# Embedding and Exporting Stationary Acoustic Metadata in SonoBat

The following document provides guidance for embedding and exporting metadata in stationary acoustic recordings using SonoBat auto ID software. Guidance for processing mobile transect can be found at https://www.science base.gov/catalog/file/get/5e3de185e4b0edb47be3d6e6?name=Sonobat_ Mobile_Transect_Guide.docx.

Attribute Files

1. Open the SonoBat Data Wizard and select "NABat Attributer" from the dropdown menu in the top left of the window. For users with older versions of SonoBat that do not feature the NABat attributer, select "Attribute Files." Click the folder in the top right of the window and navigate to the folder containing the files you wish to attribute (this should be a folder for a single deployment). Next, specify an output directory to save the final files by clicking the folder in the "Output Folder" section (there is also an option to "rename and attribute in place"). Notice that the right panel of the application fills with a display of the existing Guano Metadata in the file. This will be augmented with NABat metadata fields. Required NABat fields and optional NABat fields are outlined on pages 2-3.
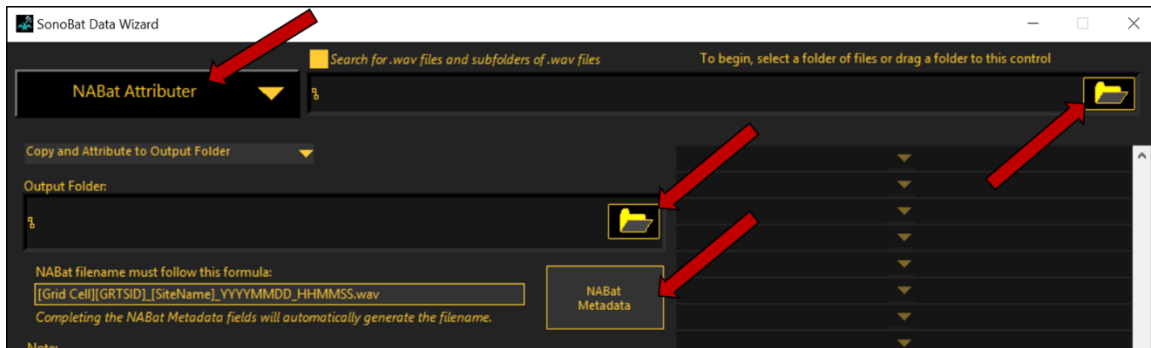

    For SonoBat versions that include the automatic NABat metadata attributer, click the "NABat Metadata" button and enter metadata in the popup window that appears. Then continue to step 2 at the bottom of the following page.

    For users with older versions of SonoBat that do not include the NABat attributer, you must manually add metadata fields for which you have data using the instructions below:

    a. To manually add a new metadata field, click on one of the yellow dropdown triangles and select "add new…"
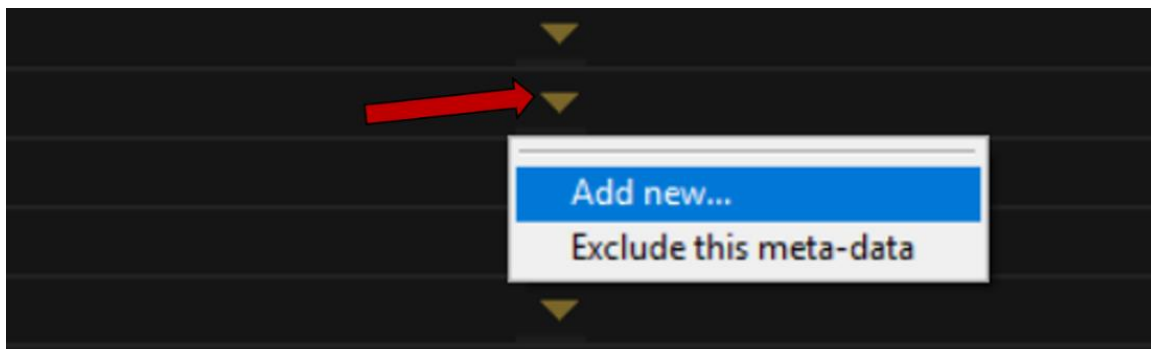
    b. In the popup menu, enter one of the NABat field names exactly as it appears below (include the NABat| as well).

    c. Click the dropdown menu in the bottom left corner of the window and select "Create advanced metadata field" from the available options.

    d. Input the value for that field and click "Accept."
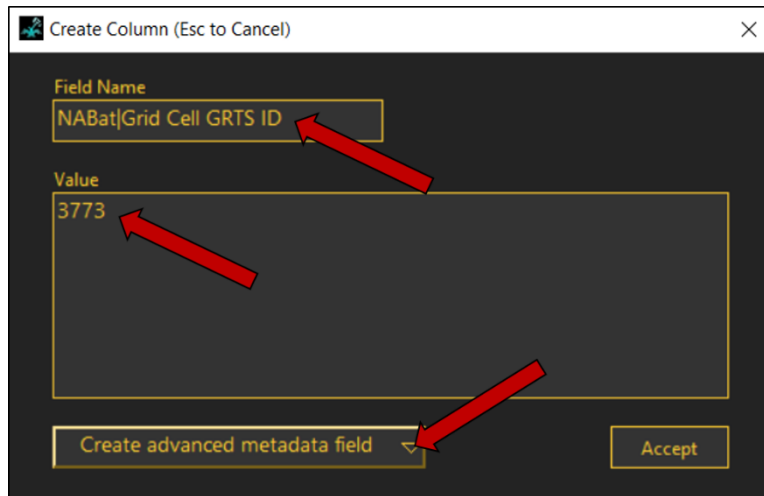
e. Repeat the above steps for all NABat metadata fields for which you have data.

2. Once you have added all required NABat metadata (and any other metadata you collected), click the "Attribute Files" button in the bottom center of the window.

* You will need to complete this process once for each detector deployment, but the metadata fields you manually added (in versions without the automatic NABat attributor) will be available without re-adding them.

Required NABat metadata fields:

NABat|Grid Cell GRTS ID **	NABat|Activation start time *
NABat|Latitude **	NABat|Activation end time *
NABat|Longitude **	NABat|Software type*
NABat|Site Name	NABat|Species List

* * Either GRID Cell GRTS ID **OR** Latitude/Longitude are required. If Latitude/Longitude are provided and GRTS Cell is unspecified, NABat will auto-assign the appropriate cell.

Optional NABat Metadata fields:

NABat|Detector type *	NABat|Water type	NABat|Nightly Low Relative Humidity
NABat|Detector Serial Number	NABat|Percent clutter	NABat|Nightly High Relative Humidity
NABat|Microphone type	NABat|Habitat type *	NABat|Nightly Low Weather Event
NABat|Microphone Serial Number	NABat|Land unit code	NABat|Nightly High Weather Event
NABat|Microphone orientation *	NABat|Contact information	NABat|Nightly Low Wind Speed
NABat|Microphone height	NABat|Weatherproofing *	NABat|Nightly High Wind Speed
NABat|Distance to clutter	NABat|Unusual occurences	NABat|Nightly Low Cloud Cover
NABat|Type of clutter *	NABat|Nightly Low Temperature	NABat|Nightly High Cloud Cover
NABat|Distance to water	NABat|Nightly High Temperature	NABat|Species List

* These fields require specific formatting/values and the NABat system will produce errors for non-recognized values. Accepted values for each field are provided below.

Accepted NABat metadata formats/values:

NABat|Activation start time:
  YYYYMMDDTHHMMSS (e.g. 20190813T193000)

NABat|Activation end time:
  YYYYMMDDTHHMMSS (e.g. 20190815T063000)

NABat|Detector type:
  BINARY ACOUSTIC AR125|BINARY ACOUSTIC AR125-FG|BINARY ACOUSTIC AR180|BINARY ACOUSTIC AcroBat|BINARY ACOUSTIC iFR-V|PETTERSSON D1000x|PETTERSSON D240x|PETTERSSON D500x|PETTERSSON M500|TITLEY AnaBat Express|TITLEY AnaBat SD1|TITLEY AnaBat SD2|TITLEY AnaBat Swift|TITLEY AnaBat Walkabout|WILDLIFE ACOUSTICS EM-Touch|WILDLIFE ACOUSTICS EM-Touch2|WILDLIFE ACOUSTICS EM-TouchPRO|WILDLIFE ACOUSTICS EM3/EM3+|WILDLIFE ACOUSTICS SM2Bat+|WILDLIFE ACOUSTICS SM2Bat-192|WILDLIFE ACOUSTICS SM3Bat|WILDLIFE ACOUSTICS SM4BAT-FS|WILDLIFE ACOUSTICS SM4BAT-ZC|WILDLIFE ACOUSTICS SMMINI-BAT

NABat|Microphone type:
  Pettersson M500 | TITLEY AnaBat Swift | Wildlife Acoustics SM3-U1 | Wildlife Acoustics SMM-U1 | Wildlife Acoustics SMM-U2 | Wildlife Acoustics SMX-U1 | Wildlife Acoustics SMX-US | Wildlife Acoustics SMX-UT | generic Directional | generic Extended Mic | generic Hi-Mic | generic Internal | generic Omni-directional | generic Regular

NABat|Microphone orientation:
  e | n | ne | nw | s | se | sw | w

NABat|Type of clutter:
  Building | Other | Rock | Vegetation | Water

NABat|Habitat type:
  agriculture | barren land | forest-conifer | forest-deciduous | grassland | shrubland | urban | water | wetland

NABat|Weatherproofing:
  TRUE | FALSE

NABat|Software Type
  SonoBat 3.x | SonoBat 4.2 | SonoBat 4.x

Rename Files

SonoBat users with software versions that include the automatic NABat attributor skip to the next section (Noise Scrubbing). These software versions will automatically rename files based on user-added metadata.

1. If the detector model you're using automatically embeds a timestamp into call files, these data should auto populate and appear in the "Audio Recording Time" column of the SonoBat output in step 4 on page 9. If so, you may skip the file renaming process. However, before uploading metadata to NABat, users should ensure that the "Audio Recording Time" column contains data. Otherwise, file names must adhere to the NABat naming format outlined below.

   GRTS ID_LOCATION NAME_RECORDING DATE_TIMESTAMP.wav/zc *
   - **GRTS ID**: GRTS Cell ID Number
   - **SITE ID**: ≤ 6 Character Name for Survey Location
   - **RECORDING DATE**: YYYYMMDD
   - **TIMESTAMP**: HHMMSS
   - **Example**: 3773_SW_20190813_221633
     - Call recorded in GRTS cell 3773 in the southwest quadrant on August 13 2019 at 10:16:33 pm.

   * Fields **MUST** be separated by an underscore and **MUST** end with the timestamp and file extension

2. If your files do not contain a timestamp, use the "Rename all Files" option in the SonoBat Data Wizard to add the Grid Cell GRTS ID and Site Name components to filenames. This strips the text before the date timestamp and adds a new prefix. However, the system may separate the new prefix and the date stamp with a dash rather than an underscore. All fields MUST be separated by an underscore. This can be corrected using the "rename with wildcards" function.

3. Use the "rename with wildcards" option to perform a "find-and-replace" function to replace any characters that conflict with the NABat file naming format. Enter the text you wish to replace in the "search pattern" field and the text you wish to replace it with in the "replace search pattern with" field. A preview of the resulting file names is provided, so you can tweak the formula before making final changes. Click "Edit Filenames" when you're ready to update the file names. You might need to make multiple file renaming runs to achieve the desired format.
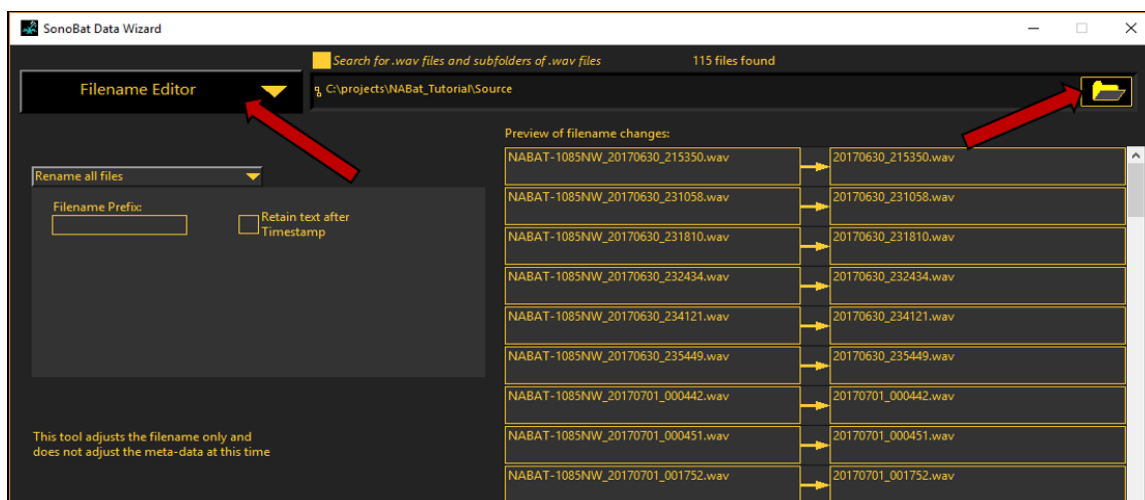
Noise Scrubbing

1. Open SonoBat Data Wizard.

2. Click the folder icon in the top right corner of the window and navigate to the folder containing your .wav files.

3. Click the drop-down menu in the top left and select "Batch File Scrubber."

4. Select "medium" from the filter options and ensure the appropriate frequency filter is selected.

5. Click "Scrub" in the bottom left of the window.
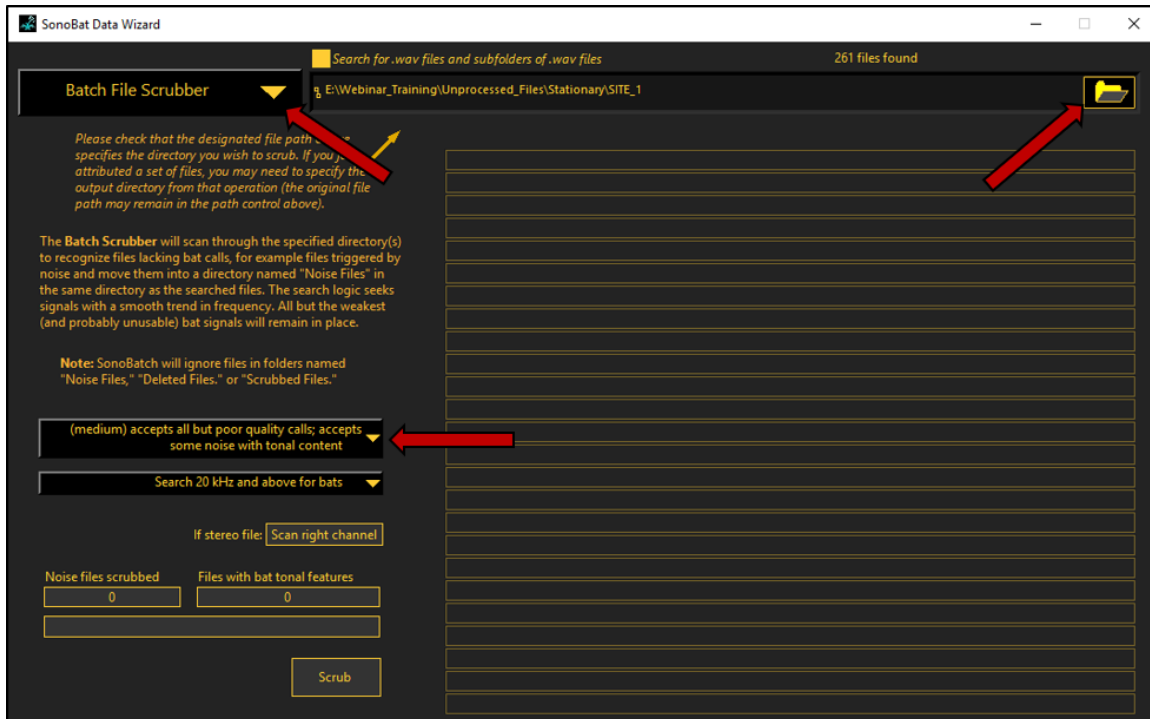
Assign Species IDs

1. Open SonoBat universal and click the "SonoBatch" button in the lower left corner.
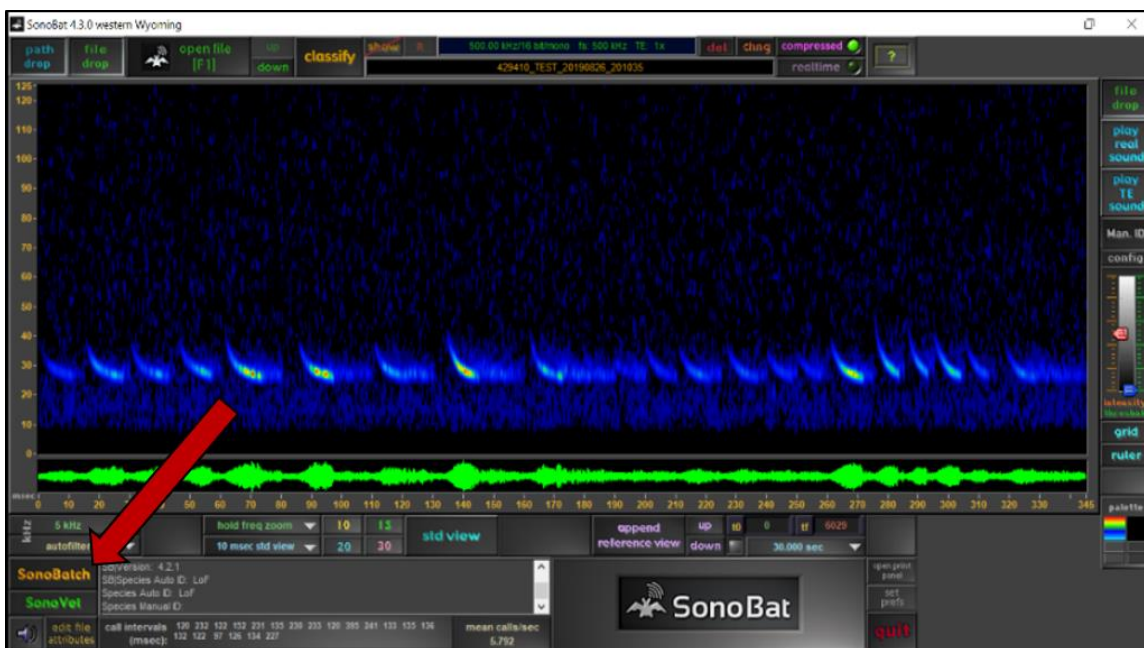
2. Click the folder icon in the top center of the window and navigate to the folder containing files you wish to process.

3. Select the classifier most appropriate for your location using the drop-down menus on the left side of the window.

4. Ensure "Append species codes to filenames?" is **not** selected.
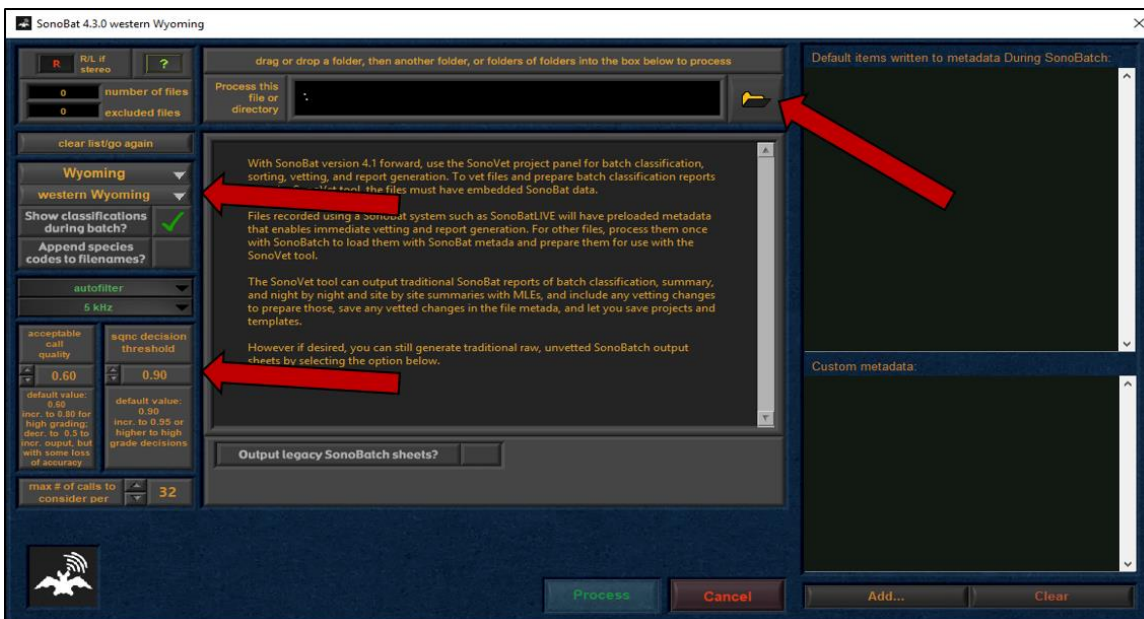
5. Select "autofilter" in areas without low-frequency bat species and "auto-low" in areas with low-frequency bats present.

6. Set "acceptable call quality" to 0.80.

7. Set "sqnc decision threshold" to 0.90.

8. Set "max number of calls to consider" to 16.

9. Click "Process" in the bottom center of the window.

    The "Guide to Processing Bat Acoustic Data for the North American Bat Monitoring Program" ([https://62dc12a5-f8a6-4e76-9a85-99a0a4197512.usrfiles.com/ugd/62dc12_177ea7985796420699 d87e630f9ca053.pdf](https://62dc12a5-f8a6-4e76-9a85-99a0a4197512.usrfiles.com/ugd/62dc12_177ea7985796420699d87e630f9ca053.pdf)) provides detailed guidance for assigning species IDs using SonoBat and the manual vetting process.

Export Metadata into NABat Bulk Upload Template

The following steps can be used to export metadata from all processed deployments, resulting in a single CSV with metadata from numerous sites. Simply select the parent folder that contains all your processed deployments and follow the steps outlined below. The presence of non .wav files in the folder will not interfere with this process. SonoBat will ignore non .wav files.

1. Open SonoBat universal and click the "SonoVet" button in the lower left corner.
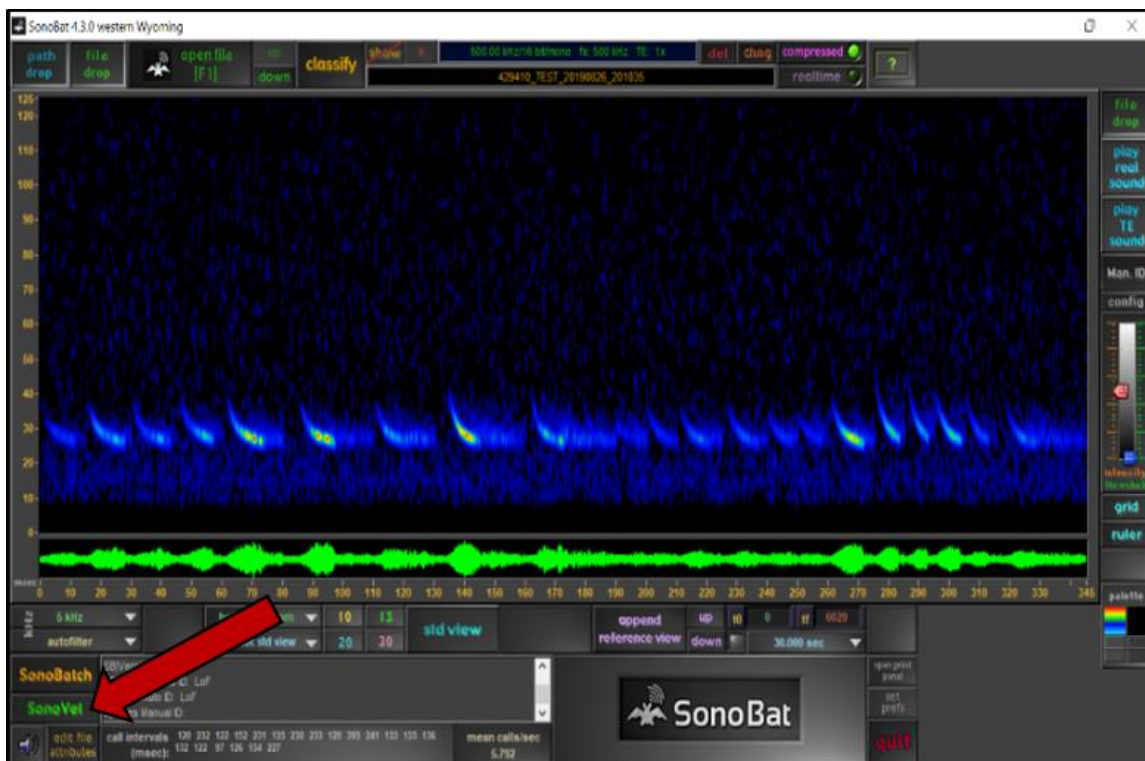
2. Click the "Add to Project" button in the Project Vetter window and navigate to the folder containing .wav/.zc files that have been processed, renamed, and which contain all required metadata. **NABat requests that users provide metadata for scrubbed NOISE files. However, SonoBat automatically ignores any folder labeled "Noise Files", "Deleted Files", or "Scrubbed Files." To ensure scrubbed files load in the SonoVet table, rename folders containing scrubbed files as "NOTBAT" before loading folders in SonoVet.**

3. Click the "Settings" tab on the top menu bar and click the "Load Layout" button to load the NABat metadata form, available for download at https://www.sciencebase.gov/catalog/item/5dcdd2b5e4b069579760b15a.

   Several versions of the metadata form are available, specific to the data and software version:

NABat_Metadata_Form_SonoBat_3.xml:	For manually entered metadata fields
NABat_Metadata_Form_SonoBat_4.xml:	For use with automatic metadata attributer
NABat_Metadata_Kaleidoscope_to_Sonobat.xml:	For data processed in Kaleidoscope before processing in SonoBat

4. Click the "Vetting Table" tab from the top menu bar. Ensure all required fields have values and that all fields for which you entered data are filled.
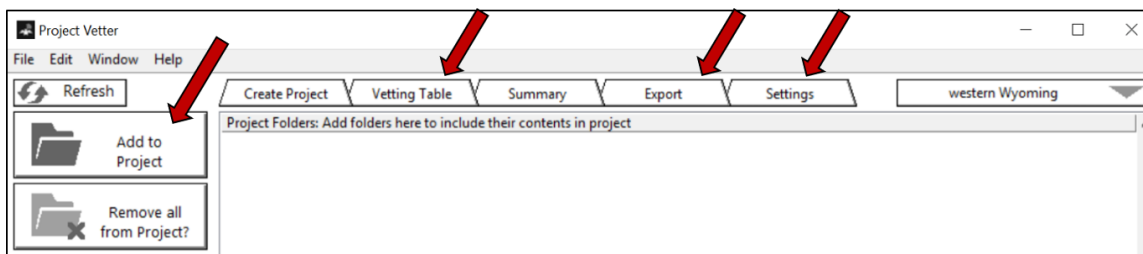
5. If everything is correct, click the "Export" tab from the top menu bar. Select a destination folder to save the metadata file and select "Output null as "" " or "Output null as an empty cell" from the dropdown menu in the bottom center of the window.
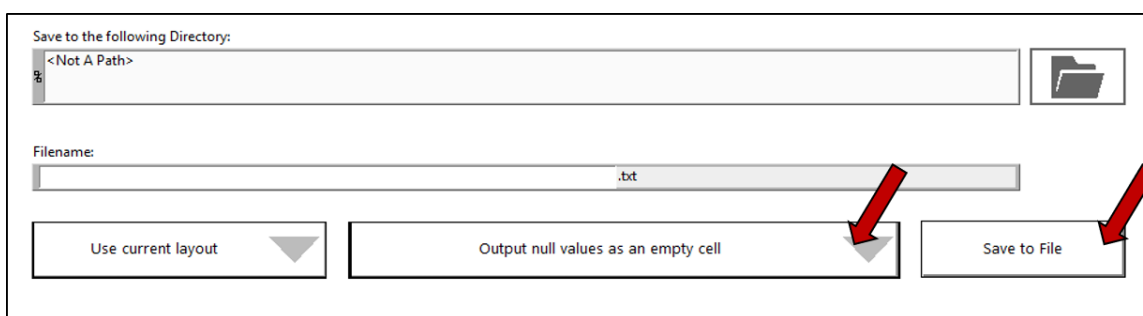
6. Click "Save to File."

7. The resulting .txt file must be converted to a .csv file. To convert the file in Excel, open a new workbook, click the Data tab➡"Get Data"➡"From File"➡"From Text/CSV."

    * Note: depending on your version of Excel, the process may vary slightly.

8. In the pop-up window, navigate to the SonoBat text file and click "Import." Select "Tab" as the "Delimiter" and click "Load" in the bottom right of the window. Your data will now open in an Excel spreadsheet.

9. In order for the NABat system to read your metadata, the column headers created by SonoBat must be replaced with the metadata field names from the NABat template. To do so: select and copy all the tab-separated column headers from Table 1 (on page 11), select cell A1 of your spreadsheet, and paste the new column headers (which will now fill the first row of your spreadsheet).

10. The specific software version must now be manually added. Highlight the "Software Type" column, and using the find/replace function, replace "SonoBat" with "SonoBat 3.x," "SonoBat 4.2," or "SonoBat 4.x," depending on your specific software version.

11. Click File ➡ Save As, select the folder where you wish to save the metadata spreadsheet, give the file a unique and descriptive name, and select "CSV (Comma delimited)" from the "Save as type" dropdown.

*   The NABat system will automatically overwrite duplicate file names with the most recent version, so it is critical that your file name is unique

12. Your metadata is now ready for upload to the NABat Partner Portal. Open your NABat project page, click the blue "Upload Survey Data" button in the top right, select "Stationary Acoustic Point," click "Full Metadata," and navigate to the metadata file you just renamed.

13. Once the file is selected, a preview window will appear with any errors highlighted in red. If the "Survey Start Time" and "Survey End Time" columns appear in red, ignore (this is caused by a minor formatting mismatch that our system will accept). Correct any other errors (use the drop-down menus to determine the correct formatting and accepted inputs), save the updated file, and click the refresh button in the top left of the preview window. Ensure all errors have been corrected and submit the metadata file to your project page.

* **Rows with errors are dropped/ignored by the NABat system, so it is crucial that errors are corrected before the file is uploaded. Otherwise, metadata for those rows will not be saved in the NABat database. Once the metadata file has successfully uploaded, it should appear under the "Bulk Upload" tab of your project homepage. The number of rows processed and rows with errors will be listed.**

Table 1. NABat metadata column headers for stationary acoustic surveys.

| GRTS Cell ID   Location Name Latitude   Longitude   Survey Start Time   Survey End Time   Detector   Detector Serial Number Microphone   Microphone Serial Number   Microphone Orientation   Microphone Height (meters)   Distance to Nearest Clutter (meters)   Clutter Type   Distance to Nearest Water (meters)   Water Type   Percent Clutter   Broad Habitat Type   Land Unit Code Contact Weather Proofing   Unusual Occurrences   Nightly Low Temperature   Nightly High Temperature   Nightly Low Relative Humidity   Nightly High Relative Humidity   Nightly Low Weather Event   Nightly High Weather Event   Nightly Low Wind Speed   Nightly High Wind Speed   Nightly Low Cloud Cover   Nightly High Cloud Cover   Audio Recording Name Audio Recording Time   Software Type   Auto ID Manual Id   Species List