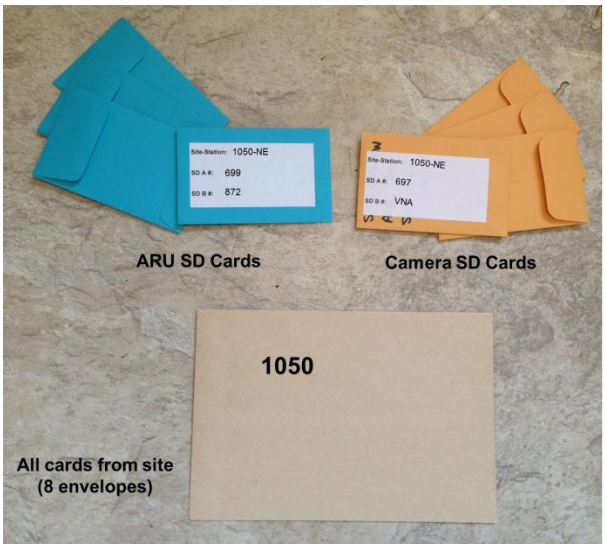
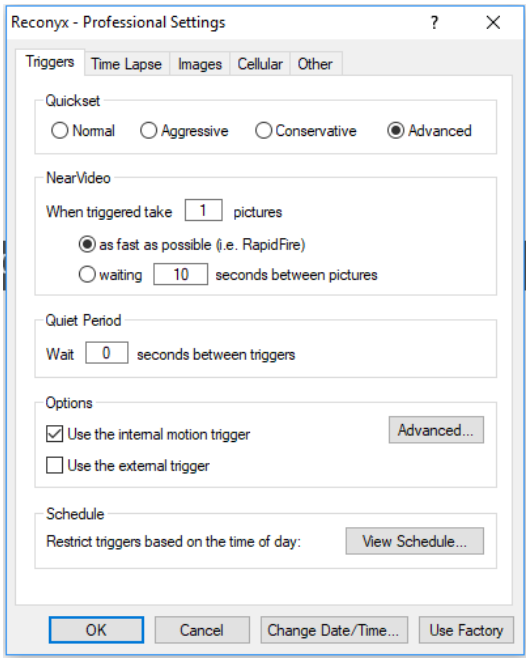
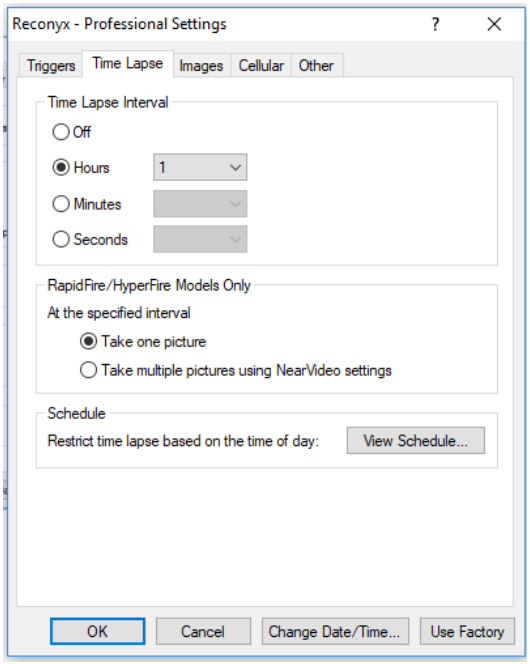


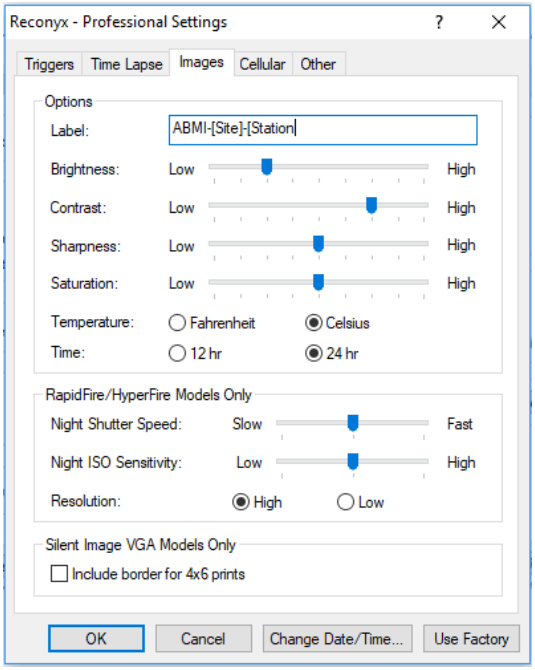
Figure 11. SD card management following unit retrieval from the field.

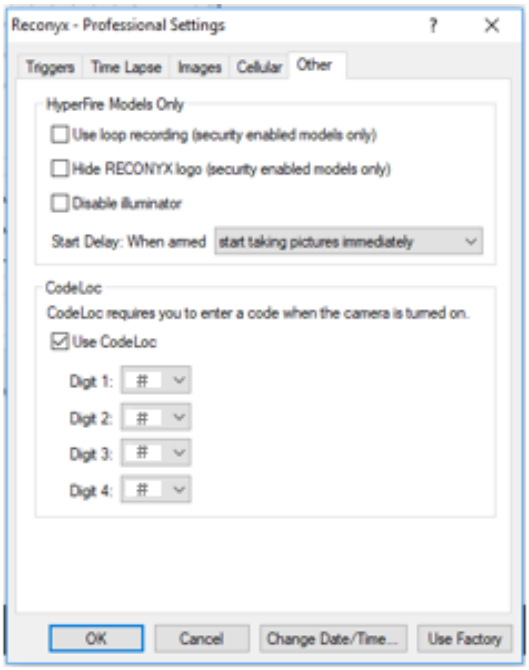
APPENDIX 1: REMOTE CAMERA TRAP SETTINGS

Reconyx PC900

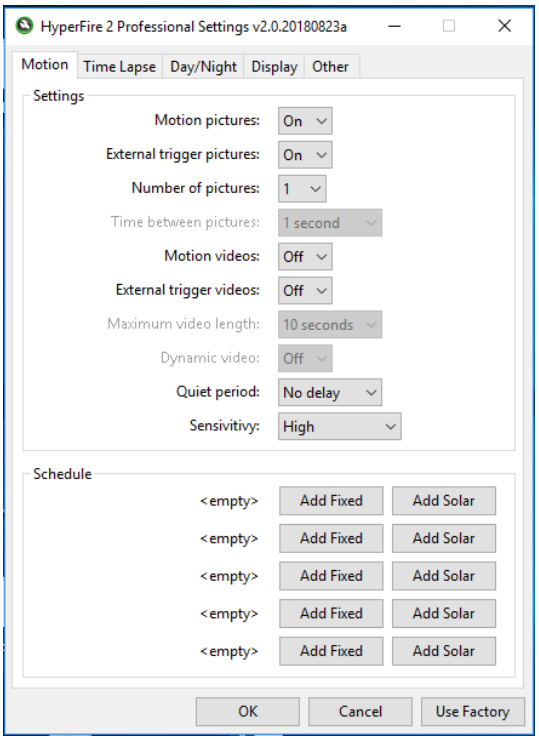


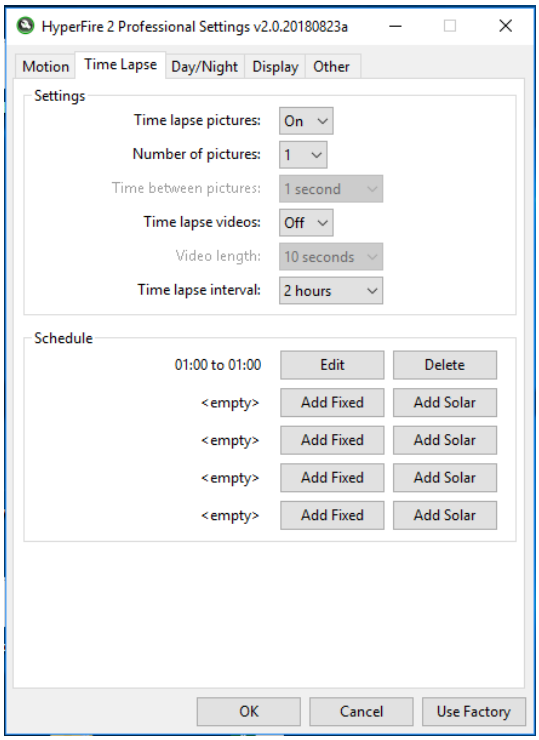


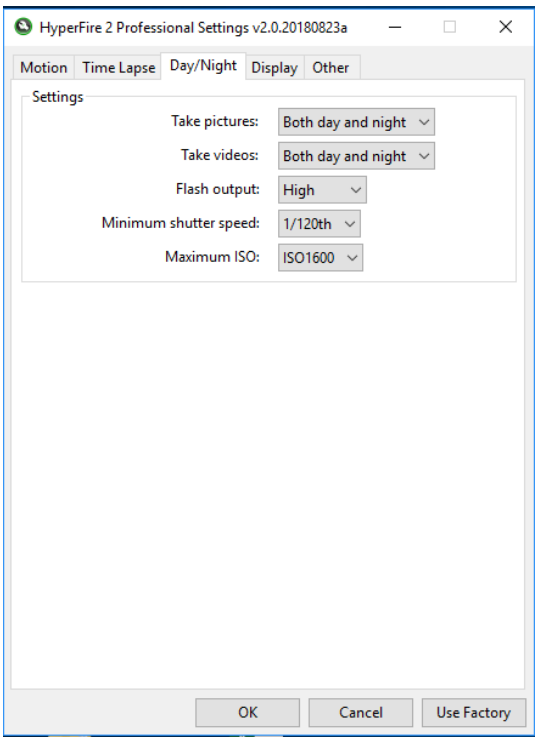


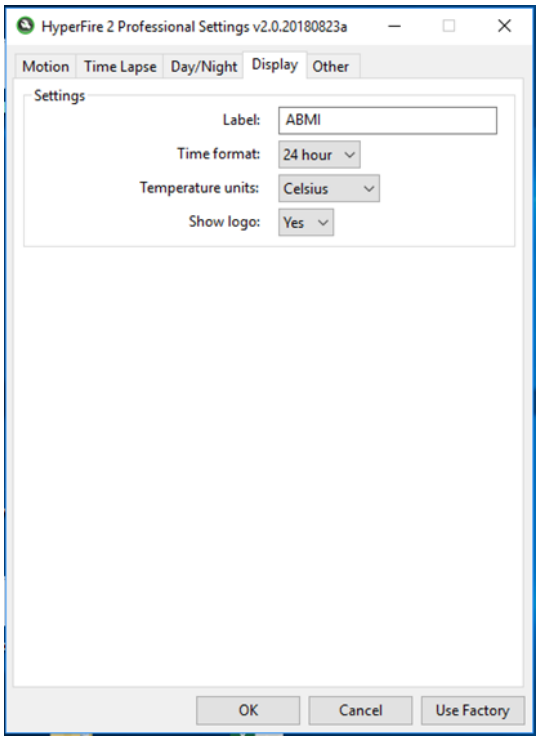


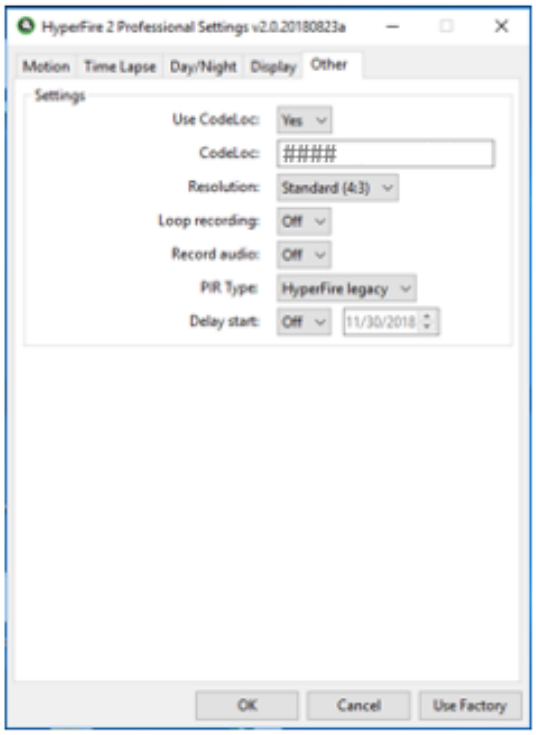
Reconyx HyperFire 2










HyperFire 2 Professional Settings v2.0.20180823a
Motion
Time Lapse
Day/Night
Display
Other
Settings
Use CodeLoc:
Yes
CodeLoc:
####
Resolution:
Standard (4:3)
Loop recording:
Off
Record audio:
Off
PIR Type:
HyperFire legacy
Delay start:
Off
11/30/2018
OK
Cancel
Use Factory

APPENDIX 2: ARU SETTINGS AND SCHEDULE

Information that is the same for SM3, and SM4

2021 Recording Schedule:

- 10 min at 00:00:00
- 3 min at 02:00:00
- 10 min at 30 min after sunrise
- 3 min at 2 hrs. after sunrise
- 3 min at 12:00:00
- 3 min at 15:00:00
- 3 min at 1 hr. before sunset
- 3 min at 1 hr. after sunset

Location (specified in SET/PGM/SM4S file):

- Latitude: 54.50 N
- Longitude: 115.00 W

Solar Mode: Sunrise/Sunset (specified in SET/PGM/SM4S file)

Timezone: UTC -06 (this is 6 from Prime Meridian = Mountain Standard Daylight Savings Time, specified in SET/PGM/SM4S file)

Memory:

- Slot A = 16 GB
- Slot B = 16 GB

OR

- Slot A = 32 GB
- Slot B = 32 GB

Batteries: 4 D-Cell batteries (Internal, Alkaline)

Note: SM3 programs are scheduled to do a 1-minute Test recording when they are put into stand by. When you press “Start Program” on the SM3, it will record 1 min and then say: Going to Sleep Until 01 March 2022 (or whenever the next scheduled recording time is).

Settings specific to SM3

SM3 does not use left and right to identify channels. The left channel is designated CH 0 and the right channel is CH 1.

All information for audio setting, file type, gain and schedule are specified in the SM3 program file. There are no longer any manual switches for any of these. Similar to the SM2, this info is entered line by line into the program using the SM3 configuration utility.

Program:

- 1 HPF CH 0: Off Ch 1: OFF
- 2 GAIN CH 0: 19.5 dB CH 1: 19.5 dB
- 3 FS WAC Format CH 0+1 48000 Hz
- 4 ZC Off DIV 8
- 5 TRGLVL CH 0: Off CH1: Off
- 6 RECORD 00:01:00
- 7 AT DATE 2022 Mar 01
- 8 REPEAT
- 9 AT TIME 00:00:00
- 10 RECORD 00:10:00
- 11 PAUSE 01:50:00
- 12 RECORD 00:03:00
- 13 AT SRIS +00:30:00
- 14 RECORD 00:10:00
- 15 PAUSE 01:20:00
- 16 RECORD 00:03:00
- 17 AT TIME 12:00:00
- 18 RECORD 00:03:00
- 19 AT TIME 15:00:00
- 20 RECORD 00:03:00
- 21 AT SSET -01:00:00
- 22 RECORD 00:03:00
- 23 PAUSE 01:57:00
- 24 RECORD 00:03:00
- 25 UNTCOUNT Forever

Settings specific to SM4

Settings and schedule are programed using SM4 Configurator software.

Settings:

Gain: Left: 12.5 dB, Right: 12.5 dB

Sample rate: 44100 Hz

Max Length (hh:mm): 1:00

LED delay off

Delay start (dd/mm/yyyy): 01/03/2022

Schedule:

- START time 00:00
- DUTY always
- END time 00:10
- START time 02:00
- DUTY always
- END time 02:03

- START rise + 00:30
- DUTY always
- END rise + 00:40
- START rise + 02:00
- DUTY always
- END rise + 02:03
- START time 12:00
- DUTY always
- END time 12:03
- START time 15:00
- DUTY always
- END time 15:03
- START set – 01:00
- DUTY always
- END set – 00:57
- START set + 01:00
- DUTY always
- END set + 01:03

Camera/ARU	Data Type	Format	Examples
GPS Coordinates	Camera/ARU Deployment Location *(1 point if units are mounted together,* *1 point/unit if units are mounted separately)*	[Site]-[Station]-[CAM/ARU/BOTH]	- 992-NE-BOTH - 1456-NE-CAM - 1456-NE-ARU
	Coordinate Text File	GPS_[Block Name]_[Block ID].rtf	- GPS_Nordegg_C32.rtf
Station Photos	Camera/ARU Deployment Photos *(1 photo/station if units are mounted together,* *1 photo/unit if units are mounted separately)*	ABMI_[Year]_[Site]_[Station]_[CAM/ARU/BOTH]_SET	- ABMI_2021_992_NE_BOTH_SET - ABMI_2021_398_SW_CAM_SET - ABMI_2021_1456_NE_ARU_SET
	Camera/ARU Retrieval Photos *(7 photos/station if units are mounted together,* *12 photos/station if units are mounted separately)*	ABMI_[Year]_[Site]_[Station[1]]_[CAM/ARU/BOTH]_[NE/NW/SE/SW/SITE/CANOPY/SET[2]] [1] Station = Quadrant [2] NE/NW/SE/SW/SITE/CANOPY/SET = Direction	- ABMI_2021_333_NE_CAM_NW - ABMI_2021_333_NE_ARU_NW - ABMI_2021_965_SW_BOTH_SET - ABMI_2021_965_SW_BOTH_CANOPY
SD Card Management	Camera SD Cards	Include on envelope: - [Site]-[Station] - SD A # - SD B #: VNA* **Cameras have only 1 SD Card*	Site-Station: 1050-NE SD A #: 699 SD B #: VNA
	ARU SD Cards	Include on envelope: - [Site]-[Station] - SD A # - SD B #	Site-Station: 1050-NE SD A #: 654 SD B #: 231
Unit Prefixes	Camera Prefix	ABMI-[Site]-[Station]	- ABMI-905-NE - ABMI-1345-SE
	ARU Prefix	ABMI-[Site]-[Station]	- ABMI-905-NE - ABMI-1345-SE
More Information	For more information, please review the following sections in the Terrestrial ABMI Autonomous Recording Unit (ARU) and Remote Camera Trap Protocols. - For GPS coordinate information: GPS Coordinates (page 21) - For Deployment and Retrieval photo information: Photos (page 21) - For Camera and ARU SD card information: SD Card Management (page 24) - For Camera Prefix information: Activating the Camera (page 5) - For ARU Prefix information: Activating the ARU (page 8 for SM3 or page 9 for SM4)		

APPENDIX 4: MAPS FOR SITES IN CROP FIELDS & PASTURE

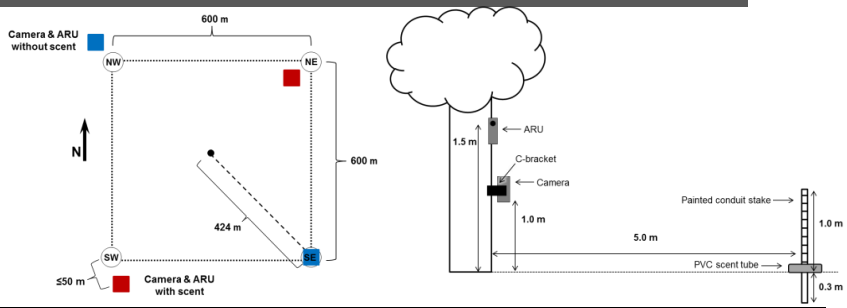
Sites in crop fields require special attention since camera traps and ARUs will need to be deployed in locations that will not be disturbed during the field season. This requires careful planning well before deployment and extensive work to obtain permission from landowners.

A map is created ahead of time following the criteria outlined in *Sites in Crop Fields: Selection Criteria*. The primary camera and ARU locations are labelled SITE CORNER-1 (e.g., NE-1) and are represented by a yellow star symbol. The alternate camera and ARU locations are numbered in order of preference (e.g., SE-2 is preferred over SE-3) and are represented by a yellow dot (Figure 12).

Figure 12. Map showing primary and alternative choices of where to move each station. It is important to look at several years of GIS data to make a well-informed choice.

APPENDIX 5: DATA AND PHOTO SHEETS

Camera & ARU Deployment



Site #:_____

Crew Members:_____

Date(s):_____

STATION	NE	Alternate Used[1]		Deployment Type[2]	Tr C P Tp O
Camera Unit #		SD Card #		File Prefix[3]	
Camera Height Above Ground[4] (m)		Direction[5] (°)		Time Set[6]	
Stake Distance (m)[7]		Target[8]		Scented[9]	Yes / No
GPS Label[10]		Latitude		Longitude	
Test Photo[11]	Yes / No	Set-Up Photo #[12]			
Comments[13]					
ARU Unit #		SD A – Card #		SD B – Card #	
Distance to Camera[14] (m)		File Prefix[3]			
ARU Height Above Ground[15] (m)		Direction[5] (°)		Time Set[6]	
Test Recording[16]	Yes / No	Set-Up Photo #[12]			
GPS Label[10]		Latitude		Longitude	
Comments[13]					

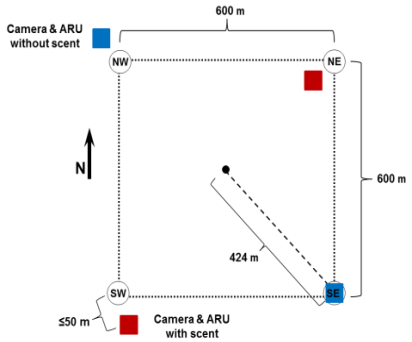
STATION	SE	Alternate Used[1]		Deployment Type[2]	Tr C P Tp O
Camera Unit #		SD Card #		File Prefix[3]	
Camera Height Above Ground[4] (m)		Direction[5] (°)		Time Set[6]	
Stake Distance (m)[7]		Target[8]		Scented[9]	Yes / No
GPS Label[10]		Latitude		Longitude	
Test Photo[11]	Yes / No	Set-Up Photo #[12]			
Comments[13]					
ARU Unit #		SD A - Card #		SD B – Card #	
Distance to Camera[14] (m)		File Prefix[3]			
ARU Height Above Ground[15] (m)		Direction[5] (°)		Time Set[6]	
Test Recording[16]	Yes / No	Set-Up Photo #[12]			
GPS Label[10]		Latitude		Longitude	
Comments[13]					

STATION	NW	Alternate Used[1]		Deployment Type[2]	Tr C P Tp O
Camera Unit #		SD Card #		File Prefix[3]	
Camera Height Above Ground[4] (m)		Direction[5] (°)		Time Set[6]	
Stake Distance (m)[7]		Target[8]		Scented[9]	Yes / No
GPS Label[10]		Latitude		Longitude	
Test Photo[11]	Yes / No	Set-Up Photo #[12]			
Comments[13]					
ARU Unit #		SD A - Card #		SD B – Card #	
Distance to Camera[14] (m)		File Prefix[3]			
ARU Height Above Ground[15] (m)		Direction[5] (°)		Time Set[6]	
Test Recording[16]	Yes / No	Set-Up Photo #[12]			
GPS Label[10]		Latitude		Longitude	
Comments[13]					

STATION	SW	Alternate Used[1]		Deployment Type[2]	Tr C P Tp O
Camera Unit #		SD Card #		File Prefix[3]	
Camera Height Above Ground[4] (m)		Direction[5] (°)		Time Set[6]	
Stake Distance (m)[7]		Target[8]		Scented[9]	Yes / No
GPS Label[10]		Latitude		Longitude	
Test Photo[11]	Yes / No	Set-Up Photo #[12]			
Comments[13]					
ARU Unit #		SD A - Card #		SD B – Card #	
Distance to Camera[14] (m)		File Prefix[3]			
ARU Height Above Ground[15] (m)		Direction[5] (°)		Time Set[6]	
Test Recording[16]	Yes / No	Set-Up Photo #[12]			
GPS Label[10]		Latitude		Longitude	
Comments[13]					

1. Record alternate at which you are deploying the units based on map/access package info. If visiting the primary Camera/ARU location (marked on the map with a star), record as Alternate 1.
2. Record how units are mounted: Tr=Tree, C=Crop, P=Pasture, Tp=Tripod, O=Other (specify in comments). If units are on a post in a boreal setting, deployment type is C.
3. File prefix is ABMI-[Site#]-[Station] for both camera and ARU e.g., the user label for units deployed at site 905 in the NE corner would be "ABMI-905-NE".
4. Record height from the ground to the bottom of camera lens once unit is secured. Record in m to the nearest 0.05 m. Clear snow if necessary. If you cannot measure to the ground, write "DNC".
5. Record the direction the camera/ARU are facing. **Camera**: North (0°) is ideal, then south. Avoid pointing the camera east or west in open areas unless necessary. **ARU**: North (0° +/- 5°)
6. Record in 24-hr format. Record the actual time when the unit is activated, not the in-unit time (unit time may be one hour ahead to account for daylight savings time).
7. Record the distance from the camera to the lured stake/painted conduit. Record in m to the nearest 0.01 m. If the lured stake/painted conduit cannot be installed, record as VNA. If the distance measurement is not taken, record as DNC. Provide comments if either VNA or DNC are recorded.
8. Describe the target area using the following categories: Trail, Natural Clearing or Funnel, Wetland Edge, Fen/Bog, Scat Pile, None. If the camera is facing a crop or a pasture and is mounted on a post, record Target as None. If the camera is facing a crop or a pasture and is mounted to a tree, record Target as Other with comment "Crop" or "Pasture" (whichever is applicable).
9. Scent must be moved clockwise to the next available point if the original location falls within 200 m of a residence, industrial or recreational facility, or campground, 100 m of an active trail (i.e., hiking trail), or 50 m of a road.
10. If units are mounted together, only 1 GPS point is needed. If mounted separately, record 1 GPS point for each unit location. Label GPS points using the following naming convention: [Site #]-[Station]-[CAM/ARU/BOTH], e.g., 992-NE-BOTH
11. Walk a laminated sheet/chalkboard with ABMI site #, station, camera #, and date towards the camera from a distance of 5m away. Tilt the surface down slightly to avoid glare from the sun.
12. Take one landscape photo of the camera and ARU set-up (or two photos if the units are attached to separate trees). Ensure the ground is visible at the bottom the photo with the camera and/or ARU in the centre of the image. Name the photo using the following naming convention: ABMI_[YEAR]_[Site#]_[Station]_[ARU/CAM/BOTH]_SET, e.g., a photo of the camera and ARU at the NE station of site 333 would be ABMI_2021_333_NE_BOTH_SET
13. Describe any sign of animal activity, human or natural disturbance, and how much obstructing vegetation was cleared for the camera. General comments, descriptions, or problems that arose during deployment should also be recorded in this section.
14. If the camera and ARU cannot be mounted to the same tree, units can be mounted up to 10 m apart. Measure the distance between unit locations. Record distance in m to the nearest 0.01 m.
15. Record height of ARU microphones from the ground when ARU is secured. Record in m to the nearest 0.05 m. Clear snow if necessary. If you cannot measure to the ground, write "DNC".
16. Start the recording schedule (SM3) or do an Instant Recording (SM4). Leave the following information: site #, station, ARU unit #, date, time (actual, not in-unit), crew members. The site # must be said first and must be spelled out, e.g., the recording at the SE station of site 907 must start with "A-B-M-I-Dash-Nine-Zero-Seven-Dash-Southeast". The remaining information is said after the site # and can be in any order.

Camera Trap & ARU Retrieval



Site #:_____

Crew Members:_____

Date(s):_____

STATION	NE	Camera Unit #		Time Retrieved[1]	
Test Photo Done[2]	Yes / No	Station Photos Taken[3]	Yes / No		
Physical Condition[4]		Mechanical Condition[5]	OK / CHECK		
# of Photos[6]		Card Status[6] (% full)		Remaining Battery[6] (%)	
File Prefix[7]				SD Card #	
Trail Presence[8]		Open Areas[9]		Water Features[10]	
Comments[11]					

ARU Unit #		Time Retrieved[1]		Station Photos Taken[3]	Yes / No
Physical Condition[4]		Mechanical Condition[5]	OK / CHECK		
Card Status (% full)[6]	Slot A:	Slot B:		Slot C:	
SD Card #	Slot A:	Slot B:		Slot C:	
File Prefix[7]					
Comments[11]					

STATION	SE	Camera Unit #		Time Retrieved[1]	
Test Photo Done[2]	Yes / No	Station Photos Taken[3]	Yes / No		
Physical Condition[4]		Mechanical Condition[5]	OK / CHECK		
# of Photos[6]		Card Status[6] (% full)		Remaining Battery[6] (%)	
File Prefix[7]				SD Card #	
Trail Presence[8]		Open Areas[9]		Water Features[10]	
Comments[11]					

ARU Unit #		Time Retrieved[1]		Station Photos Taken[3]	Yes / No
Physical Condition[4]		Mechanical Condition[5]	OK / CHECK		
Card Status (% full)[6]	Slot A:	Slot B:		Slot C:	
SD Card #	Slot A:	Slot B:		Slot C:	
File Prefix[7]					
Comments[11]					

STATION	NW	Camera Unit #		Time Retrieved[1]	
Test Photo Done[2]	Yes / No	Station Photos Taken[3]	Yes / No		
Physical Condition[4]		Mechanical Condition[5]	OK / CHECK		
# of Photos[6]		Card Status[6] (% full)		Remaining Battery[6] (%)	
File Prefix[7]				SD Card #	
Trail Presence[8]		Open Areas[9]		Water Features[10]	
Comments[11]					

ARU Unit #		Time Retrieved[1]		Station Photos Taken[3]	Yes / No
Physical Condition[4]		Mechanical Condition[5]	OK / CHECK		
Card Status (% full)[6]	Slot A:	Slot B:		Slot C:	
SD Card #	Slot A:	Slot B:		Slot C:	
File Prefix[7]					
Comments[11]					

STATION	SW	Camera Unit #		Time Retrieved[1]	
Test Photo Done[2]	Yes / No	Station Photos Taken[3]	Yes / No		
Physical Condition[4]		Mechanical Condition[5]	OK / CHECK		
# of Photos[6]		Card Status[6] (% full)		Remaining Battery[6] (%)	
File Prefix[7]				SD Card #	
Trail Presence[8]		Open Areas[9]		Water Features[10]	
Comments[11]					

ARU Unit #		Time Retrieved[1]		Station Photos Taken[3]	Yes / No
Physical Condition[4]		Mechanical Condition[5]	OK / CHECK		
Card Status (% full)[6]	Slot A:	Slot B:		Slot C:	
SD Card #	Slot A:	Slot B:		Slot C:	
File Prefix[7]					
Comments[11]					

1. Record in 24-hr format. Record the actual time when the unit is retrieved, not the in-unit time (unit time may be one hour ahead to account for daylight savings time).
2. Walk a laminated sheet/chalkboard with ABMI site #, station, camera #, and date towards the camera from a distance of 5 m away. Tilt the surface down slightly to avoid glare from the sun.
3. Take the following photos in landscape view. If the camera and ARU are mounted together: NE, SE, SW, NW, SET, CANOPY, SITE; 7 photos total. If the camera and ARU are mounted separately: take the NE, SE, SW, NW, and SET photos at each of the unit locations, take the CANOPY photo at the camera only, and the SITE photo of the general area surrounding both units; 12 photos total. Name photos using the following naming convention: ABMI_[Year]_[Site]_[Station]_[CAM/ARU/BOTH]_[Direction: NE/SE/SW/NW/SET/CANOPY/SITE], e.g., a photo of the unit set-up taken at the NE station of site 421 where only the camera is mounted would be ABMI_2021_421_NE_CAM_SET.
4. Use the following categories: Excellent, Good, Fair, Poor. See Protocol for a description of each. If anything other than Excellent is recorded, include a comment to explain your choice.
5. If CHECK is selected, include a comment to explain your choice.
6. Use the "Check Status" option from the camera main menu, or the ARU's "Check Status" button to find this information.
7. **Camera**: In the menu select "Change Setup" → "Advanced" → "User Label" → "View". **Copy the user label exactly as it appears in the unit.**
   ARU: In the " Song Meter Main Menu" scroll to Settings" → "Location" → "Prefix". **Copy the user label exactly as it appears in the unit.**
8. Collect the Trail Presence info from within a pie-shaped area 0-15m in front of the camera. Use the following categories: None, Game Trail, Seismic Line, Cutline, Transmission Line, Pipeline, Truck/Quad Trail, Gravel Road, Paved Road, Fence, Windrow, VNA (only if there is no camera), DNC (only if you did not collect this data for any reason). Include explanation/comment if VNA or DNC is selected.
9. Collect the Open Areas info from within a pie-shaped area 0-15m in front of the camera. Use the following categories: None, Clearcut, Wellsite, Pasture, Agricultue Field, Ravine Edge, Natural Burn, Other Natural Funnel, VNA (only if there is no camera), DNC (only if you did not collect this data for any reason). Include explanation/comment if VNA or DNC is selected.
10. Collect the Water Features info from within a pie-shaped area 0-15m in front of the camera. Use the following categories: None, Alkali, Marsh, Swamp, Beaver Dam, Lake, River, Stream, Wet Margin Lake, Wet Margin Wetland, Wet Margin River/Stream, Water (use this option only when more specific options are unavailable), VNA (only if there is no camera), DNC (only if you did not collect this data for any reason). Include explanation/comment if VNA or DNC is selected.
11. Note any unusual signs of activity or disturbance (e.g., camera twisted, bear scat or quad tracks right in front etc.), any difficulties encountered while retrieving the units, or any specific unit damage.

Site #:_____

Station: NE NW SE SW

Date:_____

Camera #:_____