

Alberta Biodiversity
Monitoring Institute
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ABMI Autonomous Recording Unit (ARU) and Remote Camera Trap Wetland Protocols

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CONTENTS

Disclaimer	2
Contents	3
Goal	1
Start point selection	1
Choosing a deployment location	1
Camera target area selection	1
Naming Conventions.....	1
Retrieval: Standard Field Equipment.....	1
Remote Camera Traps	1
Activating the Camera.....	1
Deactivating the Camera	2
Autonomous Recording Units.....	3
SM3 Model Activation & Deactivation	3
Activating the ARU.....	3
Deactivating the ARU	4
SM4 Model Activation & Deactivation	4
Activating the ARU	4
Deactivating the ARU	5
Retrieval in Pasture and Crop Fields.....	5
Additional Field Equipment.....	5
Specific Retrieval Instructions.....	1
Important Care Instructions.....	1
Photos	1
Condition	2
Habitat Data	2
SD Card Management	1

GOAL

The protocol for placement of cameras and autonomous recording units (ARUs) at wetlands is designed to collect information on species using the wetland habitat. As such the goal is to place the units as near as possible to the edge of the open water.

START POINT SELECTION

A start point is selected using GIS. Dual transects are made; parallel and offset 25 m on either side of the fixed transect line (FTL). At the intersection of one of these lines and the shoreline, a start point is marked. Which line the start point is placed on will be pre-determined based on the direction of supplemental plant transects previously surveyed at the wetland, clockwise (SCL) or counter-clockwise (SCC). The shoreline is determined in GIS using the most recent satellite imagery available. If no supplementary transects were collected, the default direction will be clockwise (Figure 1.).

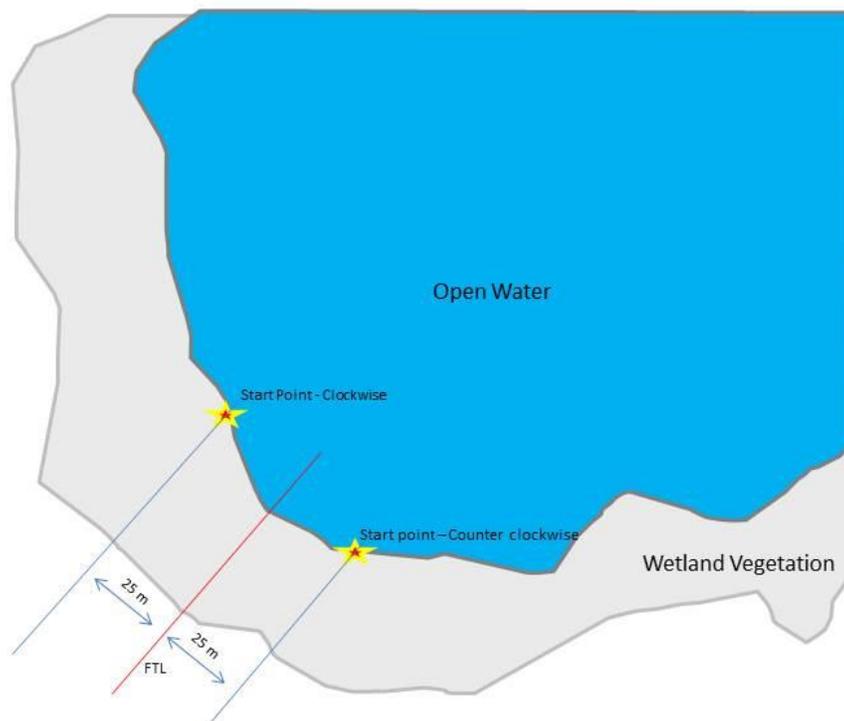


Figure 1: Location of the start point in reference to the shoreline and fixed transect line (FTL).

CHOOSING A DEPLOYMENT LOCATION

The camera and ARU are placed as close as possible to the start point within a 10 m radius. If no location within 10 m is stable enough to support the camera and ARU setup, then the location may be moved up to 300 m away, in the given direction (SCL or SCC), along the shoreline; and up to 10 m out from the shoreline. If no suitable location is found in this area, the distance out from the shoreline may be increased up to 50 m with the restriction that the camera must be sampling wetland habitats. In general,

the goal is, to minimize the risk of the setup falling over and, to place the camera and ARU in a random habitat as near as possible to both the start point AND the shoreline (Table 1, Figure 2.).

Table 1. Priorities for placing the camera and ARU setup.

Priority 1:	To place the camera and ARU within a 10 m radius of the start point
Priority 2:	To place the camera and ARU in an area 300 m along shoreline and up to 10 m out from shoreline
Priority 3	To place the camera and ARU in an area 300 m along shoreline and up to 50 m out from shoreline

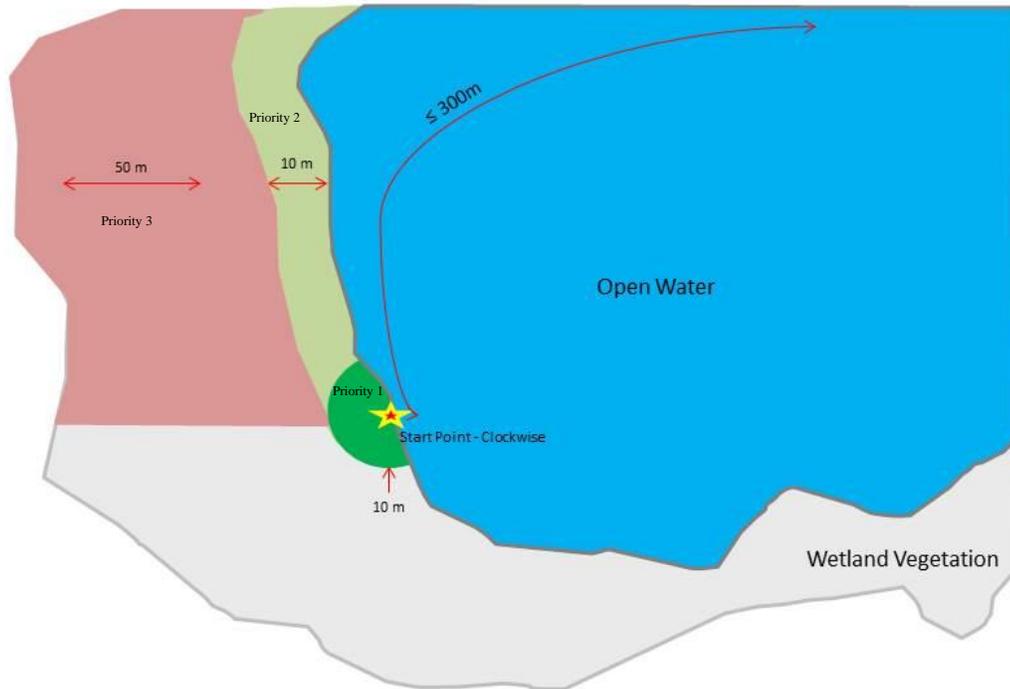


Figure 2: The first priority is to place the camera within a 10 m radius of the start point (dark green), second priority is an area 300 m along shoreline and up to 10 m from shoreline (light green), and third priority, is an area 300 m along shoreline and up to 50 m from shoreline (salmon).

Vegetation that may indicate poor stability includes cattails, bulrushes, giant reed grass (*Phragmites*), and potentially sedges. Also, look out for areas of solid ice that may be interspersed between patches of vegetation, or any indicators that you are on a floating vegetation mat. To figure this out, use your access map (patchy, broken up vegetation along shoreline may indicate floating mats), and make sure you are not on an island of vegetation surrounded by perfectly flat snow (ice underneath). Stable ground may be indicated by, vegetation not listed above, shrubs, and trees.

In the white zone use your best judgment to avoid locations that will impede landowner activities, such as on roadways, truck trails, or on tilled land.

CAMERA TARGET AREA SELECTION

Determine the camera target area following these guidelines:

- Select a target area that is in a wetland vegetation zone. An area with naturally low vegetation or a natural clearing is preferred. Clear vegetation if required.
- Point the camera toward a detection zone that has an open field of view 5 m wide and 10 m long. Ideally, it will include wetland habitat with little/no open water. Point the camera in whichever direction you think will be best to capture wildlife using the wetland. If the location is not under canopy and there are multiple good options, choose the option closest to north or south to avoid sun interfering with the camera in the early morning or late afternoon.
- Deploy painted conduit 5 m from the camera in the center of the detection area (unless it impedes landowner activities). No scent will be deployed at wetlands.

NAMING CONVENTIONS

- The file prefix for cameras and ARUs deployed at wetlands sites is ABMI-W[Site#]. For example, the user label for a camera deployed at site W905 would be: ABMI-W0905.
- Label setup photos with the site number, direction, date, and SET (to indicate that you took a photo of the set-up): ABMI_YEAR_W[Site#]_[SCC/SCL]_[ARU/CAM/BOTH]_SET. For example, a photo of the camera and ARU in the clockwise direction at site W333 would be:
“ABMI_2017_W333_SCL_BOTH_SET”
- Re-name GPS waypoint taken at the setup location using the following convention: W[Site#]-[SCC/SCL]-[CAM/ARU/BOTH]. Example: W992-SCL-BOTH.
- For the Test Photo hold a laminated sheet/chalkboard with ABMI site number (always include the W for wetland sites), camera # and date in front of the camera. We will use the same laminated sheets as for terrestrial deployments; stations (NE, SE, SW, NW) will just be crossed out.

RETRIEVAL: STANDARD FIELD EQUIPMENT

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

- Personal equipment (weather, safety, etc.)
- Tablet
- GPS (NAD83, decimal degrees)
- Datasheet, clipboard, pencil
- Compass
- Folding saw
- Photo sheet and dry erase marker
- Digital camera
- Access package

REMOTE CAMERA TRAPS

Remote camera traps are used to passively monitor wildlife in the field. We use Reconyx PC900 and HP2X cameras to collect data at our sites (Figure 3). The cameras are very user friendly and intuitive, but we still recommend reading over and bringing 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 number in the tablet
- Attach a desiccant pack inside the camera closest to the batteries
- Turn the camera on
- Enter password to show camera status
- Ensure the date and time are properly set on the camera (refer to the camera manual for any necessary adjustments)
 - The cameras have been programmed for daylight savings time. After November 3rd and before March 10th the units should be an hour ahead.
- **In The HyperFire 2 ONLY: Ensure the location is set to Latitude 54.40 N and Longitude 115.00 W**
 - “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
- Changed 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”
 - For example, the user label for a camera deployed at site 905 in the NE corner would be: ABMI-0905-NE. Don’t forget that the site number should be four digits. *
- Select “WalkTest” mode from the camera’s main menu, close unit, and slide it into the C-bracket. Use either the eyebolt or the end of the Python lock through the lock channel 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 80 cm from the ground (Figure 4).
- Additionally, test the detection zone by walking through the target area (at different distances, heights, and directions) and ensuring the red WalkTest light on the front of the camera flashes where detections are expected.
- Depending on the size and shape of the attachment tree/post, it may be necessary to use sticks or pieces of wood 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* 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.



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 password to show camera status
 - The display will show the number of pictures on the SD card, how full the card is (%) and remaining battery (%)
 - Record this information in the tablet
 - You can also scroll to “Check Status” to see the information above
- In the menu select “Change Setup” → “Advanced” → “User Label” → “View”. Copy down the user label (prefix) that has been programmed into the camera
- Slide the power switch to the “Off” position
- Record the SD card numbers 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 such as birds, amphibians, and bats. Wildlife Acoustics Song Meters are designed to record autonomously for long periods of time. Our Song Meters are the SM3 model and SM4 models (Figure 5). The basic operation of all 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.

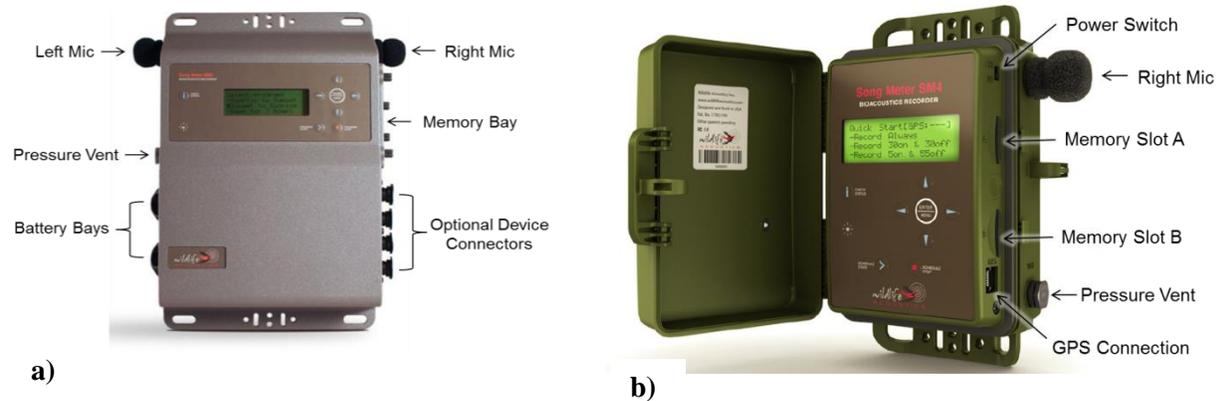


Figure 5. Key ports and features of Autonomous Recording Units (ARUs): **a)** the SM3 model; and **b)** the SM4 model. Both units are produced by Wildlife Acoustics.

SM3 MODEL ACTIVATION & DEACTIVATION

ACTIVATING THE ARU

- 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.
- 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 3rd and before March 10th, 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-0905-NE. Don’t forget that the site number should be four digits. *
- 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
- * 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
- 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.
- Open the Memory Bay and turn the power switch to the OFF (up) position
- Record SD card numbers in the tablet
- 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

- 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 3rd and before March 10th, 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-0905-NE. Don’t forget that the site number should be four digits. *
- To make a test recording, hold the up and down arrow keys at the same time.
- During the test recording leave a voice stamp with the following information: Site #, Station, Date, Time, ARU Unit #, Crew Members
- 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

- Press and hold the “Stop Program” button for several seconds
- Wait for the unit to initialize
- 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
- Turn the unit off by sliding the power switch up (EXT)
- Record SD card number in the tablet
- 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.

RETRIEVAL IN PASTURE AND CROP FIELDS

ADDITIONAL FIELD EQUIPMENT

- [Standard Retrieval Field Equipment](#)
- Post remover
- Flat head screwdriver or socket wrench (for ARUs)
- 7/16” wrench
- Python lock key



Figure 6. Custom L-bracket attached between the post and camera to adjust the tilt of the unit.

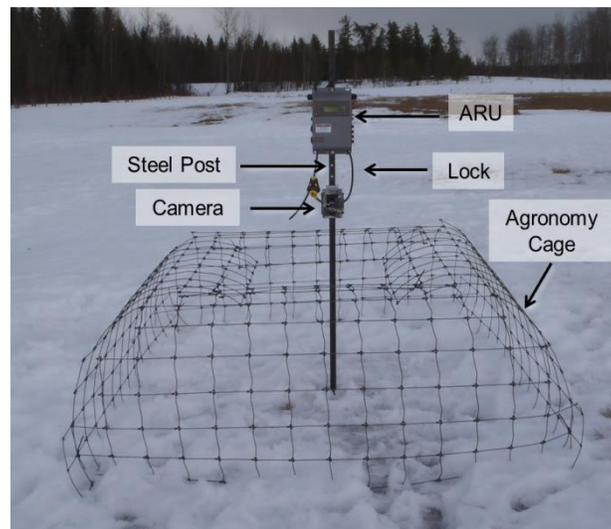


Figure 7. Camera and ARU deployed in a pasture. In a crop field, the set-up will not be surrounded by an agronomy cage.

SPECIFIC RETRIEVAL INSTRUCTIONS

- In pasture only: Cut zip ties and remove cage panels (Figure 7). Flatten for easier transport.
- Unscrew hose clamps holding the ARU 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 bolt from the threaded inset on the back of the camera
 - Remove custom bracket (Figure 6) if necessary
- Bring all hardware out of the field with you
- Remove the 7'2.1 m steel post using a post remover

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 microphones are sensitive to impact and pressure. Also, 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 to handle ARUs and cameras in wet weather and in wet locations (ex. bogs and fens). When these units are closed, they are water tight 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 SM2 units in wet conditions.

PHOTOS

To do a brief assessment of vegetation and keep a record of what every point looks like, we take photos at every camera/ARU deployment location.

Retrieval

- Take seven photographs using a digital camera
 - *Setup Photo* – From the front of the camera take a photo of the camera and ARU setup before disturbing it (SET).
 - *Cardinal Direction Photos* – From the camera/ARU location, take landscape photographs at eye level in each of the four cardinal directions (N, W, S, E).
 - *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 camera pointing directly up (CANOPY).
- Check the quality of the photos and re-take if blurry.
- Photos of the camera and ARU set-up (or two photos if the units are attached to separate trees) should be taken in landscape orientation using a digital camera.
- Ensure the ground is visible at the bottom the photo with the camera and ARU in the centre of the image for the “SET” photo.
- You will have to take a total of 14 photos if cameras and ARUs are attached to separate trees.
- Label the photos with the site number, date, and, and direction (N/W/S/E/SITE/CANOPY/SET): **ABMI_YEAR_W[Site#]_[ARU/CAM/BOTH]_[DIRECTION]**. For example, a cardinal direction photo facing N at site 333 where there is only a camera would be “ABMI_2017_W333_CAM_N”

CONDITION

To help with camera/ARU inventory and repair before the subsequent 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 details in the comments section.

Physical

- Excellent: Unit appears to be in good working order, and is 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; basically, anything out of the ordinary.

Set-Up

- Expected: The set-up is as expected. It has had minimal interference up to the time of retrieval. Camera and ARU are in place on tree/post. They are level. Post is standing straight. Cattle cages, if applicable, are in good working condition. Painted conduit may have been disturbed.
- Disturbed: The setup has been disturbed. There is obvious interference. The camera/ARU is twisted on tree/post. Post is on the ground. Cattle cages are damaged. Farmer has moved the set-up. Tree has fallen down. Set up is burned. Note: “Disturbed” does not include, mic cover damage from bears/birds/etc., broken camera lens etc. This is recorded under unit condition. “Disturbed” is only used for obvious set-up disturbances. If disturbance has occurred please choose: Cattle, Human or Other. If “Other” is chosen, describe in the comments.

HABITAT DATA

Determine the ecosite type in a **15-metre pie shaped area in front of the Camera**

- If the camera and ARU are not located on the same tree, stand at the camera and determine ecosite type from there
- Determine the current ecosite type within the area sampled and record the proportion of area (in 10% increments) occupied by that type.

If present, record the type and proportion of the area affected by human disturbances (<1%, and 5% increments). If there is no human disturbance, record “NONE”. Multiple disturbance types can be recorded if present, in order of abundance (Table 2)

Table 2. List of human disturbance categories and associated codes

CULT	Cultivation/Agriculture	Any type of cultivated field that is used to grow agriculture crops
PAST	Pasture	Any type of pasture (tame or native), grazing reserve, etc.
HARV	Harvest/Forestry	Any type of forest harvesting (e.g. clear-cut, partial-cut, understory retention, etc.) <30 years old
IND	Industrial	Any type of building, roadway, yard, etc. associated with industrial development
PIPE	Linear Pipeline	Wide linear features associated with the energy industry
POWER	Linear Powerline	Linear features with a line for conducting electrical power
SEIS	Cutline or seismic line	Narrow linear features associated with the energy industry
ROADP	Road Paved	Any type of road with a paved surface
ROADG	Road Gravel	Any type of road with an unpaved but improved (i.e. gravel) surface
TRAIL	Trail	Truck or ATV trail with an unimproved surface
RES	Residential	Human dwelling, farm building, or farm yard in a rural or acreage setting
WELL	Well	Area cleared for oil/gas/CBM pump jacks or well heads
RAIL	Linear – Rail line	Railway
BARE	Bare ground	Human caused bare ground for which cause cannot be determined
PUGG	Pugging/Hummocking from livestock	Game trails, livestock trails, livestock tracks (pugging and hummocks)
CAMP	Recreation/Parking	Recreation facilities including camping and parking areas, improvised campsites and fire pits.
OTHER	Other	Specify other disturbance type (culverts, bridges, garbage etc.)
URB	Urban	Any type of human dwelling, associated building or yard/driveway/road in an urban setting
NONE	No disturbance present	No human caused disturbance

- Disturbance values must not sum to >100%, even in the event of multiple disturbance types (values may be <100). If disturbance types overlap, select the disturbance type that has the greatest impact. For example, a grazed pasture also has a truck trail running through it. Record the truck trail for the % area that it covers, and then record the pasture disturbance for the remaining area that cattle have access to.

In the 15-metre pie shaped area also collect the presence of any of the following habitat types.

Trail Presence

- Game Trail – Any trail primarily created by wildlife.
- Cutline – Any type of cutline or seismic line.
- Transmission Line – Power lines of any size.
- Pipeline – Any pipeline or pressurized gas line.
- Truck/Quad Trail – Any type of truck or ATV trail with an unimproved surface.
- Gravel Road – Any road with an unpaved but improved (i.e. gravel) surface.
- Paved Road – Any type of road with a paved surface; or parking lot.
- Fence – A linear fence of any style or height.
- Windrow – A line of trees or shrubs at the edge of a field.

Open Areas

- Clearcut – Any type of forest harvesting <30 years old.
- Well Site – Any area cleared for oil/gas pump jacks, well heads, or other equipment.
- Pasture – Any uncultivated area used for grazing domestic livestock (note that some uncultivated areas may contain a mixture of native or non-native plants).
- Cultivation – Any type of cultivated field that is used to grow agricultural crops, including forage.
- Ravine Edge – The upper edge of a ravine, gully, or coulee that is at least 1m deep.
- Natural Burn – Any evidence of scarring or burning that is <30 years.
- Other Natural Funnel – A comment must be entered into the tablet with this category.

Water Features

- Alkali – Water with a high salt content, usually with white salt flats at water's edge or vegetation that is highly salt tolerant. Water is above the rooting zone for most or all of the year
- Marsh – Areas dominated by cattails, rushes and reeds with the ecosite VD-None.
- Swamp – Areas with trees and shrubs present, poorly developed bryophytes, often with pools of water. The ecosite is SD-None. Water is above the rooting zone for some of the year and the soil is mineral or humified organic soil rather than peaty.
- Beaver Dam – Wood and soil structures created by beavers. Also includes beaver lodges.
- Lake – Standing water with <10% emergent vegetation cover.
- River – Moving water that has “River” in its name.
- Stream – Moving water usually smaller than a river that does not have “River” in its name.
- Wet Margin Lake – Areas adjacent to a lake (any body of water that has the word “Lake” in its name) that has at least 20% cover of hydrophytic plant species.
- Wet Margin Wetland – Areas adjacent to a wetland that has at least 20% cover of hydrophytic plant species.
- Wet Margin River/Stream – Areas adjacent to a river or stream that has at least 20% cover of hydrophytic plant species.
- Water – Water present that does not fit any of the previous descriptions. A comment must be included when this code is used.

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 block (18 envelopes in total - 9 camera, 9 ARU) into a larger envelope (~4.5"x6.75"), and label it with the site numbers and block name (Figure 8)
- Submit envelopes to your supervisor at the end of shift. They will transport them 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.

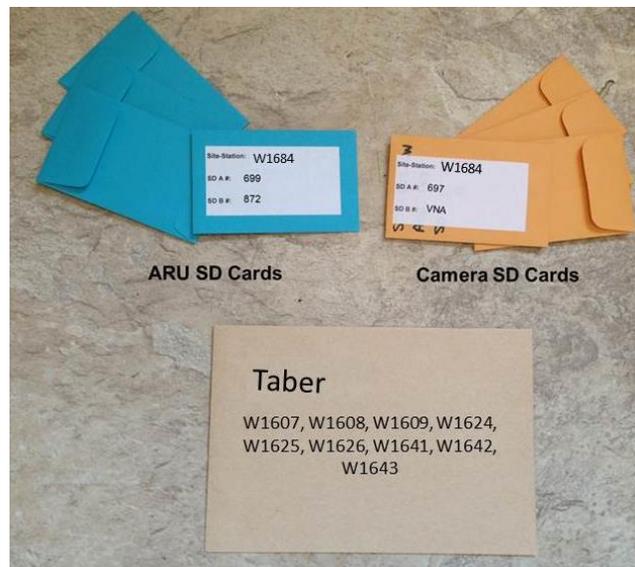


Figure 8. SD card management following unit retrieval from the field.