

Standard Operating Procedure #3:

Preparing for the Field Season

Version 1.0

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

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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 the steps to be taken before the field season to prepare equipment and supplies and plan field work operations.

Many tasks must be completed prior to each field season in order to ensure a successful acoustic monitoring effort. Technicians should start preparations no later than mid-May to make certain there is time to inventory, test, and replace supplies and equipment. Table 1 provides a checklist of preseason tasks, and further detail is provided in the following sections.

Table 1. A checklist of tasks to complete before beginning the bat monitoring field season.

_____	Review most up-to-date protocol and all SOPs
_____	Inventory equipment, return a copy to GLKN protocol lead
_____	Order supplies (if needed)
_____	Clean and inspect acoustic detectors, replace batteries, update firmware
_____	Perform voltage test and calibration for microphones
_____	Run overnight equipment tests
_____	Determine data storage plan, update folders/file structure as needed
_____	Print out blank copies of datasheet
_____	Print out Quick Start Guide, SOPs, maps, site photos, and previous years' datasheets for reference in the field
_____	Load site coordinates on handheld GPS
_____	Create schedule for field work, share with supervisor
_____	Obtain or update permits, contact landowners
_____	Reserve government vehicle and/or arrange rides

1.1 Read the Protocol and Supporting Documents

Prior to the field season all technicians must read and familiarize themselves with the most recent version of the project protocol and standard operating procedures (SOPs). Be sure to understand the purpose of data collection and the appropriate way to deploy acoustic recorders, document field sites, and manage data. Be alert for portions of the protocol or SOPs that may be in need of revision and bring these to the attention of the GLKN protocol lead. Additional documents that technicians should read in preparation for field work include user guides for the acoustic detectors, previous years' park summary reports, and GLKN reports and resource briefs.

1.2 Equipment Inventory and Maintenance

An inventory should be conducted each spring to ensure all equipment is located, available, and functioning before the beginning of the monitoring season. A general list of required equipment can be found in Appendix A, though additional items may be required specific to each park. An inventory spreadsheet will be provided to each park by the GLKN protocol lead. This spreadsheet should be filled out with the current year's status of each item. Appendix B illustrates the required inventory format.

Each park should keep electronic copies of equipment inventories and maintenance records. Documenting annual maintenance can help isolate problems. Be sure to return a copy of the completed yearly inventory to the GLKN protocol lead. GLKN purchased some equipment and needs to keep track of these items. Furthermore, if equipment repair or replacement is needed, GLKN can facilitate this process.

Monitoring equipment (acoustic detectors and microphones) should be inspected for damage, cleaned, tested, and calibrated each spring. Acoustic detectors must also be updated with new firmware and set files. Firmware files are programming updates provided by the manufacturer to eliminate bugs or improve functionality. Set files determine the recording schedule and audio settings and are provided by the GLKN protocol lead.

Appendix C provides a checklist for routine inspection and maintenance of equipment. Refer to the following sections for detailed steps to test and calibrate the equipment.

1.3 Microphone Inspection and Testing

Each year before the field season each microphone should be checked for damage and tested for acoustic sensitivity and voltage problems. First, visually inspect each microphone. Common issues include degrading foam wind screens; loose black cap on the end of the microphone; or connections coming apart between the silver microphone tube and black plastic base. Make note of any issues on your equipment inventory and maintenance log. Contact the GLKN protocol lead regarding microphone repair or replacement.

Second, test each microphone to ensure it is still appropriately sensitive to ultrasonic sounds. Instructions for microphone calibration are provided below. Since ultrasound is beyond the range of human hearing, use Wildlife Acoustic's Ultrasonic Calibrator to test the microphones. Directions and photos are also provided in the Song Meter user guide (Section 9.3 for SM3, Section 7.3 for SM4).

Third, test each microphone to ensure it is still functioning properly and has no voltage problems. Instructions for the microphone voltage test are provided below, using a protocol provided by the Wildlife Acoustics customer support team.

Microphone Calibration

1. For best results, remove the foam wind screen from the microphone. Use extra caution to avoid damaging the microphone.
2. Attach the microphone to the Song Meter using a cable.
3. Turn Song Meter on and navigate to **Main Menu > Utilities > Calibrate Mic**.
4. Prepare the calibrator. Slide the clear plastic microphone adapter onto the calibrator from the bottom. The side with the smaller hole should be facing the toggle switches. Slide the plastic piece on as far as possible, right up against the toggle switches. See photos in Song Meter user guide.
5. Set the toggle switch for testing mode to **CAL**.
6. Place the microphone in the microphone adapter so it rests in the larger hole opening and up against the smaller hole opening. See photos in Song Meter user guide.
7. Turn on the calibrator using the **ON / OFF** toggle switch. The LED light will illuminate indicating the calibrator is working. If not, you will need to replace the calibrator's battery before proceeding.
8. While looking at the decibel (dB) level on the Song Meter display, very slowly rotate the microphone 360 degrees. You will see the number fluctuate as you rotate it. Write down the minimum and maximum of the range of numbers you see. Goal is to obtain these decibel readings with ± 0.5 dB accuracy. All of your numbers should be negative.

EXAMPLE 1: The numbers fluctuate between a minimum of -41 and a maximum of -35 .

EXAMPLE 2: The numbers fluctuate between a minimum of -44 and a maximum of -40 .

9. Now look again at the numbers you recorded. Is the maximum number (i.e., the least negative number, the number closest to zero) higher or lower than -38 dB?
 - a. If this number is **higher (less negative)** than -38 dB your microphone is properly calibrated and ready for deployment.

EXAMPLE: The maximum is -35 . This is higher than -38 . The mic is good.

- b. If this number is **lower (more negative)** than -38 dB your microphone has lost sensitivity and must be replaced.

EXAMPLE: The maximum is -40 . This is lower than -38 . The mic must be replaced.

10. Record the range of decibel readings observed on your equipment inventory and maintenance log.
11. Detach the microphone. Continue testing the rest of your microphones in the same way.
12. Press **◀ Left** when finished to exit the calibration utility.
13. Place wind screens back on the microphones for field use (replace wind screen if degrading). Again, use extra caution to avoid damaging the microphone. Remember that when properly installed there should be a slight gap between the inside of the wind screen and the end of the microphone; do not pull the wind screen down tightly against the microphone. Refer to illustration in Song Meter user guides (Section 3.2 for SM3, Section 3.6 for SM4).

Microphone Voltage Test

1. Turn on the Song Meter without any microphone attached.
2. Press Check Status and note the voltage level shown on the display.
3. Attach the microphone to the port.
4. Press Check Status again and note the new voltage level.
 - a. A good microphone will have little to no voltage drop (0 to 0.1 V change).
 - b. A bad microphone will have a larger voltage drop. This is due to a shorted component in the microphone causing it to draw excess power. The microphone must be replaced.

It is a good general practice to rerun the calibration and voltage tests on every microphone at least once during the field season to ensure it is still functioning properly. Warning signs of faulty microphones include rapid battery discharge, a deployment with zero audio recordings, or large numbers of “dump” files or corrupted audio files. If you believe that a microphone is not functioning properly, do not deploy it again. Use the above methods to test the microphone and contact the GLKN protocol lead if repair or replacement is necessary.

1.4 Acoustic Detector Inspection and Programming

As with microphones, each acoustic detector (Song Meter) must be visually inspected for damages prior to the field season. Inspect the exterior of the unit, all attachment ports, SD card slots, and battery compartments. Make note of any issues on your equipment inventory and maintenance log. Contact the GLKN protocol lead or the park supervisor regarding Song Meter repair or replacement.

Song Meters must also have the correct date/time programmed and be updated with new firmware and set files. Firmware files are programming updates from the manufacturer to eliminate bugs or improve functionality. Set files determine the recording schedule and audio settings and are provided by GLKN.

Use the **Check Status** button to see what the current settings are on each unit. The first two lines will display the date and time and firmware version (firmware is indicated by the numbers after the letter R). Follow instructions for setting date and time as described in the Song Meter user guides (Section 3.7 for SM3, Section 4.2 for SM4). If desired, you can set the date and time using the external GPS attachment rather than setting it manually. Once the date and time are set, the unit should generally retain this information even when you switch out the batteries because it has a separate clock battery. The clock battery will last up to three years. After that, it is not replaceable in the Song Meter 3 so date/time will need to be reset every time the batteries are switched. In the Song Meter 4 the clock battery can be replaced following instructions in Section 3.10 of the user guide.

Updating Firmware

Firmware files are programming updates for the Song Meter provided by the manufacturer (Wildlife Acoustics) to eliminate bugs or improve functionality. Firmware should be updated a minimum of once per year before beginning the field season. Once updated, firmware will not normally need to be adjusted during the field season. The GLKN protocol lead will alert field staff if further upgrades are released mid-season.

Follow the instructions below to update firmware. You may also wish to refer to the Song Meter user guides (Section 9.4 for SM3, Section 7.6 for SM4).

1. Obtain the latest firmware files. These will either be provided by the GLKN protocol lead or can be downloaded from the Wildlife Acoustics website. Firmware files end with “.SM3” for Song Meter 3 or “.SM4” for Song Meter 4.
2. Copy the firmware 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 > Utilities > Firmware Update**.
4. Select the proper file and press **Enter**. Unit will install the new firmware and restart.
5. Press **Check Status** to verify that the new version of firmware has been installed. The firmware version is indicated by the numbers after the letter R.

Loading Set Files

Set files determine the recording schedule, time zone, and audio settings used by the acoustic detector. Set files are provided by the GLKN protocol lead and are specific to each park because of differences in time zone and park name prefix. In order to compare results among parks and examine trends through time it is very important that all Song Meters are programmed with the same schedule and settings. Therefore, please DO NOT change the recording schedule or audio settings from what has been programmed in the set file provided by GLKN. If you need to deploy a detector with a delayed start due to logistical constraints, you will need to obtain a different set file from the GLKN protocol lead and follow additional steps (see Appendix C of SOP #4).

Follow the instructions below to install the set file. You may also wish to refer to the Song Meter user guides (Section 4.7 for SM3, Section 6.6 for SM4).

1. Obtain the latest version of the set files from the GLKN protocol lead. The set files end with “.PGM” for Song Meter 3 or “.SM4S” for Song Meter 4.
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** (SM3) or **Main Menu > Schedule > Import Sched + Setts** (SM4).
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. To later verify which program settings are loaded, go to **Main Menu > Program > Edit Program** and use the **▼ Down** button to scroll down and view all the settings. Do not change anything! Press **◀ Left** to return to the Program menu when finished.

Once you load the GLKN set file as described above, this program will be loaded as the active program and will be the default that is used whenever you start recording. You do not need to import/load the program at every deployment.

Programming Site Prefix and Coordinates

Although the set file will be loaded at the beginning of the field season, be aware that you will still need to manually program two pieces of information for every single deployment. First you will need to manually enter the site-specific prefix (Site ID) using the park four-letter code, the cell’s GRTS order number, and the site’s letter designation (e.g., SLBE001A). Secondly you will need to enter the latitude/longitude for the site either manually or using an external GPS attachment. These must be done **AFTER** you load the set file, or else the set file will overwrite them. Further information about these steps is provided in SOP #4.

Verifying the Loaded Program

During the field season it is possible that the desired recording program may be accidentally deleted or overwritten with another program (such as Sunset/Sunrise). Therefore, it is important to verify at

each deployment that the program is correct. This can be done by noting the displayed message when you press “**Program Start**” or “**Schedule Start**” button. The screen will show “**Going to sleep until...**” followed by a date and time. The date should always show the current (today’s) date, and the time should always show 18:00:00 if the correct schedule is loaded. If this is NOT correct, you will need to follow the instructions above to load the GLKN set file again. Exception: If you are using a delayed start, the date shown should be the date you are delaying until, and the time shown should be 18:00:00 for SM3 units or 00:00:00 for SM4 units.

1.5 Acoustic Detector Settings and Terminology

GLKN adopted a standard set of acoustic settings and a standard recording schedule in 2016 (updated slightly in 2018). The GLKN protocol lead should use the Wildlife Acoustics Song Meter Configurator utility to program these settings into set files. The Configurator utility is available for download from the Wildlife Acoustics website. There will be a minimum of two set files created for each park, corresponding to the two Song Meter models. If needed, additional set files can be created to utilize the delayed start option. The standard settings with standard recording schedule are shown below for both the SM3 and SM4 models (Figure 1), followed by the modified schedule when using a delayed start (Figure 2). Proper time zones for each park are shown in Table 2.

The following definitions will explain the abbreviations used and the terminology related to the Song Meter audio settings:

- **High Pass Filter (HPF):** Filter that only allows signals higher than the specified frequency to be recorded. This is useful for limiting unwanted recordings.
- **Gain:** Indicates how much the signal is amplified (voltage gain = output voltage / input voltage).
- **Full Spectrum (FS):** We record audio files in full spectrum in the WAV file format. This allows for richer data and higher quality results, at the cost of larger file sizes. (The alternative is zero crossing (ZC) format which some other devices use.)
- **Sample Rate:** Number of times an analog signal is sampled per second in kHz. Should be set to a number that is at least double the highest frequency you expect to record.
- **Minimum Frequency (FRQMIN):** Specifies the lower bound of frequencies, with signals below the specified amount not causing a “trigger” but instead being categorized as “noise” by the Song Meter’s internal scrubber.
- **Maximum Frequency (FRQMAX):** Specifies the upper bound of frequencies, with signals above the specified amount not causing a “trigger” but instead being categorized as “noise” by the Song Meter’s internal scrubber.

- **Minimum Duration (DMIN):** Specifies the minimum duration for a signal in the specified frequency range to be consider a valid signal by the scrubber.
- **Maximum Duration (DMAX):** Specifies the maximum duration for a signal in the specified frequency range to be considered a valid signal by the scrubber.
- **Trigger Level (TRGLVL):** Trigger level is relative to noise floor and is satisfied if a signal exceeds the specified level (above the noise floor) within the frequency range defined by Min/Max Frequency.
- **Trigger Window (TRGWIN):** Specifies the maximum recording duration in the absence of a triggering signal. This means that the Song Meter will keep recording for a short time after a triggering signal, allowing it to pick up sequences of bat calls.
- **Trigger Maximum (TRGMAX):** Specifies the maximum duration for a triggered recording, i.e., the maximum file size.

Table 2. The time zone programmed into the set file is specific to each park. 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

Configuration settings

☒ Prefix: SLBE

☒ Timezone: UTC-04 :00

☒ Position: Lat: 0.00 N Lon: 0.00 W

☒ Solar mode: Sunrise/Sunset

☐ Cutoff voltage: 0.0 V

☐ Sensitivity: 0: 0.0 dB 1: 0.0 dB

Deployment scenario

SM3BAT Start dd/mm/yy hh:mm:ss 01/06/2016 18:00:00

A: 64GB B: 64GB C: Empty D: Empty

Mic 0: SMM-U1/SM3-U1 Mic 1: SMM-U1/SM3-U1

Trig Ratio (%): 10% Battery (Wh): 72 Wh

Program

1 HPF CH 0: 1 kHz CH 1: 1 kHz

2 GAIN CH 0: Automatic CH 1: Automatic

3 FS WAV Format AUTO 256kHz

4 ZC OFF DIV 16

5 FRQMIN CH 0: Specify 16 kHz CH 1: Specify 16 kHz

6 FRQMAX CH 0: Specify 192 kHz CH 1: Specify 192 kHz

7 DMIN CH 0: Specify 1.5 ms CH 1: Specify 1.5 ms

8 DMAX CH 0: Off CH 1: Off

9 TRGLVL CH 0: Specify 12 dB CH 1: Specify 12 dB

10 TRGWIN CH 0: 3.0 s CH 1: 3.0 s

11 TRGMAX CH 0: Specify 15.0 s CH 1: Specify 15.0 s

12 REPEAT

13 AT TIME 18 : 00 : 00

14 RECORD 14 : 00 : 00

15 UNTCOUNT Forever

16 <Choose>

Deployment scenario

SM4BAT-FS Start dd/mm/yy hh:mm:ss 01/06/2016 18:00:00

Slot A: 64GB Slot B: 64GB

Mic 0: SMM-U1

Trig Ratio (%): 10% Battery (Wh): 72 Wh

NOTE: Remember to select the correct model of SM4 recorder e.g. SM4, SM4BAT-FS, or SM4BAT-ZC
NOTE: Run time estimates assume power-efficient flash cards and high quality batteries at room temperature. Run times can vary significantly (by as much as 50%) otherwise.

Settings

☒ Prefix: SLBE Gain: 12 dB

☒ Timezone: UTC-04 :00 16k High Filter: off

☒ Position: Lat: 0.00 N Lon: 0.00 W Sample rate: 256kHz

☒ Solar mode: Sunrise/Sunset Min Duration: 1.5 ms

☐ Battery Cutoff: 0.0 V Delay start (dd/mm/yyyy): 01/01/2000 Max Duration: off

LED 5 minutes only Min Trig Freq: 16 kHz

Trigger level: 12 dB

Trigger window: 3 s

Max Length (mm:ss): 00:15

Schedule

--- Load built-in schedule ---

START time 18 : 00

DUTY always

END time 08 : 00

Add

Figure 1. Standard settings used for SM3BAT (*top*) and SM4BAT FS (*bottom*), as provided in the set files from GLKN. Note that the prefix and latitude/longitude must be updated for each site at the time of deployment. Example given is for SLBE, but park code and time zone will be set appropriately for each park.

1.6 Equipment Testing

Once Song Meters have been inspected and programmed, and microphones have been checked and calibrated, the equipment should be tested overnight to ensure it functions properly and collects appropriate data. Each Song Meter should be tested at least once a year in the spring prior to any deployments.

1. Make sure the Song Meter has fresh batteries. Battery voltage with fresh batteries should read approximately 6.4 V. Only alkaline batteries (size D) should be used, not rechargeable batteries.
2. Verify correct date and time have been programmed. Verify correct set file with recording schedule, time zone, and audio settings has been loaded. Verify prefix and latitude/longitude have been manually entered.
3. Insert an empty, formatted SD card into Slot A. Use only SanDisk Ultra 64 GB class 10 SDXC cards. SD cards may be formatted either on a computer or using the Song Meter formatting utility, found at **Main Menu > Utilities > Format All Cards**.
4. Attach a working, calibrated ultrasonic microphone. On SM3, either port may be used.
5. Press the “**Program Start**” or “**Schedule Start**” button.
6. Make sure the message “Going to sleep until...” appears on the display. Once again, verify that the date is correct and that the start time is 18:00.
7. Leave the Song Meter to record overnight. Place in a secure location where it will not be disturbed.
8. In the morning, press the “**Program Stop**” or “**Recording Stop**” button.
9. Take out the SD card and place in a computer to examine the output files.
10. You should see a summary text file (.txt). This file is automatically created by the Song Meter and collects information once every minute while it is actively recording. You may also see audio files (.wav) if any recordings were made. These are likely noise of some type. Finally, you may see dump files (.sm3dump or .sm4dump) which indicate there may have been a loss of power or other problem.
11. Open the summary text file to review the data. Check that the time on the first line is approximately 18:00 and the time on the last line is approximately 08:00. This shows that the Song Meter was running properly all night long. Then compare the battery voltage on the first line (should be about 6.4 V) to the battery voltage on the last line. If the voltage dropped more than a few tenths, this unit is probably not functioning correctly.

Please contact the GLKN protocol lead to help resolve equipment issues if you find that a unit creates dump files during this test, if the battery voltage drops significantly, or if anything else unexpected or problematic occurs.

1.7 Prepare Data Management Plan

Data management is a critical component of a successful field season. Technicians will need to prepare an organization system prior to beginning field data collection. Consult with the park supervisor to determine where bat survey data will be stored. Due to the large amount of data generated by acoustic monitoring, data will typically not be stored on the park's server. Instead, parks typically opt to store bat data on external hard drives. Data should be stored in two separate locations (e.g., two different external drives) in order to maintain a backup copy. GLKN has provided an external hard drive to each park for this purpose, and the park should provide a second drive, server space, or other storage solution. Wherever data will be stored, set up a new file structure for the current year of data collection. There should be a separate folder for each site, which will contain the site's datasheet, photos, audio files, and summary files.

1.8 Assemble Resources to Bring in the Field

GLKN has established a shared online drive for bat monitoring information. All technicians and supervisors will have access to this drive, which contains protocol and SOP documents, the blank field datasheet, completed datasheets and photos from prior years, park summary reports and GLKN reports from prior years, the latest firmware and set files, and other helpful resources. This is also the location where technicians will upload their data from the current year to be reviewed by the GLKN protocol lead. If additional field staff need access to the shared drive, ask the GLKN protocol lead to connect them.

Each technician should assemble relevant resources from the shared drive and/or from park files to have on hand during field deployments (Table 3). Documents should be printed out and carried in a clipboard or stored in digital form on a tablet computer. Whatever format is selected, these resources should be easily available to the field crew so they can be referred to during deployments.

Table 3. A checklist of documents and resources to assemble, for use during field deployments.

_____	New blank datasheets (most up-to-date version)
_____	Previous years' completed datasheets to help with navigation and ensure proper microphone orientation/height (use corrected version provided by GLKN)
_____	Previous years' photos to help with locating sample sites and setting up equipment in a consistent manner (use corrected version provided by GLKN)
_____	Point locations for all sample sites, loaded onto a handheld GPS (use corrected coordinates provided by GLKN)
_____	Maps and directions to all sample sites
_____	SOPs containing instructions for deploying/retrieving acoustic detectors
_____	GLKN Quick Start Guide (see SOP #4)
_____	Song Meter user manuals
_____	Emergency phone numbers and radio contacts
_____	Copies of all applicable permits and authorization for accessing private land (if needed)

1.9 Prepare and Share Schedule for Field Work

The field season for this protocol runs from 1 June to 15 August. This time period will be the standard and will remain the same every year in order to monitor differences among parks and sites and track trends through time. The schedule for deployments should follow previous years' schedules to the greatest extent possible. Both the order in which sites are sampled and the dates of sampling

should be as consistent as possible from year to year. Ideally, dates will be no more than one week earlier or later than previous years. Deployments are allowed to be anywhere from 7–14 days in duration. This flexibility offers the opportunity to catch up or stretch out the sampling schedule to get back in synch with previous years.

Plan the sampling schedule as far ahead of the field season as possible. Once a preliminary sampling schedule has been established, technicians should communicate the plan to supervisors and co-workers. Doing so will help with reserving vehicles, recruiting field assistants, arranging rides, and accommodating any planned time off. Communicating with other park staff (e.g., visitor center staff) is also a good idea to alert them that bat monitoring activities will be taking place.

1.10 Permits and Access

Conducting research within a national park typically requires having a permit. However, since this bat monitoring is being done in collaboration with park staff and GLKN, most parks will waive the requirement for a federal permit. Consult with the park's natural resources supervisor to determine if a permit is required and how to obtain one.

Prior to the field season, be sure to check with the park supervisor to determine if any areas of the park are closed to surveys or if there are any new restrictions on sampling. For example, there may be construction activities or trail closures which would limit access to certain areas. At some parks (i.e., MISS and SACN), certain survey sites may be located on land that does not belong to the National Park Service. Sites may be on private property, state/county property, or property managed by other federal agencies. Before accessing those sites, it is very important to confirm that permission has been granted to enter the property and find out if there are any special restrictions or guidelines.

Appendix A. List of Required Equipment

This list should be reviewed before the field season to assemble all necessary equipment and supplies. It should also be double checked each day before you begin field work to ensure you have everything you need. A good practice is to tape this list to the front of your field clipboard. You may wish to add items or modify this list to fit your own park's needs.

Equipment needed for deploying and retrieving bat monitoring equipment:

- ☐ Maps, directions, and site descriptions for sites where units will be deployed
- ☐ Previous years' datasheets and site photos for reference
- ☐ List of contacts (phone numbers or radio call numbers) including emergency numbers, park supervisor, other park staff, dispatch, and GLKN protocol lead
- ☐ Song Meter acoustic detectors
- ☐ Fresh batteries, alkaline, D-size (4 for each Song Meter, plus extra) (*do not use rechargeable batteries*)
- ☐ Empty, formatted SD cards (2 for each Song Meter, plus extra)
- ☐ Storage case, small envelopes, or Ziploc bags to hold/organize SD cards
- ☐ Microphones (1 for each Song Meter, plus extra)
- ☐ Microphone cables (length dependent on site, recommend bringing extra)
- ☐ Cable locks and keys (1 for each Song Meter)
- ☐ Laminated signage explaining equipment/project if site is in a publicly accessible or visible location
- ☐ Mounting equipment such as T-post, PVC, tripod, painter's pole (varies by park)
- ☐ Pruning shears (for trimming vegetation around mic)
- ☐ Handheld GPS loaded with survey sites (use corrected coordinates provided by GLKN)
- ☐ GPS attachments for Song Meters
- ☐ Printed copies of GKLN Quick Start Guide, SOPs, and Song Meter user manuals
- ☐ Blank datasheets (may wish to use waterproof paper)
- ☐ Clipboard
- ☐ Pencils

- ☐ Tape measure (for measuring height of microphone)
- ☐ Compass (for navigation to site and for properly orienting microphone and directional photos)
- ☐ Range finder (for measuring distance to features for site description)
- ☐ Electrical tape
- ☐ Zip ties
- ☐ Bungee cords
- ☐ Leatherman multi-tool
- ☐ Camera

Appendix B. Example Equipment Inventory

<i>Park's 4-letter code</i>	<i>Item type</i>	<i>Manufacturer's serial number (not needed for calibrators)</i>	<i>ID # assigned by GLKN (items will have either a GLKN ID or a Park ID, typically not both; ID # not needed for mics)</i>	<i>ID # assigned by park</i>	<i>Purchase year & source if known (if Other, specify in notes)</i>	<i>Good working condition? Damaged? Malfunctioning? Passed calibration & voltage tests?</i>	<i>Any other pertinent notes</i>
Park	Item	Serial #	GLKN #	Park #	Purchase Year/Source	Status	Notes
GRPO	SM3	SM303669		GRPO002	2015 WNS; Tribal	Working; one mic port damaged	
GRPO	SM4	S4U03767		GRPO006	2016 WNS; GLKN	Working; no damage	
GRPO	Mic	MU104130			2015 WNS; Tribal	Working; passed voltage test; calibrated ok (-30 to -34 dB)	
GRPO	Mic	MU108626			2017 WNS; GLKN	Working; passed voltage test; calibrated ok (-26 to -36 dB)	New for 2018 field season
GRPO	Garmin GPS - SM3	1A3038598	511		2015 WNS; Tribal	Working	

Number of SD Cards: _____

Appendix C. Checklist for Inspection/Maintenance of Acoustic Detectors and Accessories

Serial Number of Acoustic Detectors Serviced: _____

Serial Numbers of Microphones Serviced: _____

Date of Service:		Completed By:		
Task Performed		Results (check one column for each task)		List the Serial Number/Issue for Each Item Needing Work
		All Items OK	Some Items Need Work	
Song Meter Acoustic Detectors	Housing inspected for damage			
	Microphone ports and SD card slots inspected for damage			
	Battery bay inspected for corrosion or damage			
	Batteries replaced; battery voltage verified to be ~6.4 volts			
	Latest firmware loaded (Version: _____)			
	Latest set file loaded			
	Date and time programmed correctly			
	Format SD cards; insert and verify they do not read Dirty/Empty			
Microphones	Microphones, cables, and connections inspected for damage			
	Microphone windscreens inspected for damage, replaced if needed			
	Microphone calibrated to test sensitivity			
	Microphone checked for voltage drop			
All	Overnight test run			

Additional Notes: