BAT SURVEY SOLUTIONS
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POST-PROCESSING STATIONARY-POINT ACOUSTIC DATA WITH SONOBAT FOR USF&WS SURVEYS

I. BEFORE POST-PROCESSING (THESE STEPS SHOULD ALL BE COMPLETED PRIOR TO POST-PROCESSING WAV FILES)

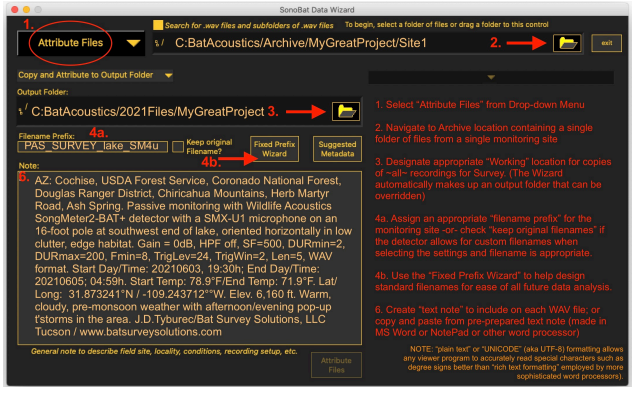
1. Capture Complete **METADATA** for EACH Detector Location *(this is a 2-step process done during deployment and annotated as needed during recovery)*	Use paper data sheets, Survey 1-2-3, and/or smart phone records (e.g., images, GPS, etc.). Redundancy is helpful, create data sheets that prompt necessary metadata components from USF&WS guidelines. Digitize paper data sheets and smart phone images, labeling them with PROJECT, Location, and deployment site details.
2. Create an RTF or TXT **FILE NOTE** that can be appended to each WAV file out of the Metadata components above for files from EACH detector location. *(this is should be done as soon as possible after deploying detectors by the person who did the deploying while information is still fresh)*	At a minimum the file note should include: STATE, County, nearest town, landowner, general location, descriptive location, habitat description, deployment site details, Lat/Long, elevation. Detector settings, microphone height, orientation, azimuth, distance to clutter, type, and percentage; distance to water and type, purpose of project, and name and contact of responsible person(s) doing deployment and data collection. TIP: Enter as much info as possible from the Metadata in step #1 above so it can be copied and pasted from the file note into the GUANO fields during the Attributing step (see page 2).
3. On pickup, archive detector **LOG** file with WAVs and note any unusual occurrences on paper data sheet (or in digital files)	It is a good idea to append each log file with the deployment site prefix. Log files can be imported into Excel and combined for multi-day deployments with multiple data collections. This is essential for confirming detector up-time (e.g., reporting that survey effort is met)
4. Download **WEATHER Data** from an on-site Kestrel or nearest weather station (e.g., using Synoptic Data: https://synopticdata.com/)	It is helpful (but optional) to include several days before and after survey window incase of events outside the monitoring window that could explain unexpected bat activity. Summarize data with Excel to confirm max/min conditions were met according to guidelines.
5. Edit FILE NOTE to include weather anomalies and actual Start day/time and End day/time from log file, noting any lack of up-time due to full CF card and/or dead battery or other unusual occurrence upon pickup.	Name FILE NOTE for PROJECT, Location, and deployment site. TIP: Standardize Text Note Contents to ensure complete capture of all metadata. Tho metadata is embedded in WAV files, the file note is important so any "voucher" calls will include this narrative. TIP: Use actual start time in HHMMSSms format from **LOG** file, not "sunset +20 minutes." All info from Text Note can be copied and pasted during the attribution process to save time and prevent transcription errors.
6. Off-load original WAV files from detector memory card to an appropriately organized **ARCHIVE** location, creating a unique folder for EACH detector site, that resides in a Location sub-folder for the Project	This type of organization is essential for analyzing data at a night-level, site-level basis for a Location and for multiple Locations for a Project. SonoBat automatically groups data into monitoring nights for each detector site so additional nightly sub-folders are not needed.
7. Setup appropriate "**WORKING**" directory for attributed copies of WAV files and copies of metadata. SonoBat can Analyze multiple locations with multiple detector sites all at one time and automatically calculate nite-level summaries (no separate "monitoring night" folders are required)	Name Directory for the Project. Put all attributed WAV files from the entire project into a single folder so they can be scrubbed and batch classified (AutoID'd) all at once - the unique filenames for each detector Location-site keeps the data separate and allows for reporting on the entire project, individual locations, and individual deployment sites. Excel outputs will include "monitoring night" for night-level analyses. TIP: Be sure to copy all METADATA from archive location(s) to appropriate working locations. Eventually ARCHIVE data will be stored and backed up elsewhere, and metadata may be required.

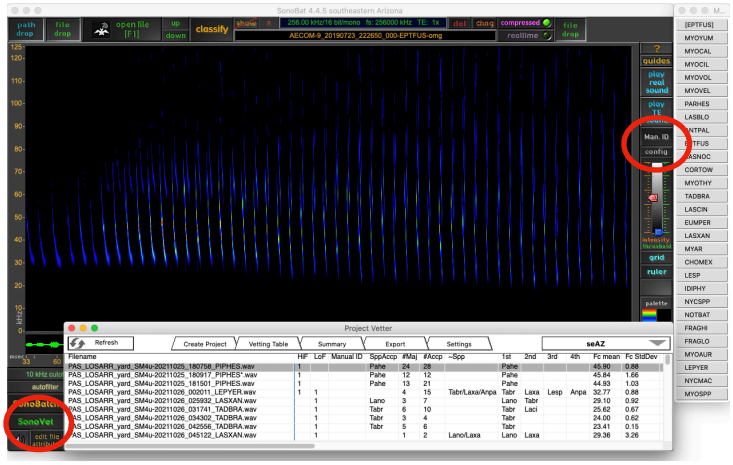
NOTE: It is best to work on all acoustic post-processing and analysis locally (e.g., on a desktop or laptop) rather than port WAV files for processing from a central server or cloud storage service. An acoustic computer should have the largest hard drive, fastest processor, most amount of RAM possible, and best video card to speed processing, analysis, and reporting. These sound files are large and analyzing them is an intensive process.

II. What You Need to Post-process, Auto-classify, Manually Vet, and Report on Acoustic Data

SonoBat30	SonoBat Software Suite Includes: **SonoBat30** which used mainly to: (1) view and batch process WAV files to determine species IDs, (2) use the SonoVet function to (a) access a dynamic spreadsheet to manually vet batch classified results, and (b) export MLE results ***and*** a file-level AutoID/Manually Vetted output for reporting purposes. Two separate SonoBat30 programs are included: Western North America & Eastern North America with each license. (PC-users also receive SonoBatLIVE.)
SonoBat **DataWizard**	The SonoBat Software Suite Includes: **DataWizard** which is used to post-process original WAV files from any acoustic survey project and includes utilities to (1) make "attributed" copies of original WAVs that (a) are renamed with consistent file names, (b) embedd "rich text" file notes, (c) embed with GUANO metadata, and (d) make copies of WAVs to a "working" location so original WAVs can remain un-edited in an archive location; (2) scrub non-bat noise files; and (3) AutoID (e.g., "batch classify") WAV files by writing call metrics to every WAV file for MLE calculations and file-level AutoID reports and for manual vetting efforts. These steps are described on Page 3. *Additional DataWizard functions include: (1) a filename editor to correct mis-named files OR correct time-offsets from mis-programmed detectors, (2) a file note editor, (3) a metadata re-namer, (4) a metadata remover, and (5) a WAV to ZC converter. The SonoBat30 also has the same "batch blassify" option.*
SonoBat **Reference Views**	The SonoBat Software Suite Includes: **Reference Views** which are collections of specially designed WAV files which can be pulled up in the SonoBat viewer during the manual vetting process. Users must select the collection of reference views for their region (west or east) and the style of the collection (either Fc-sorted or ABC-sorted) in the "SetPrefs" panel of the SonoBat Viewer. Once selected, this collection will be available every time the program is used.
SonoBat Regional Classifier Matrix *(with sub-region species lists)*	See: https://sonobat.com/regions/ This link provides essential information for determining which species are in which sub-region for Eastern / Western Classifier provided in SonoBat30. *(This is also available from Bat Survey Solutions, as an Excel file upon request. Contact: jtyburec@batsurveysolutions.com)*
Guidance for using SonoBat *(see **SonoBat Documents** in main SonoBat Program folder)*	This contains roughly a dozen PDFs and other resources with additional detailed instructions, to install, run, and process acoustic data, including a QuickStart guide for SonoBatLIVE which is included with the SonoBat30 suite for PC-users. Collectively, these resources serve as the "user's manual" for SonoBat.

SONOBAT30 SOFTWARE SUITE: DataWizard (at left) showing steps for performing "Attribute Files" post-processing steps, described fully on page 3. SonoBat30 viewer with Vetting window and Manual ID buttons active for seamless verification of AutoID results, also described fully on page 3.





III. Post-processing Steps for Each Detector Deployment and for Vetting Entire Project

Process	Step 1 & 2	Step 3 & 4	Step 5
DataWizard: NABat Attributer Make "Working" Copies of WAV Files, Changing File Name and Attributing Metadata	From dropdown menu in top left select: Attribute Files and navigate to the first site data in the ARCHIVE folder created in step 6 on page 1.	Designate Output Folder for location or for a single deployment, depending on organizational scheme and Select FilenamePrefix to get location/site entered as GUANO *(essential for nite/site output for vetting)*	Copy and paste appropriate FILE NOTE from deployment that was created in step 2 on page 1 and select Attribute Files

Repeat process above for all deployments at each location in Project. NOTE: Each detector deployment MUST be attributed separately because each represents a unique recording site and will have a unique Filename Start and File Note. Multiple deployments from multiple locations can be put into a single project file so they can be scrubbed and batch classified all together (see below).

Process	Step One	Step Two	Step Three
DataWizard: Batch File Scrubber Get Rid of Non-Bat Noise	Navigate to Output Folder created above *(**Important**: Do not scrub Archive folders.)*	Select "high grade" and "Search 5kHz and above for bats" for southeast/ southwest U.S. surveys.	Select Scrub. Noise files will appear pink, files with bat-like content will appear green and scroll by as scrubbing proceeds.
DataWizard: Batch Classification Add Computer-Generated AutoID's to Each WAV File	Navigate to Output Folder created above *(**Important**: Do not classify Archive folders.)*	Select proper Classifier and region from dropdown menu *(See Regional Classifier Matrix to make appropriate selection).* Choose option to "modify filename" if desired.	Select **Process** - automated classification will proceed, a "box score" tally will populate with summary results. *No spreadsheet output is automatically created during this step.*

Try to keep track of which folders/directories have been batch classified. It is not a good idea to re-batch already batched WAV files. This is why it is a good idea to deposit all attributed files into a main project folder so the Batch Classification process can be done at once, and only once. A key feature of SonoBat30 is that all AutoID parameters are written to the WAV file during the Batch Classification process. They are accessed when a section of Batched files are added to the SonoBat30 program and vetting table. By switching the Classifier Region and Sub-region results can be generate from different species-sets. There is never any need to re-Batch Classify and already classified file or folder of files.

Process	Step One	Step Two	Step Three
SonoBat: SonoVet Create Site-level / Nite-level MLE Output	In **Create Project** Tab, Select "Add to Project" and navigate to Output Folder classified above	In **Export** Tab, in the Use Current Layout drop-down, select "Nite-Site Summary" and "Save to File"	Navigate to Output Folder and the *"*ProjectSummary*.txt"* file will be one level up (outside) folder, open with **Excel**, and evaluate output for MLE's to determine need to vet.
SonoBat: SonoVet Manually Vet Individual Files to Confirm or Reject MLE Results, Identifying Species of Interest	Select **Vetting Table** Tab Add Location / Site info to Table: Right-click on any column header and select Insert Before/After —> Insert GUANO metadata: **SB|Location** and **SB|SiteCode**	NOTE: The vetting table layout can be saved and invoked for all future projects so Step 1 can be omitted from this process. Go to the **Export** Tab and "Save Layout" naming and filing it for easy future use.	Right-click on **SppAccp** column to "Create Complex Sort" Add the following columns, in order: **Monitoring Night, SB:Location, SB: SiteCode, SppAccp, #Accp (sort Z-A), #Maj (sort Z-A)** then select **Accept**
SonoBat: Viewer Window, Get Ready to Vet - Select "CONFIG"	**Configure** Manual ID vetting buttons as desired adding species guilds as needed and SAVE	Invoke Manual ID buttons from **ManID** button on viewer frame. Tile with **Viewer** window and **Vetting Table** window so all can be seen	Select first filename in **Vetting Table**, WAV file will appear in SonoBat viewer, buttons will invoke Manual ID decisions in table and append to filename (if so configured)
Vetting Table When finished vetting entire collection, in window, select **Export** Tab	Edit filename by adding "vetted" as an appendix and select **Save to File** to create TXT file	Open TXT file with **Excel** and save as *.xlsx file. Filter columns and edit or add any metadata as needed. Filter and/or pivot data for internal reports on survey as desired	Create any necessary tables or charts to append to reports required for compliance surveys and include these on additional tabs in spreadsheet or create images as needed. Enjoy!