

Standard Operating Procedure #5:

Data Management by Field Staff

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					

Contents

	Page
Figures.....	ii
1.0 Introduction.....	1
1.1 Data Management in the Field.....	1
Datasheets.....	1
Audio Files, Program Files, and Summary Files.....	1
Site Photos.....	2
1.2 Data Management in the Office.....	3
Data Storage.....	3
Folder Structure.....	3
Saving Deployment Data.....	4
File Naming Conventions.....	4
1.3 Quality Assuring the Data.....	7
1.4 End of Season Data Submission.....	9

Figures

	Page
Figure 1. Example of required folder structure to organize data by year and site.	3
Figure 2. Examples of correctly named and organized files uploaded to the shared online drive for a typical site with a single deployment (<i>left</i>) and for a site with two deployments (<i>right</i>).	8

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 methods to be followed for organizing and managing data resulting from deployment of bat acoustic monitoring equipment. Step-by-step procedures are included to help field crews maintain consistency and quality in data management.

1.1 Data Management in the Field

High quality data starts with careful management of equipment and data in the field. The primary types of data we collect are 1) site and deployment information on field datasheets, 2) audio files, 3) Song Meter program files to record the schedule and settings used, 4) Song Meter summary files to track detector status, and 5) site photographs.

Datasheets

Be prepared for field work by printing out sufficient copies of the field datasheet, including a few extras. You do not want to find yourself at a sample site with no datasheet. Always fill out the datasheet while you are in the field doing the deployment or retrieval. Review each datasheet to be sure all fields are complete, information is clearly stated, and handwriting is legible. Refer to SOP #4 for instructions on completing the datasheet. Do not wait and try to fill out the datasheet back at the office because it will be difficult to remember the details accurately. As soon as possible after returning from the field, make a scanned copy of the datasheet (PDF file format) as a backup of the paper copy.

Audio Files, Program Files, and Summary Files

Audio files, program files, and summary files will be recorded onto SD cards by the Song Meter. These data are critical to our project; be very attentive to proper handling, tracking, and storage of the SD cards. Prior to the field season, all SD cards will be labeled with unique numbers to aid in tracking. At deployment, the SD card numbers will be recorded on the datasheet. This will help us track if a particular card is consistently malfunctioning and should be discarded. It will also help us match data files to the proper deployment in case the Song Meter prefix is not programmed correctly.

Two empty, formatted SD cards should be brought into the field for each new deployment of a Song Meter. Cards can be formatted either on a computer at the office, or in the field using the Song Meter formatting utility. Recommended card size is 64 GB (gigabytes). The Song Meter will always write data to the SD card in the “A” slot first, then if necessary, move to the SD card in the “B” slot. Generally the batteries on the Song Meters will die before the first 64 GB SD card becomes full. This means that in most cases the card in the “B” slot will not end up having data written to it. However,

this is just a prediction and can vary depending on the quantity of calls and noise files being collected. Always include a second SD card when deploying the Song Meter, to account for possible extreme cases or malfunctions. More than two cards can be used if available.

When retrieving equipment, first record the status of each SD card on the datasheet (using the “Check Status” button). Then remove the cards from the Song Meter and place in a labeled envelope, zip-lock bag, or SD card carrying case. Develop a consistent system for keeping track of which SD cards come from which sample site and be very careful to keep used cards clearly separated from new blank cards. If we can’t confidently say which site the data came from, it will have to be excluded from analysis. As soon as possible after returning from the field, download audio files, program files, summary files, and any “dump” (diagnostic) files from the SD cards and place in the proper site folder.

Site Photos

Site photographs are important for documenting site conditions and verifying consistent placement of equipment from year to year. However, photos can look alike in many cases, and mixing them up does a disservice to future technicians who are using the photos to try to relocate the site. It is unrealistic to think you will be able to reliably identify all photos when you look at them later in the office, especially if a few days have passed. Furthermore, GLKN staff have not typically visited your sample sites and will not be able to identify the photos. As the field technician, you are the local expert and this is your responsibility.

To save yourself the trouble of puzzling over which photo is which, always take the photos in the exact same order, so you will be able to correctly and confidently identify them later in the office. For example, always start with the datasheet photo, followed by the North, East, South, and West photos, then the equipment set up photo, and lastly the microphone area photo. If multiple technicians are working on the project, make sure everyone is taking photos in the same order. As soon as possible after returning from the field, download photos from the camera and assign proper file names.

1.2 Data Management in the Office

Once a deployment is complete and the equipment has been retrieved, the data must be saved securely. The data management scheme for this project incorporates guidelines for where to store data, how to organize it, and file naming conventions.

Data Storage

To prevent accidental data loss, we will back up all data by using two separate data storage locations at each park. The first location will be an external hard drive provided to the park by GLKN. The second location will be selected at the discretion of the park but must be completely separate from the first location (i.e., not two copies on the same external hard drive). Recommended locations for the second copy are another external hard drive or the park's server. Acoustic files are large in size so plan accordingly to have adequate storage capacity.

Folder Structure

Once you have identified the two locations where data will be stored, create identical folder structures in both locations to keep your data organized. Please utilize the folder structure described below (Figure 1) to maintain consistency among parks. Create a new folder for the current year of data collection. Within this, create a new folder for each sample site. All files pertaining to each site will be stored within that site's folder. Label the site folders with the Site ID, e.g., "APIS001A". Within each site folder, create a new folder named "WAV" to hold the audio files.

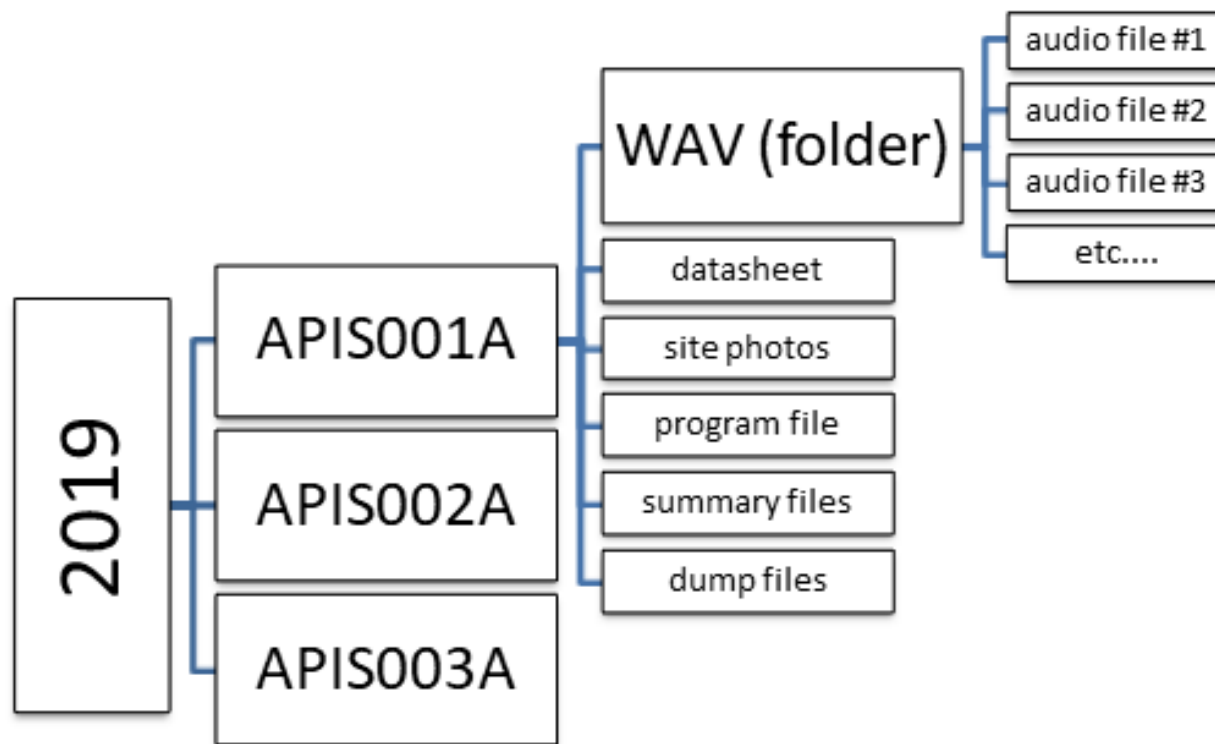


Figure 1. Example of required folder structure to organize data by year and site.

Saving Deployment Data

When the folder structure has been created, you can begin to move deployment data into it. Working on one sample site at a time to prevent data mix-ups, copy ALL data from each SD card into the appropriate site folder. This includes WAV audio files, summary text files, program file, and dump files (if any). Save the scanned PDF copy of the completed datasheet and all site photos to the appropriate site folder as well. Rename files to incorporate the Site ID and year (see instructions in next section).

Within each site folder keep the audio files inside the separate folder named “WAV”. If there are one to several dump files they do not need to be in a separate folder. If there are a large number of dump files, it is recommended to move them to a separate folder. Datasheets, site photos, summary files, and program files do not need to be in separate folders.

Remember that you may have data on more than one SD card for a particular site, so you may have more than one summary file. Even if a site had more than one SD card, all the data belonging to the same site can be combined in that site’s folder.

In situations where there were multiple deployments at the same site in the same year, create a second “WAV” folder so that audio files are separated by deployment. Add the deployment number to the folder names as well (e.g., WAV_deploy1 and WAV_deploy2).

File Naming Conventions

Do not change the name of any audio (WAV) files or dump files. Save the audio files using the names automatically generated by the Song Meter, which includes the site prefix, date, and time. Even if the wrong prefix was accidentally used, do not change the file names. If needed, the entire batch of audio files will be bulk renamed by GLKN staff at the end of the season once data has been submitted. If the wrong prefix was used, please note this on your completed datasheet and/or alert the GLKN protocol lead via email.

Use the following naming conventions for scanned datasheets, site photos, program files, and summary text files. Do not forget to add the year to the end of each file name.

- **Scanned Datasheet PDF:** PARK###A_Data_Year (Example: GLKN001A_Data_2016)
- **Datasheet Photo:** PARK###A_Sheet_Year (Example: GLKN001A_Sheet_2016)
- **Directional Photo:** PARK###A_Direction_Year (Example: GLKN001A_East_2016)
- **Microphone Aspect Photo:** PARK###A_Mic_Year (Example: GLKN001A_Mic_2016)
- **Equipment Setup Photo:** PARK###A_Set_Year (Example: GLKN001A_Set_2016)
 - If multiple setup photos were taken, add a number after Set (Example: GLKN001A_Set2_2016)
- **Action Photos:** PARK###A_Action_Year (Example: GLKN001A_Action_2016)

- Use this if you took any “action shots” of field crews deploying equipment, accessing sites, completing datasheets, etc. These photos are good for reports.
- **Song Meter Program File:** OriginalName_Program_Year (Example: GLKN001A_Program_2016)
 - “Original Name” indicates the name that is automatically generated by the Song Meter, which is based on the Site ID that was programmed as the prefix.
- **Song Meter Summary Text Files:** OriginalName_Year (Example: GLKN001A_A_Summary_2016)
 - “Original Name” indicates the name that is automatically generated by the Song Meter, which is based on the Site ID that was programmed as the prefix.

In situations where there were multiple deployments at the same site in the same year, add the deployment number to the end of the file names. For example, two datasheets would be named GLKN001A_Data_2016_deploy1 and GLKN001A_Data_2016_deploy2. This will allow us to differentiate data collected during the first deployment as compared to data collected during the second deployment. It is important to keep these distinct because they will be treated as independent deployments when we enter data in the database.

1.3 Quality Assuring the Data

In order to check on the status of acoustic detectors and verify correct programming and protocols are being used throughout the summer, field staff are required to regularly provide data to the GLKN protocol lead for review. This will be accomplished through the bat monitoring project's shared online drive.

On the shared drive you will find a folder labeled "Upload Data Here". In this folder you will find folders organized by park and sample site. Within each sample site folder there is a separate folder for WAV files. Upload your files into the appropriate folder by site, making sure you use the naming conventions as described above. Please upload your data in a timely manner as soon as possible after the end of each deployment round.

For each deployment, upload the following items:

1. Five audio files, taken from different days and times. Do not upload all audio files! Doing so would take a very long time, and for the purposes of quality assurance only a small sample is necessary. Copying only a few files should not take much time. These will provide a check on the audio quality of recorded data and how microphones are functioning. **Format is .wav**
2. The program file that you exported from the Song Meter at the time of deployment. This provides us with a record of the recording schedule and settings that were used for the deployment. You should have only one program file per deployment. **Format is .PGM or .SM4S**
3. The summary text file(s) that was created by the Song Meter. This will provide us information on battery usage, detector status, and recording schedule. If multiple summary files were created during a deployment, upload all of them. **Format is .txt**
4. A scanned copy of each datasheet. We will check for consistency and any problems or clarifications needed for proper site documentation. **Format is .pdf**
5. Photographs taken at each site. You will have at least 7 photos for each site: 4 directional photos, microphone aspect photo, equipment setup photo, and datasheet photo. **Format is .jpg**

In situations where there were multiple deployments at the same site in the same year, add additional folders to contain the sample WAV files from each deployment. Also remember to add the deployment number to the end of the file names. Examples of correctly organized files are provided below for a typical single deployment and for a site with two deployments (Figure 2).

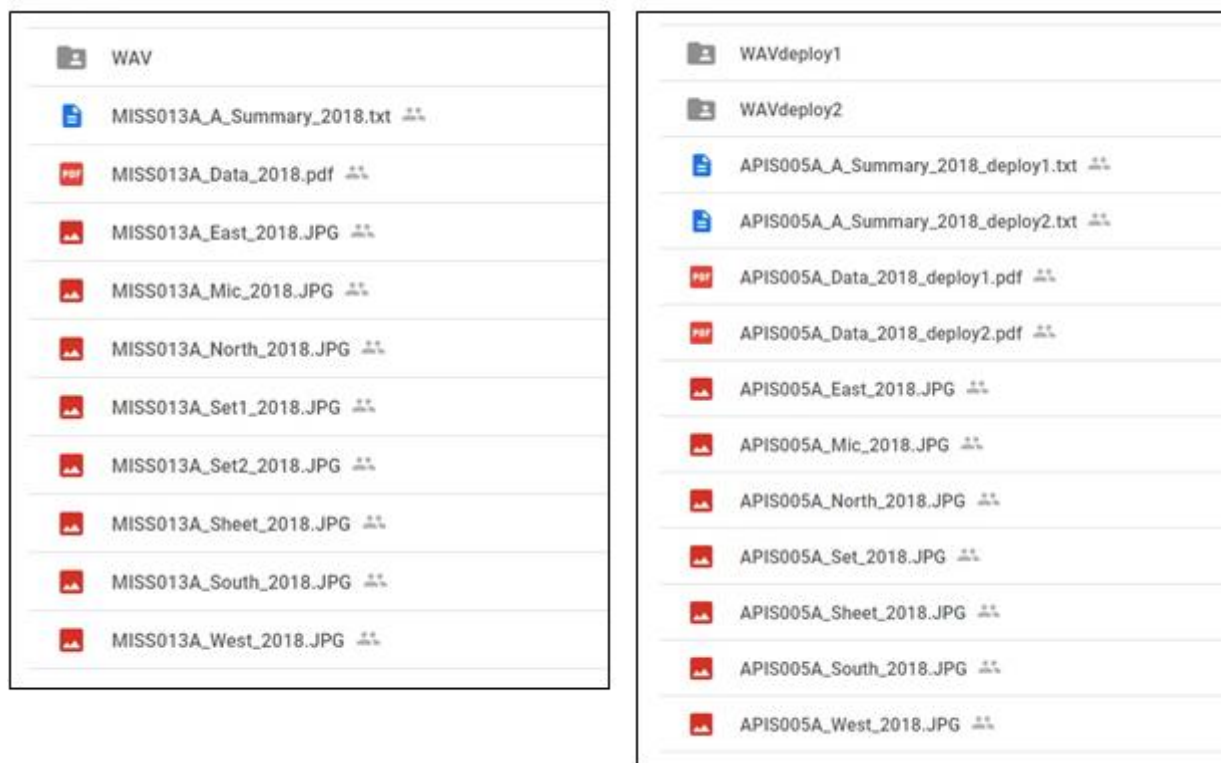


Figure 2. Examples of correctly named and organized files uploaded to the shared online drive for a typical site with a single deployment (*left*) and for a site with two deployments (*right*).

1.4 End of Season Data Submission

At the end of the summer, each park will be asked to submit their data to the GLKN office in order to centralize all of the project data for summary and analysis. By the time fieldwork concludes, all deployment data should already be securely saved. Carefully review the entire dataset to verify that each site folder contains all the necessary data: WAV audio files, summary files, program files, site photographs, scanned datasheets, and if applicable, dump files, additional explanatory notes, or additional photos. Double check that the correct folder structure has been utilized and correct file names have been assigned, following the specific guidelines provided above.

After reviewing the entire dataset and verifying it is complete, you will need to submit the data to the GLKN office. Mail or deliver in person a complete copy of the dataset on the external hard drive that GLKN provided to the park. Do not store data from any other projects on this hard drive. If sending the hard drive by mail, please follow up with the GLKN protocol lead to confirm that it has been received. Retain the second complete copy of the entire dataset at the park as a backup.