

Standard Operating Procedure #4:

Deploying and Retrieving Acoustic Detectors

Version 1.0

In Bat monitoring protocol for the Great Lakes Inventory and Monitoring Network: Version 1.0

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Month 2020

Please cite this publication as:

Goodwin, K., B. Route, and P. Matzinger. 2020. Standard operating procedure #4: Deploying and retrieving acoustic detectors (version 1.0). *In* K. R. Goodwin. 2020. Bat monitoring protocol for the Great Lakes Inventory and Monitoring Network: Version 1.0. Natural Resource Report NPS/GLKN/NRR—2020/XXXX. National Park Service, Fort Collins, Colorado.

Revision History Log

The following table lists all edits and amendments to this document since the original publication date. Information entered in the log must be complete and concise. Users of this standard operating procedure will promptly notify the GLKN protocol lead and/or project coordinator about recommended and required changes. The protocol lead and/or project coordinator must review and incorporate all changes, complete the revision history log, and change the date and version number on the title page and in the header of the document file.

Previous Version #	Revision Date	Author (with title and affiliation)	Location in Document and Concise Description of Revision	Reason for Change	New Version #
Add rows as needed for each change or set of changes tied to an updated version number					

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1.0 Introduction

The Great Lakes Inventory and Monitoring Network (GLKN) is implementing a monitoring program to document changes in bat populations in national park units in the upper Midwest. We are using acoustic monitoring as an index for assessing long-term bat population trends in response to ecosystem changes including climate, habitat, and disease such as white-nose syndrome (WNS). The goals of this monitoring program are to assess probable presence and absence of bat species, and to determine relative activity levels of those species for each national park unit over time. This Standard Operating Procedure (SOP) describes deploying and retrieving bat acoustic detection equipment and procedures for consistent data collection.

1.1 Sampling Schedule

The sampling season for GLKN's bat acoustic monitoring program runs from 1 June through 15 August each year. Technicians should start deploying equipment at the first few sampling sites on 1 June or as soon as possible after that date. Acoustic detectors and microphones should be inspected and programmed, and other supplies should be prepared during the last few weeks of May to allow an on-time start to field deployments.

Acoustic detectors will be programmed to record during the hours of 6:00 pm to 8:00 am each night. The detector should be deployed at each sampling site for 7–14 nights. Note that this refers to the number of nights of sampling, not the number of days. Although the goal is to have 7–14 nights of sampling per site, sometimes a deployment will result in fewer nights or more nights due to equipment failure or logistical issues. These data will generally still be accepted and included in analysis as long as there is a minimum of four nights of recording and a maximum of 16 nights (see SOP #8, Section 1.2).

The order in which sites are sampled and the dates of sampling should be as consistent as possible from year to year. Technicians must check prior years' schedules when planning their work to ensure consistency. Ideally, dates will be no more than one week earlier or later than previous years.

1.2 Setting Up Equipment

Equipment should be set up similarly to prior years. This means in the same location, using the same mounting system, with the same microphone orientation and microphone height. Use the previous years' datasheet notes, sketches, and site photographs, as well as the corrected coordinates provided by GLKN to pinpoint the correct location and guide your setup. If previous crews did not sufficiently document the site setup, add more information with clear descriptions in the notes and good photographs.

To assist in relocating sample sites, consider placing a metal tag or flagging on the mounting tree to identify the exact location. However, before marking trees, you must obtain approval from the park. This may not be allowed in designated wilderness or in publicly visible areas.

When you arrive on site, look around to see if anything has changed from previous years (e.g., significant blowdown from storms, flooding, or the like) and if so, document these changes on your datasheet. If changes are severe enough that the site has to be moved more than 10 meters, remember to assign the next sequential letter to the Site ID (refer to SOP #1). Clearly explain on the datasheet why the move was necessary. Even if it was a minor change of less than 10 meters, please indicate where and why the sample site was moved.

For every deployment, insert four fresh alkaline, D-size batteries in the Song Meter before setting up the equipment. Do not use rechargeable batteries. Also insert two empty, formatted SD cards in the Song Meter. This will help ensure recording can continue throughout the entire deployment period. Use the GLKN “Quick Start Guide” as a reference to ensure no tasks are overlooked while you are deploying and retrieving equipment (Appendix A).

If a park has both Song Meter SM3 and SM4 models, it does not matter which model is used at a particular site. Data collected on the two types is comparable, so the detector models are interchangeable for the purposes of this project.

The acoustic detectors and microphones can be set up in several different ways. Parks have chosen to use a variety of mounting systems, determined by their management needs and landscape features. The systems described below all have advantages and disadvantages, but all are acceptable options.

Tripod

A camera tripod provides a simple way of mounting and directing the microphone. The microphone can be attached using a specialized microphone shock mount that screws directly into the top of the tripod. Alternatively, the microphone can be attached to the tripod’s handle using zip-ties or electrical tape (Figure 1). Attach the Song Meter unit to an adjacent tree or other object, or onto the base of the tripod.

The tripod setup has the advantage of not requiring any ground disturbance if the park has concerns with Section 106 compliance. It also allows flexible placement away from vegetative clutter. In addition, tripods are easily collapsible and can be carried in a pack. In areas exposed to wind, the tripod should be anchored to prevent it from tipping over by tying to a nearby rock, tree trunk, or other solid object, or securing the base with tent stakes (if ground disturbance is permitted). If vandalism or theft is a concern, consider adding a cable lock or chain/padlock to secure the tripod to a nearby tree.



Figure 1. Examples of equipment set up using the tripod to hold the microphone and a nearby tree to hold the Song Meter. NPS PHOTOS.

T-Post

A second option is to use the combination of a T-post with a PVC pipe, boat hook, or telescoping painter's pole (Figure 2). If using T-post with PVC pipe, the piece of PVC should be 10-feet long and 1.5 inches in diameter. You will first push or hammer the T-post into the ground until deep enough to be secure. Attach the microphone to the top of the PVC pipe using zip ties or electrical tape. Then slide the PVC pipe down over the top of the T-post. Finally, attach the Song Meter to the PVC pipe using a plywood backing board with holes drilled for U-bolts, which fit around the PVC (Figure 2).

If using T-post with a boat hook or painter's pole, use zip-ties to attach it to the T-post. Attach in an offset manner, with the top of the boat hook or painter's pole slightly higher than the top of the T-

post. This allows for a greater final height. Attach the microphone securely to the top of the boat hook or painter's pole using zip ties or electrical tape. Insert the base of the T-post into the ground until secure. Finally, extend the boat hook or painter's pole upwards to elevate the microphone. Mount the Song Meter on a nearby tree trunk.

The use of a T-post with any variety of pole has the advantage of allowing the microphone to be elevated further off the ground. In addition, the pole can easily be set in more open areas to avoid vegetative clutter. However, this system does require more equipment and hauling long PVC pipe and heavy T-posts may be undesirable in backcountry areas.



Figure 2. Examples of equipment set up using a T-post with PVC (*top*) and T-post with painter pole (*bottom*). Inset photos demonstrate attachment of the Song Meter to a backing board and the backing board to the post using U-bolts. NPS PHOTOS.

Painter's Pole

Since most of our parks have an abundance of trees, the use of painter's poles mounted in trees is an easy way to set up a deployment. Use a telescoping painter's pole such as those available at hardware stores, in combination with an attachable screw-on paint roller handle (Figure 3). The roller handle provides a base to which the microphone can be attached with zip ties and electrical tape. Secure the pole to the tree with adjustable bungee cords. For a more rigid setup, use a larger diameter tree, or use two points of contact such as a trunk and low branch, a forked trunk, or two separate trees growing close together.

This type of setup is relatively simple to construct and quite secure as long as the bungees are pulled tight. It requires less equipment to carry and is flexible depending on the site conditions. For example, in addition to attaching it to a tree trunk, the painter's pole can be set up on a stump, a fence, or higher in the canopy of a tree if there is a suitable gap in the vegetation (i.e., not too much clutter).



Figure 3. Examples of equipment set up using a telescoping painter's pole. NPS PHOTOS.

Tree Mounted

The final option for setting up equipment is simply attaching the Song Meter to a tree trunk using screws and attaching the microphone directly to the port on the detector (without a cable) (Figure 4). This method is quick and simple and requires very little equipment. However, the main disadvantage is that it is difficult to get the microphone away from vegetative clutter and into open air space, because the detector is attached to the tree. It is also more difficult to get the microphone elevated high enough off the ground, because the whole setup will need to be within arm's reach for a person standing on the ground. Both of these factors may impact recording quality.



Figure 4. Examples of equipment mounted on a tree trunk with microphone directly attached to Song Meter. NPS PHOTOS.

1.3 Microphone Placement

The Wildlife Acoustics microphones used for this project are omnidirectional, meaning they detect sound from all directions. However, they have a slight reduction in sensitivity at the rear. To maximize the number and quality of recordings, microphones should be aimed towards the air space where bats are expected to be flying. Orient the microphone in the same direction as previous years to maintain consistency (refer to datasheets for proper compass bearing).

As much as possible, microphones should be placed away from clutter (tree branches, shrubs, tall grasses, buildings, rock faces). Microphones should also be set at least 2 meters (approximately 6 feet) off the ground. The higher the microphone is elevated the better, in order to sample more open air space. Microphones placed lower than 2 meters may pick up echolocation calls that are bouncing off the ground, creating distorted recordings and making call identification much more difficult. Low microphones can also be more easily disturbed by wildlife.

If your setup has the microphone placed a distance away from the Song Meter, the connecting cable should be placed on the ground rather than strung across in midair. This will reduce the chance of passing wildlife running into the cable and damaging the setup. Coil extra cable and secure with a zip tie or wrap it several times around the pole. Cables should be loose enough to provide some flexibility with normal movements in the wind, but reasonably well taped, zip-tied, or otherwise secured or padded to avoid unnecessary vibrations and noise that might interfere with good call recordings.

Microphones are expensive (approximately \$300 each) and can easily be damaged by water or improper handling. Place microphones horizontally or very slightly tipped down towards the ground in order to keep rain out. In addition, create loops in the microphone cable both at the base of the microphone and at the port where the cable connects to the Song Meter (Figure 5). Water will follow the cable down and drip off the bottom of the loop rather than running into the equipment. The connection points at both ends of the microphone cable should also be wrapped with a layer of electrical tape to keep them free of water. No additional external weatherproofing will be used, because this can negatively affect recording quality.

Always handle microphones with care, especially while transporting in the field. Microphones should be wrapped in bubble wrap or other cushioning material and placed at the top of your backpack to minimize damage. If a microphone is damaged or malfunctioning, please report this to the GLKN protocol lead. A microphone that breaks due to mishandling must be replaced at our expense. If a microphone breaks due to poor materials or manufacturing defects, we may be able to get it replaced or repaired for free.



Figure 5. Loops should be created in microphone cables. Rainwater will drip off the bottom of the loop, rather than flowing into the microphone port or microphone base.

1.4 Preventing Vandalism

Regardless of which mounting system is used, the following general guidelines should be followed to minimize the risk of equipment being stolen, vandalized, or disturbed.

Unless working in a very remote area, it is highly recommended to use a cable lock system (e.g., Master Lock brand Python Cable Lock) to secure the Song Meter to a tree or other object. In high-traffic areas where many people are likely to encounter the equipment, it may be necessary to use the more robust security housing available from Wildlife Acoustics.

Although the Song Meters themselves are subtly colored, other components may be brightly colored (e.g., painter's poles). Spray paint these using green, black, or camouflage paint to better blend in with the environment and minimize chances of disturbance by people.

Post a sign on the Song Meter to inform people why the equipment is there. For example: "National Park Service Property – Bat Acoustic Monitoring In Process – Please Do Not Disturb". You may also wish to add a contact phone number, educational information about bats, and/or a note saying that human voices are not being recorded, as this is often a concern. Example signage is available on the GLKN bat project's shared online drive.

1.5 Song Meter Programming

Song Meters should be inspected, programmed, and tested during pre-season preparation as described in SOP #3. This includes setting the date and time, installation of the latest firmware updates, and loading the correct set file provided by GLKN. However, field technicians still need to run through several steps once they reach the survey site to ensure Song Meters are properly deployed. Use the GLKN "Quick Start Guide" as a reference to ensure no tasks are overlooked while you are deploying and retrieving equipment (Appendix A).

You have to manually program two pieces of information for every single deployment: the site prefix and the site coordinates. These must be done AFTER you load the set file, or else the set file will overwrite them. This is why the set file should be loaded in the office during pre-season preparations. Use the following step-by-step instructions to set up the Song Meter when you arrive at the survey site.

1. Install four fresh alkaline D-size batteries (do not use rechargeables) and two empty, formatted SD cards. Cards may be formatted using the Song Meter formatting utility found at **Main Menu > Utilities > Format All Cards**.
2. Enter the Site Prefix, which is the same as the Site ID (e.g., SLBE001A). The Site ID is derived from the park's four-letter code, the cell's GRTS order number, and how many sites have been sampled within the cell, as described in SOP #1. Each recorded audio file will have this prefix automatically attached to the file name. This allows us to easily determine at which site it was recorded.

Navigate to **Main Menu > Settings > Location> Prefix**. Use the up and down arrow keys to cycle through the alphabet, and the right arrow to advance to the next space. After you have entered the entire Site ID, continue pressing the right arrow until the cursor returns to the far left side of the line; this will save the entered prefix. Refer to instructions in Song Meter user manual (Section 3.12 for SM3, Section 4.3 for SM4).

3. Set the Latitude and Longitude. Either use the external GPS attachment specific to the Song Meter, or enter manually by copying the coordinates from your handheld GPS unit.

To use the GPS attachment, connect the GPS to the Song Meter using the designated port. It will automatically detect that the GPS is connected. Press the **Check Status** button to observe the progress of the GPS. On the Check Status screen you will see a “?” flashing between the date and time. This indicates the GPS is trying to connect to satellites to acquire a position. Once it successfully acquires the position, the “?” changes to a “\$” (SM3) or a “#” (SM4). Setting the coordinates this way will also set the clock. Refer to instructions in Song Meter user manual (Section 3.18 for SM3, Section 3.7 for SM4).

To enter coordinates manually, navigate to **Main Menu > Settings > Location> Latitude** and enter the correct numbers. Press **Enter** or **Right** to save coordinates. Repeat for **Longitude**. Refer to instructions in Song Meter user manual (Section 3.8 for SM3, Section 4.4 for SM4).

Note that although the Song Meter may show only two digits, the full coordinates must be recorded on the datasheet in decimal degrees, with five digits after the decimal point. For example: Latitude = 47.99969 N, Longitude = -89.75873 W

4. Press **Check Status** button to verify all settings before starting recording. Note that SM3 units have status information split into two screens, so you must press **Check Status** a second time to see the second screen.
 - a. Check that the date and time are correct, as shown on the top line of the Check Status screen.
 - b. Check that all SD cards are properly loaded and being read by the device. The status of each card is indicated after the letter of the card slot (A, B). Each SD card should read “0/64”, indicating 0 out of 64 gigabytes of card capacity have been filled. If it says “Dirty” or “Empty”, try removing and reloading the card, reformatting the card, or switching it out for a different card.
 - c. Check that the microphone is properly connected and recognized by the device. Microphone status is indicated after the word “Mic0” or “Mic1”. If properly connected, it should read “U1”. If it reads “NA”, try removing and reattaching the microphone or using a different microphone.

- d. Check that battery voltage is sufficient. New batteries should be around 6.4 V. Battery voltage is shown after the word “Bat”.
5. Navigate to **Main Menu > Settings > Location** to double check that the site prefix, latitude, longitude, and time zone offset (UTC) are correctly programmed. Correct time zones are shown below (Daylight Savings Time):

Parks	Time Zone
ISRO, KEWE, PIRO, SLBE	UTC - 04
APIS, GRPO, INDU, MISS, SACN, VOYA	UTC - 05

6. Navigate to **Main Menu > Program > Export Program** (on SM3) or **Main Menu > Schedule > Export Sched + Setts** (on SM4). Press Enter to export the recording program to the SD card. You will see a message that the file has been exported successfully. This provides a record of what schedule and audio settings were used at the deployment. The exported file is automatically assigned a file name that uses the Site Prefix you have entered (e.g., SLBE001A.PGM for SM3 or SLBE001A.SM4S for SM4). Refer to instructions in Song Meter user manual (Section 4.6 for SM3, Section 6.7 for SM4).
7. When the above items have been completed, press the **Program Start/Schedule Start** button to start the recording schedule. If there are any warning/error messages, press **Program Stop/Schedule Stop** to address the problems before continuing. If there are no warnings/errors, the screen will show the message “Going to sleep until...” followed by a date and time. If you have correctly programmed the Song Meter, the date shown should be the current date, and the time shown should be 18:00:00. This means the Song Meter will go to sleep until 6 pm, then wake up to start recording bat calls. If the date and time displayed in the “Going to sleep until...” message are NOT correct, you will need to follow the instructions in SOP #3 to load the set file again.

Note that none of the other settings should be changed in the field, unless you are using the delayed start option and need to adjust the recording start date (see Appendix B). If you think that something is wrong with the recording schedule please contact the GLKN protocol lead.

1.6 Filling out the Datasheet

It is very important to fill out the datasheet completely and legibly for every deployment. Missing or unreadable information may result in the site having to be removed from data analysis. Each new deployment should have its own datasheet, even if you are redeploying at the same location. For example if equipment fails after only two days and you need to redeploy using replacement equipment, start a new datasheet and use the notes section on both datasheets to explain the situation. Additionally, if you omit a site please fill out a datasheet to document this change. At a minimum, you must fill in the Site ID, observer name, and a justification for omission in the notes section.

Below are guidelines for how to complete each field on the datasheet. Refer to the blank datasheet in Appendix C.

Site Name: This is an optional field for internal park use if desired. Provide a descriptive name for the site (e.g., “Long Island” or “Osceola Landing Marsh”). Use consistent names from year to year.

Site ID: Use the format PARK###A (e.g., APIS001A) for sites selected with the GRTS protocol. Refer to naming conventions specified in SOP #1.

Park: Enter the park’s four-letter code: APIS, GRPO, INDU, ISRO, KEWE, MISS, PIRO, SACN, SLBE, or VOYA.

Observer(s): This can be one to several people who were on the team deploying and checking the site. Use full names, not initials or radio numbers. It is most important to list the primary field technician/biologist responsible for recording the information. If there is a question about the data, this is the person who we can contact who would know how the data was collected.

Deployment Date: This is the first day the acoustic detector was deployed at this site. Please use the format MM/DD/YYYY. If using the delayed start option, you must also note the date you are delaying until (see below).

Recovery Date: This is the day the acoustic detector was retrieved from the site. Please use the format MM/DD/YYYY.

Delay Start: Circle “Yes” or “No” to indicate if you are using the delayed start option. If yes, enter the date that recording is scheduled to actually start. Please use the format MM/DD/YYYY.

Detector Model: Circle the appropriate model: SM3BAT, SM4BAT, or Pettersson D500X.

Detector Serial Number: It is important to know which individual unit was deployed at the site, to help track if a unit fails and to connect the audio files to the location. Enter the serial number of the detector unit. For SM3s this number is on a sticker with a bar code on the left side of the unit (e.g., SM303547). For SM4s it is on a sticker with a bar code on the inside of the cover (e.g., S4U00341). If you can’t find the serial number or it is covered, use a park-assigned number unique to that unit.

Microphone Model: Circle “SMM-U1” if that is the model of microphone being used (most common). This is indicated on the manufacturer’s label on the microphone. If a different model is used, circle “Other” and write in the model.

Microphone Serial Number: Record the serial number of the microphone, which is found on the label sticker. Microphones can fail or have calibration problems. We can track systematic problems using the identifying number of the microphone, to help weed out poorly performing microphones.

Microphone Height: This is the height in meters from the mic to the ground. Goal is to obtain a measurement with ± 0.03 m (3 cm) accuracy. The mic height should be the same each year—refer to previous datasheets to ensure this is done correctly. Goal is to match the previously recorded height within 0.1 m (10 cm).

Microphone Orientation: Provide the compass direction (in degrees) that the microphone is pointing. Goal is to obtain a compass bearing with ± 2 degrees accuracy. The microphone orientation should be the same each year – refer to previous datasheets to ensure this is done correctly. Goal is to match the previously recorded compass bearing within 5 degrees.

Datum: Circle which projection your handheld GPS unit is using for the coordinates. Most should be using NAD83. Consult your GPS manual to learn how to set the datum.

Latitude/Longitude: Copy the coordinates from your handheld GPS. Please use a Garmin or other GPS device (cell phone accuracy is not as reliable). Allow the GPS at least 5 minutes to locate satellites and pinpoint your location so you obtain a more accurate reading. Goal is to collect coordinates with ± 5 m horizontal accuracy. Record coordinates in decimal degrees, not degrees-minutes-seconds. Record out to five digits after the decimal point (e.g., Lat: 48.59442, Long: -93.10435).

Battery Location: Circle if internal batteries vs. an external power source was used. If external, specify what type (e.g., gel cell, car battery).

SD/CF Card Numbers: Record the numbers of the cards used for the deployment and which slot each card was in. At the beginning of the season all cards should be labeled with a unique number to help keep track of them. This will also help us track if a card has stopped working.

Photos: Check the boxes indicating which photos were taken. This section of the datasheet is intended to help you remember which photos are needed and make sure none are skipped. Also see Section 1.7 below.

Mounting System: Circle the category that most closely describes the system used at the site. This should be the same each year– refer to previous datasheets to ensure this is done correctly.

Distance to Clutter: Circle the approximate distance to the nearest clutter in front of or around the microphone. Goal is to estimate the distance with ± 2 m accuracy. The amount of clutter can change the type of calls bats produce and the quality of the recording, so it is helpful to know the environment in which the recording was made. Only circle one distance category.

Clutter Percentage: If the nearest clutter is within 5 meters, estimate the percent of clutter within a 5-meter radius around the microphone. Goal is to estimate the percentage with $\pm 10\%$ accuracy. If clutter is beyond 5 meters, leave blank.

Primary Clutter Type: The type of clutter can also determine how the recording could be affected. Circle the primary or closest form of clutter to the microphone. Only circle one clutter type. If there are multiple clutter types, indicate the rest in the notes section.

Local Habitat: Circle the choice that best describes the primary habitat feature you are sampling in the immediate area. Only circle one. If there are multiple habitat types, indicate the rest in the notes section.

Broad Habitat: Circle the choice that best describes the surrounding habitat/landscape within about 100 meters of the microphone. Only circle one. If there are multiple habitat types, indicate the rest in the notes section.

Site Map: The X in the center of the circle represents the microphone. Draw an arrow to show the direction the microphone is pointed, then sketch the key habitat features that surround the microphone within 100 meters. Notice the North Arrow and make your sketch oriented accordingly. Try to be to scale, but this is not an art contest. Most importantly, try to be helpful to the next person needing to locate and set up the site. Do not leave this blank!

Site Description/Access Notes: Describe the area and give distances and compass directions to important features that will help future technicians find the exact location. Make sure those features are documented in photographs and/or the habitat map sketch. Specify what species and what size tree you mounted equipment on. Record notes about how to access the site, navigation guidance, and anything else that would help future technicians. Be specific and use compass directions, not right/left. Use the back of the sheet if you need more space for notes. Do not leave this blank!

Log of station checks: On the first line, record information from the date of deployment. Your last entry should be information from the date you picked the unit up. In between, record any trips you made to check the equipment, replace cards or batteries, or any other maintenance activity. For each entry, record the observer initials, date, time, battery voltage, and what was done. When you retrieve the equipment at the end, note any problems that might have affected the data collection. For example: tripod tipped over, cord was chewed on by wildlife, site was flooded, or site was vandalized. Also record in this section any significant weather events that occurred during the deployment such as sustained periods of high wind, thunderstorms, or major rainstorms. Use the back of the sheet if you need more space for notes.

1.7 Taking Photos

The exact site where you place the detector will need to be found again in subsequent years. Good documentation is critical and good quality photos are a key part of the documentation. A minimum of seven photos are required for each site. Photos should be taken with a GPS-enabled camera (if available) with geotagging turned on. This will add a GPS coordinate to the metadata of the photo, so it can be associated with a specific location. Photos should be taken with ≥ 2 -megapixel resolution and in JPG format.

Follow these steps when taking site photos:

1. Fill out the datasheet and take a photo of it. This alerts the person reviewing the photos of the Site ID for the photos that follow. It also provides a backup of the data if the datasheet gets lost.
2. Take photos looking out away from the microphone in the four cardinal directions: North, East, South, and West. Use a compass. Goal is to take each photo within ± 5 degrees of the desired compass bearing. Always take the directional photos in the same order so that later you will be able to easily identify which photo shows which direction. Together these four photos will document landmarks in all 360° around the point.
3. Take one photo from the perspective of the microphone looking out at the target habitat being sampled.
4. Take one or more photos of the equipment setup to document what type of apparatus you used (tripod, painter's pole), what size and type of tree it was on, and how the microphone was set in relation to the detector.

All directional and microphone perspective photos should be in landscape format (horizontal). Review the photos immediately after you take them to make sure they are not blurred, too dark, too light, or obscured. A photo of a tree trunk is not useful! See Appendix D for example photos. On the datasheet, be sure to check the boxes indicating which photos were taken. Back at the office, organize the photos by site and relabel them (refer to SOP #5).

1.8 Retrieving Equipment

At the end of the deployment period, return to the sample site to retrieve the equipment so that it can be redeployed at the next site. Remember to bring the datasheet you started filling out at the time of deployment. Datasheets must be completed in the field during the retrieval process, not back at the office later. This will maximize the accuracy of your data collection.

Use the following step-by-step instructions to properly record data and take down the equipment.

1. When you arrive on site, look around and note anything that looks different since the time of deployment. For example, there may be damaged or missing equipment; disconnected cables;

changes in microphone orientation or height; a fallen tree; or flooding. Make notes to describe any changes on your datasheet.

2. Note the date and time of retrieval on the bottom of the datasheet in the “Log of Station Checks” section. Also record the initials of the field crew.
3. On the Song Meter, press the **Program Stop/Schedule Stop** button to disable it, so it is no longer active. Press the **Check Status** button to view the remaining battery voltage. Battery voltage is shown after the word “Bat”. If the screen does not turn on when Check Status is pressed, the batteries are likely dead. Record the battery voltage on the datasheet or note that the batteries were dead.
4. Press the **Check Status** button again to view the status of each SD card. This is indicated after the letter of the card slot (A, B). Each card should read “3/64” or similar, indicating 3 out of 64 gigabytes of card capacity have been filled. Even if a card says “0/64” it may still have data on it, amounting to less than one gigabyte. Do not reuse or reformat the card without checking for data first! If a card says “Dirty” or “Empty”, the card isn’t being read properly. Again, it may still have data on it so double check before reusing or reformatting the card. Record the status of each card on the datasheet.
5. If redeploying the Song Meter immediately, remove the SD cards and place them in a labeled envelope, zip-lock bag, carrying case, or other secure location where they will not be mixed up with cards from other sites or with empty cards. If returning to the office, you may want to leave the SD cards safely in the Song Meter until you are back. Be very careful to keep your used cards clearly separated from your new cards, and to keep track of which cards were used at which site, to avoid accidental data loss or mix-ups.
6. Switch the Song Meter off and carefully disconnect the microphone cable. Remove and pack up the Song Meter, microphone, cables, cable lock, pole, and tripod. Wrap microphone securely in bubble wrap or similar, to prevent damage.
7. Double check around the site to make sure no equipment or trash is accidentally left behind.

1.9 End of Season Equipment Care

Once all deployments have been completed, the bat monitoring equipment should be organized and stored for the winter. Clean the Song Meters by wiping with a damp cloth, to remove debris, spider webs and other debris. Remove all batteries from Song Meters and recycle. Remove all SD cards from Song Meters. Once you verify all data has been properly saved, clear and format the SD cards. Store microphones in static bags and wrap in bubble wrap. Pack up equipment and store in a secure location, being sure to label boxes and document where everything is stored so the next technician can easily locate it.

If you have any damaged or non-working equipment, contact the GLKN protocol lead to determine whether the item should be repaired, replaced, or disposed of. If you determine that additional supplies will be needed for the next monitoring season, please inform the GLKN protocol lead. It is helpful for us to be aware of these needs so supplies can be purchased and distributed to parks in the off-season.

Appendix A. Quick Start Guide

In the Office Before Deployment

Inspect and test equipment, including calibration and voltage test for microphones.

Update firmware on Song Meters.

Load set program (recording schedule and audio settings) on Song Meters.

Insert fresh batteries in each Song Meter.

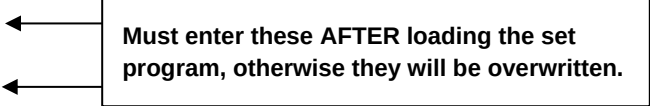
Format all SD cards and label each with a unique number.

Load sample points onto handheld GPS using corrected site list provided by GLKN.

In the Field When Deploying

Set site prefix on Song Meter.

Set latitude/longitude on Song Meter.



Must enter these AFTER loading the set program, otherwise they will be overwritten.

Format SD cards if not already done.

Use “Check Status” button to verify Song Meter is prepared to record:

- Verify date and time are correct
- Verify both SD cards are being read properly (should see 0/64)
- Verify microphone is being read properly (should see U1)
- Verify battery voltage is sufficient (should see ~ 6.4 V for new batteries)

Use Location menu (Main Menu > Settings > Location) to verify site prefix, time zone, latitude, and longitude are correctly programmed.

Press “Program Start/Schedule Start” button to enable the Song Meter and verify recording schedule is correct based on “Going to sleep until.....” message.

Double check that all equipment is mounted securely and locked.

To prevent water damage: cover unused Song Meter ports, seal cable connections with electrical tape, and add a loop into microphone cable.

Complete datasheet, including detailed notes and sketch. Record new, complete GPS coordinates. Do not copy coordinates from old datasheet!

Take photos of datasheet, four directions, where mic is pointing, and entire set-up.

In the Field When Retrieving

Upon arriving, note if any changes or problems occurred at the site (i.e., damaged/missing equipment, microphone orientation changed, cable disconnected) and record on datasheet.

Press “Program Stop/Schedule Stop” button to disable the Song Meter.

Use “Check Status” button to view the remaining battery voltage and amount of data on each SD card. Record these on datasheet.

If redeploying Song Meter immediately, place the SD cards in a labeled envelope or other secure location where they will not be mixed up. If returning to the office, leave SD cards safely in Song Meter until you are back.

Take down the Song Meter, microphone, and pole/tripod. Pack microphone securely in bubble wrap or similar, to prevent damage.

Double-check around the site to make sure no equipment is accidentally left behind.

In the Office After Retrieval

Transfer all data from the SD cards to both the GLKN external hard drive and park’s server or secondary external hard drive. Place each site’s data in proper site folder. Retain all WAV files, summary files, and dump files.

Review datasheet to make sure it is complete. Scan to a PDF and add to proper site folder.

Organize photos into proper site folders and rename each photo.

Upload data to be reviewed by GLKN Protocol Lead.

Double-check all data has been copied to both storage locations, then clear the SD cards for redeployment.

Appendix B. Using the Delayed Start Option

In some situations, it may be advantageous to deploy equipment days or weeks ahead of the date when you want recording to actually begin. This can be accomplished by including a delayed start in the Song Meter recording schedule programming. You will need to re-program the Song Meter with a new set file and adjust the exact start date. Refer to the following instructions. Also be sure to make a note on your datasheet that delayed start was used.

SM3BAT

1. Obtain the delayed start version of the set file from the GLKN protocol lead. The set file ends with ".PGM" for the Song Meter SM3 model.
2. Copy the set file to the top level of a SD card and insert the card into Slot A.
3. Turn Song Meter on and navigate to **Main Menu > Program > Import Program**.
4. Select the proper file and press **Enter**. Unit will import the set file program and display the message "Program/Schedule Imported", or will warn you if there is an error. When finished, press **◀ Left** to return to the **Program** menu.
5. Now navigate to **Main Menu > Program > Edit Program** and use the **▼ Down** button to scroll down through the settings until you see Line 12 AT DATE. Change the date to your desired recording start date in the future. Press **Enter** several more times until the cursor returns to the far left-side, saving changes. Recording will start at 18:00 on this date. Press **◀ Left** twice to return to the **Main Menu** when finished. Do not change any other lines of the program!
6. Continue programming as you normally would, following steps in Section 1.5. When you press the **Schedule Start** button, you should see a message that the unit is going to sleep and recording will begin on your selected future date at 18:00:00.

SM4BAT

1. Obtain the delayed start version of the set file from the GLKN protocol lead. The set file ends with ".SM4S" for the Song Meter SM4 model.
2. Copy the set file to the top level of a SD card and insert the card into Slot A.
3. Turn Song Meter on and navigate to **Main Menu > Schedule > Import Sched + Setts**.
4. Select the proper file and press **Enter**. Unit will import the set file program and display the message "Program/Schedule Imported", or will warn you if there is an error. When finished, press **◀ Left** twice to return to the **Main Menu**.
5. Now navigate to **Main Menu > Settings > Delay Start**. Change the date to your desired recording start date in the future. Press **Enter** to save changes. Recording will start at midnight on this date. Verify that **Enable Delay Start** is set to "yes".

6. Continue programming as you normally would, following steps in Section 1.5. When you press the **Schedule Start** button, you should see a message that the unit is going to sleep and recording will begin on your selected future date at 00:00:00 (midnight).

Appendix C. Field Datasheet

BAT ACOUSTIC MONITORING DATASHEET Site Name: _____ Site ID: _____

Park: _____ (Optional, e.g. Long Island) (Required, e.g. API5001A)

Observer(s): _____ Deployment Date: _____
(Use Full Names) _____ Recovery Date: _____

Delay Start? Yes No If Yes, Start Date: _____

Equipment and Habitat Information:

Detector Model: SM3 SM4 D500X Datum: NAD27 NAD83 WGS84

Detector Serial Number: _____ Latitude: _____ (Decimal Degrees)

Microphone Model: SMM-U1 Other _____ Longitude: _____

Microphone Serial Number: _____ Battery Location: Internal External

Microphone Height: _____ meters If External, Type: _____

Microphone Orientation: _____ degrees

SD/CF Card Numbers: Slot A _____ Slot B _____ Slot C _____ Slot D _____

Photos Taken: Datasheet ☐ North ☐ East ☐ South ☐ West ☐ Mic Target Area ☐ Setup ☐

Take 7 photos minimum: 1) completed datasheet, 2) surrounding area in 4 cardinal directions, 3) area the microphone is sampling, and 4) the equipment setup.

Mounting System: Tripod T-post with Pole Pole attached to Tree Tree Mounted Other: _____

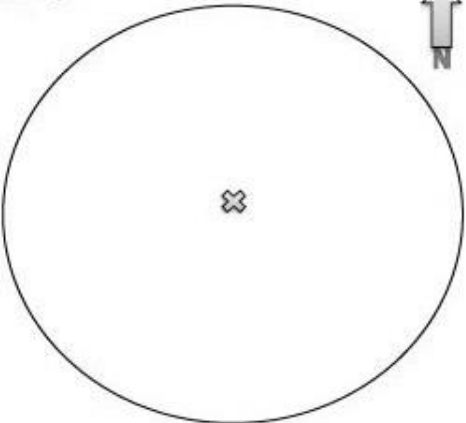
Distance to Clutter: < 5m 5m 10m 20m 50m 75m 100m >100m If distance is < 5m, % clutter within 5m radius around mic _____%

Primary Clutter Type: Water Building Vegetation Rock Other _____

Local Habitat (Area Being Sampled): Developed Forest Edge Open (field, meadow) Pond/Lake
Road/Trail/Cutline Stream Other: _____

Broad Habitat (Surrounding Area): Agriculture Forest-Conifers Forest-Deciduous Grassland
Suburban Urban Water Wetland

Site Map:



X indicates microphone location. Draw an arrow to show direction mic is pointing. Draw map of area within 100 m radius of site, showing landmarks and features of interest (water, buildings, roads, etc.). Provide a written site description below, including detailed directions to help others locate the site (distance from road or trail, etc.).

Site Description/Access Notes:

Log of station checks:

Observer (initials)	Date	Time	Battery Voltage	What did you do? (deployed unit, swapped cards, new batteries, picked up unit, etc.) Also note significant weather events.

Version date 2/11/2020

BAT ACOUSTIC MONITORING DATASHEET Site Name: _____ Site ID: _____
 Park: _____ (Optional, e.g. Long Island) (Required, e.g. API5001A)

Observer (initials)	Date	Time	Battery Voltage	What did you do? (deployed unit, swapped cards, new batteries, picked up unit, etc.) Also note significant weather events.

Additional Notes:

Appendix D. Site Photo Examples

Poor Quality Photo Examples

Photo A: Avoid blurry photos. Avoid vertical photo orientation.

Photo B: Avoid poor lighting and dark shadows that make it hard to see the subject. Walk around and try a different angle.

Photo C: Avoid having view of the surrounding habitat obscured by a person, tree trunk, vehicle, or other object. Do not zoom in.



Good Quality Photo Examples

Photo A: Photo is in focus and clearly shows entire set up and a nearby landmark (barn).



Photo B: Using horizontal photo orientation is preferable to show landscape

