Standard Operating Procedure (SOP) 8: Data Downloading, Proofing and Backup

Protocol for Monitoring Small Mammals

Central Alaska (CAKN) Inventory and Monitoring Network

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SOP 8 – Data Downloading, Proofing and Backup

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SOP 8.0 – Introduction

SOP 8 provides procedures to download, proof and backup data both in the field during data collection and once field work is completed. Data include those collected on the iPads using the application Park Observer, field data notebooks, field notes, mortality and sample tags and photos. Daily editing and error checking in the field of Park Observer data, mortality tags and data notebooks is conducted after daily trapping sessions are completed. Once the annual survey is completed, final downloading, proofing and backup occur for all data collected. These instructions are based on data downloading and backup procedures from the ARCN/CAKN sheep surveys (Sheep SOP 9, available at https;//Irma.np.gov/DataStore/Reference/Profile/2238929), the ARCN Yellow-billed Loon surveys (YBLO SOP 8 https://irma.nps.gov/App/Reference/Profile/2216938.) and the newly developed iPad and Park Observer data download and backup protocols (AKRO GIS website; http://akrgis.nps.gov/observer/no-wifi.htm).

Data from the iPads are downloaded to iTunes. All field-proofed and completed iPad files are consolidated into an Access database where they are error proofed. These data are also downloaded, saved and viewed in ArcGIS. Backup copies of the proofed data also are saved to USB external hard drives, to the CAKN network drive and to IRMA: https://irma.nps.gov/DataStore/Reference/Profile/2216930.

Photos are downloaded, renamed and backed up to the CAKN network drive for archiving. Hard copy field notebooks are scanned, saved and archived on the CAKN network drive and to IRMA.

SOP 8.1 – Proofing and Backup of Park Observer and Notebook Data While in the Field

Each data record is entered simultaneously in both data field notebooks and in Park Observer (notebooks are a redundancy should problems with electronics occur in the field).





After each trapping session, data are checked and proofed for errors in Park Observer and in field data notebooks. Errors include: missing or duplicate records (in either Park Observer, field data notebooks or both), missing data fields within records, inaccurate data fields, tag code errors (either missing, additional or incorrect characters), and mortality or sample tag errors. If problems arise with recording data on the iPads in the field, the situation is immediately documented in detail in data and field notebooks. These details are used to reconcile errors during data downloading and proofing at the office. If problems persist with the electronics, use of the iPads is discontinued and data collection is switched to only field data notebooks.

Below is an overview of the proofing and backup steps during data collection in the field. See SOPs 6 and 7 for more details on data fields, conducting surveys and collecting data.

1. Park Observer data are proofed and edited on the iPads and reconciled against field data notebooks after each trapping session to ensure completeness and accuracy. Each data record is checked to ensure it is entered only into one data notebook and one iPad.

2. Mortality and sample tags are checked for completeness and accuracy.

3. Field notes are updated at the end of each trapping session.

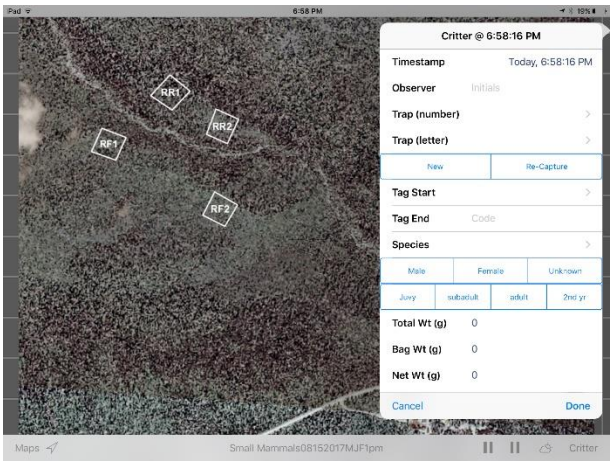
4. Field notes and field data notebooks are photographed after each trapping session using the iPads (backup in case of loss of a notebook).

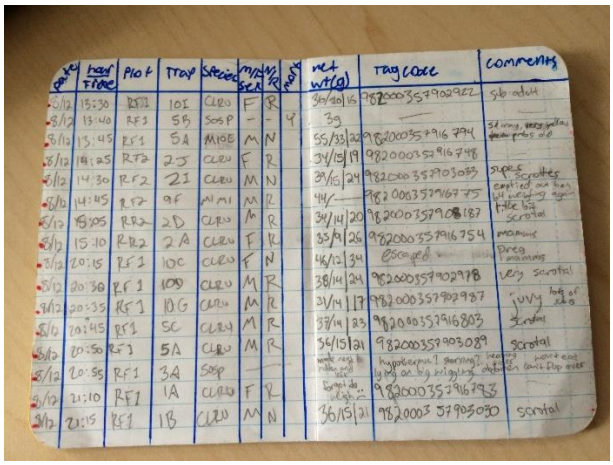
5. Park Observer files are emailed after each trapping session to: yugaipads2016@gmail.com. This provides a temporary backup in the field (files are stored in the gmail sent folder if internet access is unavailable in the field).

SOP 8.1.1 – Proofing Data in the Field: Reconciling iPad Park Observer and Notebook Data after Trap Checks

After trap checks, each record entered into Park Observer is compared to field data notebooks to ensure data are consistent, accurate and complete. The iPads, notebooks, mortality and sample tags are aligned side-by-side and all data fields are checked:

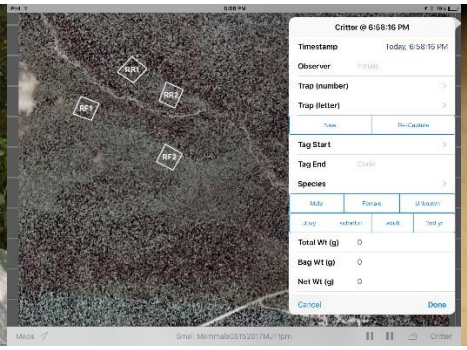
a. Duplicate records in field data notebooks and iPads are deleted.
b. Missing records are added (field data notebooks or Park Observer).
c. Data fields for each particular record are reconciled for consistency and accuracy between field data notebooks and Park Observer.
d. Characters in tag numbers are counted (should be either 10 or 15).
e. Times are clarified between am and pm (if military time was not used).
f. Each record is checked to ensure all fields are completed.
g. Comments are clarified or further detailed.
h. Illegible handwriting is clarified.
i. All data are checked to ensure redundant records are identical

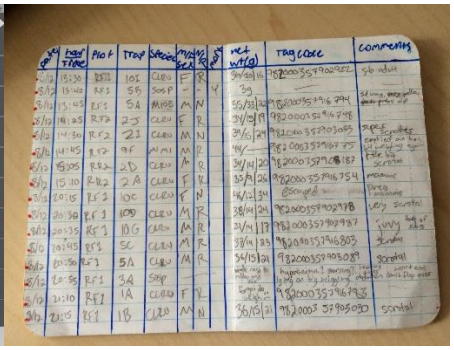




SOP 8.1.2 – Proofing Mortality Tag Data in the Field After Trap Checks

After trap check data has been reconciled between Park Observer and field data notebooks, data written on mortality and sample tags is proofed. The iPads, notebooks, mortality specimens and mortality tags are aligned side-by-side. All mortality and sample records are reconciled against one another to ensure accuracy and completeness. Handwriting on mortality and sample tags is clarified. If required, specimens are weighed by the tail. After all mortality and sample tag data is proofed and entered into Park Observer and a field data notebook, specimens are bagged individually with their mortality tag and placed in a freezer container labeled in permanent marker with, "CAKN DENA Small Mammal Morts (YEAR)." The container is taped and placed in a cool place until it is transported to the freezer. See SOPs 6 and 7 for more details on data fields, conducting surveys and collecting data.

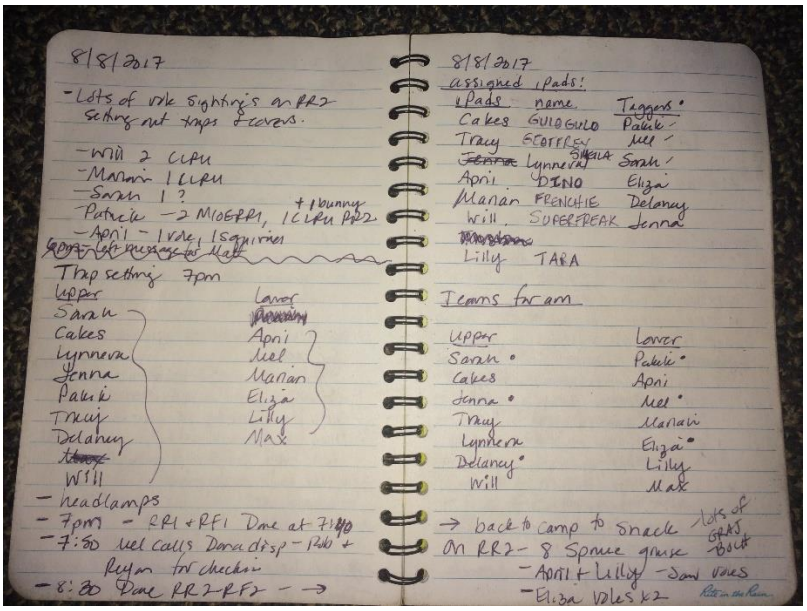





SOP 8.1.3 – Updating Field Notes After Trap Checks

Field notebooks are updated at the end of each trap check to record details about trip logistics, observations and survey metadata to document events during the survey. Completion times of

each trap check are recorded as well as assignments of field equipment and trapping crews. This metadata is useful for reconstructing survey history and events when reconciling data and reporting on survey conditions.



SOP 8.1.4 –Taking Photographic Backups of Field Notes and Field Data Notebooks after Trap Checks

Filed notes and field data notebooks are photographed after each trapping session using the iPads. These images serve as backups in case of the loss of notebooks. Notebooks are opened to the most recent pages containing notes or data after each completed trap check. The iPad is aligned over open pages and photos are taken. The images are stored in the iPad's camera gallery. These images are deleted after the survey, if not needed.

SOP 8.1.5 – Backing up Park Observer Files after Trap Checks

Park Observer files are emailed after each trapping session to: yugaipads2016@gmail.com and the project managers's work gmail. This provides a temporary backup in the field (files are stored in the gmail sent folder if internet access is unavailable in the field).

1. Tap on Survey File name at bottom center of your Park Observer screen on the iPad (e.g., SmallMammals08152017MJF1pm). The "Select Survey" window will open and the list of options will show.

2. Tap on the share icon (square with up arrow) next to the survey to share



3. Tap on *Share Survey with iTunes.* If wifi is accessible, tap"*Mail Survey"* and the .poz file is emailed from the iPad's email account (yugaipads2016@gmail.com). Select "*Mail Observations and GPS Points as CSV*" to email .csv files. Even if wifi is not accessible, files are stored in the gmail "*sent*" folder as a backup and are retrievable later. In the email subject line, include the name of the survey for each trap check and iPad. For example: "Smammals08122017MJF1pm."

SOP 8.2 – Downloading, Proofing and Backup of Park Observer and Notebook Data After the Survey is Completed

Below is an overview of the proofing and backup steps after data collection in the field is completed.

1. Retrieve emailed Park Observer: "Critter.csv," "TrackLogs.csv," and "GpsPoints.csv."

2. All retrieved Park Observer data are imported into a consolidated an Excel file.

3. Consolidated Park Observer data in Excel are reconciled against field data notebooks and field notes to ensure every record is entered and duplicates are deleted (verifying data; see SOP 9).

4. Incomplete or inaccurate data records in the consolidated Excel file are corrected. Every record in field data notebooks is checked off in red ink after proofing.

5. Consolidated data are filtered in Excel in various ways to ensure data make sense (validating data; See SOP 9).

6. Once consolidated data are proofed, data are again spot checked for completeness and accuracy (verifying data; see SOP 9). by a separate technician and the project manager. The project manager determines when the data are sufficiently proofed and considered final.

7. Proofed final data in Excel are appended to the Small Mammals Access database.

8. Field notes and filed data notebooks are signed and dated once data proofing is completed. The notebooks are scanned and saved as .pdfs and stored on the CAKN network folder: J:\Monitoring\Small_Mammals\Scanned Field Notebooks and Databooks.

9. The proofed, consolidated Access database is renamed as CAKN_DENA_SmallMammalsYear_Final and saved to the CAKN network drive: J:\Monitoring\Small_Mammals\CAKN_DENA_SmallMammals_Data\FinalData.

10. Photos are downloaded from all iPads, cameras and phones. Photos are culled for blurry and redundant images. Final photos are batch renamed

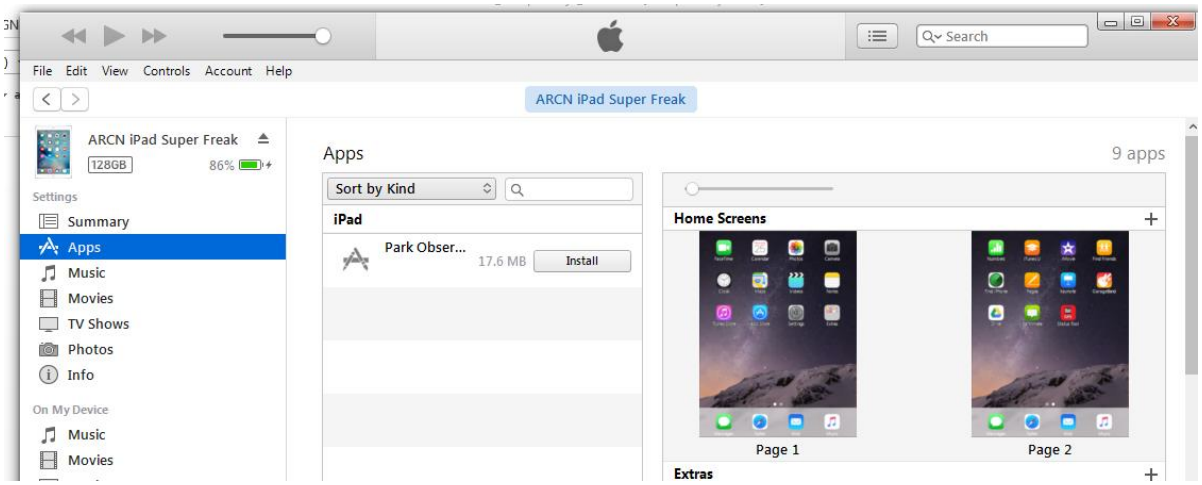
(CAKN_DENA_SmallMammalsYear). All photos are downloaded to the network folder by year: J:\Monitoring\Small_Mammals\CAKN_DENA_SmallMammals_Photos_Year.

11. Final versions of proofed consolidated Access database, and .pdfs of field notes and field data notebooks are archived in IRMA: https://irma.nps.gov/DataStore/Reference/Profile/2216930.

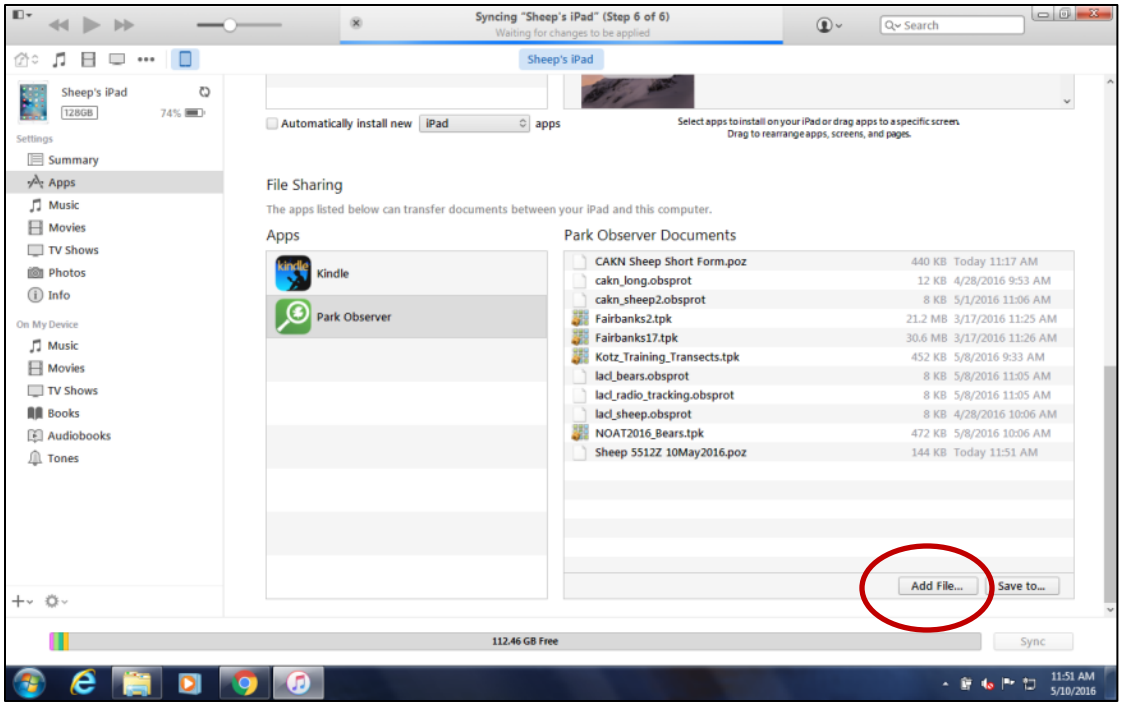
SOP 8.2.1 – Downloading iPad Park Observer Data in iTunes

Installing without wireless (any office but AKRO)

1. Connect to: http://akrgis.nps.gov/observer/no-wifi.htm (contents shown below).
2. Download the application package (Park_Observer_0.9.8b.ipa and the Park Observer Toolbox [ParkObserver.pyt]) to a PC or Mac with iTunes. The latest is 0.9.8b (as of June 22, 2016).
3. Connect iPads to the computer with a USB cable. iPads sync to only one computer at a time. Use the same computer to sync all iPads.
4. Open iTunes on the computer. Note: A network connection is not required to connect to the iTunes Store. An iTunes or iCloud account is not required to authorize the iPad on the PC.
5. Check to ensure iTunes is logged out of. To check, select the "Account" menu from the main screen and the "Sign in" is shown as an option. If not, select "Sign out". If further problems arise, try logging out of the iTunes account on the iPad by opening the Music app, clicking on the small red user logo (person's head in a circle) and selecting "Sign out".
6. Click "Allow" in iTunes when prompted to allow access to the connected iPad.
7. Click the "Trust" alert on your iPad.
8. Select the iPad icon at the top left of the iTunes window to see the details of the iPad.
9. Click on Apps in the list on the left of the iTunes window.
10. Click the small icon "File" at the very top left and select Add File to Library... (or press Control-O).
11. Browse to and open the file downloaded in the first step or drag the download from step 1 onto the app page in iTunes.
12. Click the Install button next to Park Observer in the list of Apps.



13. Click on the Apply button at the bottom left of the iTunes window.
14. Installation progress will be reported in the banner at the top of the iTunes window (e.g, "Syncing Apps. . . ')
15. When done, click the eject button next to the name of the iPad, but leave the iPad attached to the computer.
16. Tap the Park Observer App icon on the iPad.
17. An "Untrusted Enterprise Developer" alert will appear on the iPad; tap Cancel.
18. Tap on the Settings App icon and navigate (scroll down) to General -> Device Management -> National Park Service and tap on Trust National Park Service.
19. Press the Home button (round actual button at base of iPad).
20. Tap the Park Observer App icon on the iPad.
21. Tap Allow when asked if Park Observer can access your location.
22. Download maps (.tpk)* and protocols (.obsprot – the latest version is Small_Mammals.obsprot) from the server – or get these from the survey project manager. Save these to a file on the computer.
23. Re-attach iPad to the computer. It should appear as a device in iTunes.
24. In iTunes, click on your iPad under Devices in the left sidebar in iTunes.
25. Click on Apps, in the list of options along the left side of the iTunes window and a list of apps on the device appears.
26. Scroll down the list of apps (scroll way down), and select Park Observer.
27. Scroll down further. At the bottom right is a button to add files to Park Observer. Click the Park Observer button on the left and navigate to where your maps (tile caches [.tpk]) and protocols (.obsprot) are and "Add File" the maps and protocols downloaded in the previous step. See screen shot below.
28. Hit Apply. When it's done syncing, click Done and then eject the iPad from the laptop.



SOP 8.2.2 – Retrieving iPad Park Observer Data from Email

All Park Observer data files collected on different iPads are emailed from yugaipads2016@gmail.com and to the PROJECT MANAGER. Files include "Critter.csv," "TrackLogs.csv," and "GpsPoints.csv." Retrieve Park Observer files from each iPad on each trap check. Email subject lines include the name of the survey for each trap check and iPad. For example: "Smammals08122017MJF1pm," (date, initals of observer using iPad, trap check). A total of 12 emails are retrieved for each iPad's Park Observer data (3 trap checks per day x 4 trapping days).

1. Open gmail and search for "yugaipads2016@gmail.com" to find the Park Observer files for the small mammal survey.
2. Download files in order by earliest date and trap check time (refer to subject line).
3. Each email containing Park Observer data has three files: Critter.csv," "TrackLogs.csv," and "GpsPoints.csv." Click the down arrow to download all three files into one folder.
4. Name this folder using the subject line of the email (e.g. Smammals08122017MJF1pm)
5. Save each folder to the CAKN drive J:\Monitoring\Small_Mammals\CAKN_DENA_SmallMammals_Data\(Subject Line Title)

SOP 8.2.3 – Consolidating Park Observer Data into Composite Excel File for Proofing

After Park Observer data from each iPad is downloaded from email, all data collected from different iPads are consolidated into a composite Small Mammals Excel file.

1. Retrieve emailed Park Observer data in order of earliest date, trap check and by iPad (iPads are denoted by observer initials) using folder names.

2. Double click on the "Critter.csv" of the first file of the first iPad to open it (each iPad has 12 files; one for each trap check). Excel launches and the file opens showing populated Park Observer data collection fields in a spreadsheet format.

3. Save the Excel file as "SmallMammalsProof(Year)" in: J:\Monitoring\Small_Mammals\CAKN_DENA_SmallMammals_Data\

4. Leave this Excel file open and change the name of the open sheet from "Critter" to "Proof." Scroll to the last populated data row in the spreadsheet.

5. Open the next Critter.csv file for this iPad (e.g. next trap check on the same day). Select the upper left-most square and highlight entire spreadsheet. Click copy and then paste into the SmallMammalsProof(Year) in the first available row beneath the existing data. Hit save.

6. Repeat this process for all 12 Critter.csv files for each iPad. Hit save after each paste.

7. When all files are copied over to the SmallMammalsProof(Year), click "+" at the bottom of the spreadsheet to add another sheet. Name this sheet, "Raw." Scroll to the top of the "Proof" spreadsheet. Select the upper left-most square and highlight entire spreadsheet. Click copy and then paste into upper left-most cell the "Raw" spreadsheet. The "Raw" sheet is an untouched copy of the consolidated Park Observer data available for reference or as a replacement if errors occur during the proofing process.

8. Add another sheet and click "+" at the bottom of the spreadsheet. Name this sheet, "Final." Hit save.

9. Return to the "Proof" spreadsheet to begin the proofing process.

SOP 8.2.4 – Reconciling, Verifying and Validating Consolidated Park Observer Data Against Data Notebooks

Compare field data notebooks and field notes against consolidated Park Observer data to reconcile data collection errors. Field proofing is cursory and errors are missed. Examining consolidated data from all iPads reveals more complex errors not detectable by examining iPads separately. Consolidated data provides more complete capture history information that aids in reconciling discrepancies.

1. Sort consolidated data in Excel by ascending date, plot and trap check time. This sorts the data chronologically in alignment with field data notebooks. Inspect data to ensure all trapping dates (4), trapping sessions (6, 13, 20) and all plots are present for all trap checks (RR1, RR2, RF1, RF2).

2. Compare Excel data to field data and notes to ensure every record is entered and duplicates are deleted (in both notebooks and Excel). Examine Excel data for missing data fields. Compare to field data and notes to fill in missing data fields where possible.

    1. For each observer, check each field data notebook's records against Excel to ensure data is entered and correct. Mark each notebook record with a red dot in the date column (far left) after checking.

    2. Enter missing notebooks records by hand. Highlight in yellow in notebooks any missing field data notebook records that are added to Excel file. Make a note in comments field in Excel file of each record that was added manually. Hit Save.

    3. Check every data field in each record before deleting it to ensure it is a duplicate. If some data fields are missing, retain the record with the most complete fields. Make a note in the comments field in Excel file that a similar record was deleted. Hit Save.

    4. If data fields in records differ between the field data notebook and Excel, consult field notes and project manager to resolve discrepancies.

    5. Date and initial notebooks after all missing data is entered. Hit Save in Excel.

SOP 8.2.5 – Filtering and Sorting Consolidated Park Observer Data for Proofing

Sort Excel data by ascending tag code, date and plot. This displays complete capture histories for each tag grouped in chronological order during the survey. Open the current year's Biomark (the vendor from which we purchase PIT tags) tag code file in Excel and sort by ascending tag code number. Keep both files open side by side in the same Excel window. Use the Biomark tag codes to reconcile tag code data entry errors in Excel file.

1. For each tag code in Excel file, check that the number of characters is either 10 or 15. Highlight in red any tag codes that have incorrect numbers of characters.

2. Check all tag codes in the Excel file against Biomark list. Go through the small mammal Excel file and copy and paste each unique tag code into the "find" function (under Edit menu) in the Biomark file.

    a. Click on the Biomark tag code Excel sheet and hit "find next" in the find function window. If the tag number is found in the Biomark tag code file, highlight the matches in yellow in both the Biomark and the small Excel files to mark as checked. Do this for the entire spreadsheet until all tag codes are checked. Hit Save.

b. Any tag codes in the small mammal Excel file that do not match in the Biomark file should be highlighted in red. Some tag codes may be recaptures from the previous years, unused tags from previous years or may represent data entry errors. Hit Save.

4B032F2919
4B1B380C1C
4B04101229

c. Go back through the small mammal Excel file and try to identify the correct tag numbers for all the red-highlighted tag codes. Use "find" and select 4 or more characters from the erroneous tag code to search for in the current Biomark tag code file for that year. Often, only 1 or 2 characters are off and you can find the tag code by searching on just 4 characters to identify the incorrect digit or letter. This is a trial and error process until you can narrow down where the error occurs in the 10-15 character alpha-numeric tag codes.

   i. See example below where the number in red is the incorrect code:

4B04101229

   Try searching on the first 4 characters "4B04", then search for the closest matching tag code in the Biomark file. If no matches are found, try again searching on the last 4 characters "1229". Here there is a hit on the correct tag code number "4B05101229" and the data-entry error occurred on the 4th character-a "**4**" was entered instead of a "**5**."

   4B0**5**101229 (correct tag number in Biomark tag code list)

   ii. Unused tags purchased in previous years are available to be used in subsequent years. If after searching the current Biomark file there are still different "unmatched" tag codes in the small mammal Excel file, highlight these numbers in light gray and make a comment that they may be a previous year's recapture (recap) or an unused tag from a previous year.

4B0324372B
432C5D4879

iii. Repeat steps b and using the previous three years' Biomark to reconcile different tag codes highlighted in gray in the current year's small mammals Excel file. Often tags ordered from Biomark in previous years are from different batches and the first 4 – 12 characters (prefixes) in the codes are different in each batch. For example, the batch from 2008 includes the batch prefix "4B03" whereas the recaptured tag from 2007 includes the batch prefix "432C."

iv. Also search the previous three years' small mammal Excel files to see if the "unmatched" tag codes represent overwintered, recaptured animals tagged in previous years. Small mammals are not known to live much longer than three years in the wild so searching the previous three years of data is sufficient.

v. Repeat steps b and c to try to reconcile red-highlighted tag codes that are either too long or too short. Use the current small mammal Excel file and additional capture history data fields, such as plot and trap location, new or recapture, species and sex, to attempt to resolve tag code discrepancies. Provide details in the comments field of each record.

vi. Repeat steps iii to try to resolve any remaining tag code discrepancies using other capture history data. Provide details in the comments field of each record.

vii. Remove highlighting from all resolved tag code discrepancies and the yellow highlighting from checked tags. Maintain gray and red highlighting for any remaining unresolved tag code discrepancies. Provide details about the unresolved discrepancies in the comments field of each record. Hit Save.

viii. Discuss remaining unresolved tag code discrepancies with project manager. Project manager decides whether or not to include unresolved records in the final database or to delete them. Project manager provides details about unresolved discrepancies and deleted data in the metadata sheet in the database. Hit Save.

3. Sort the small mammal Excel file ascending by tag, then N/R (new or recapture) then date to examine if species identification, sex, weight and new and recapture events (N/R) are consistent and "make sense" for each tag's capture history (each time an animal with that tag was captured during the survey).

    a. Ensure that each tag's capture history begins with a new (N) capture. If a new capture event is missing for a tag code, highlight N/R field in yellow. This is most often a typo. It is likely that the earliest capture record by time and date is the new capture event. If the new capture record cannot be found, maintain the R, highlight yellow and make a note in the comments.

    b. Use "find" to search throughout the Excel file for each species. Begin with MIMI (the rarest), then MIOE (less common than CLRU) and lastly CLRU (most common).

        i. Continue "find next" in Excel to search for each unique tag codes associated with MIMI. Examine the capture history to ensure species and sex identification are consistent (e.g. all MIMI, all male) for all capture history. If there are discrepancies (e.g. some MIMI, some CLRU), highlight in yellow and describe in the comments. Use other data fields for these records (plot, trap location, date, time, comments, etc.) to try to reconcile the inconsistency and identify and correct errors. Refer to data from the new capture record for this tag (when the animal was handled the longest) to attempt to identify incongruencies. Highlight species changes in yellow.

        ii. Repeat process for MIOE (tundra voles). This should catch most species misidentifications throughout the small mammal database. Juvenile animals for all species are similar in appearance and size and difficult to distinguish. In this instance, species may be misidentified, however, CLRU are common and distinct enough for this situation to be rare.

4. Examine capture event (N/R) history for each tag to determine consistency of sex identification, weight, and species data. Use additional data in comments to validate sex and species data (e.g. black back, mammaries, scrotal, juvenile, etc.).

    a. Sex identification: Young animals with immature secondary sexual characteristics are difficult to identify to sex. Weights under 12 g indicate a

sexually immature or juvenile animal. Capture history data showing inconsistent sex identification in combination with weights 12 g and under indicate sex identification is inaccurate. Default to sex identification during the "new" capture event (N) when the animal is tagged. It is more likely that species and sex identification for a new capture (N) are accurate during tagging, when the animal is handled longer and by experienced crew. If sex identification is not resolvable, highlight in yellow and provide details in the comments. The project manager determines if data is excluded or deleted.

b. Weight: Juvenile animals are 12g and under; subadults are 13g-17g; adults are 18-30g (northern red-backed vole); 18-70g (singing and tundra voles with heavier animals as pregnant females or over-wintered adults). Inconsistent weights over the tag's capture history of >5g indicates measuring error (faulty Pesola, windy day, active animal in bag, trash dumped prior to bag weight, etc.). Weights with variance <5g are averaged over the capture history for the tag with the final weight being the average. Weights with variance above >5g are excluded. Outliers are discarded and remaining capture history weights are averaged. Highlight weight discrepancies in yellow and provide details in the comments. The project manager determines if data is excluded or deleted.

c. Species identification: Northern red-backed voles (CLRU) have variations in stripe color on their backs that can aid in identification. They are smaller as adults than the other two species and are more abundant. Singing voles (MIMI) prefer subalpine habitats, are rarer than the other two species and larger as adults than northern-red backed voles but overlap in adult size with tundra voles. Tundra voles (MIOE) are more common than singing voles and prefer wet tundra habitats. These life history characteristics help resolve discrepancies in species identification for a tag's capture history. Examine consistency of weights, and plot and trap locations visited to discern if species identification discrepancies for a tag code represent a tag number typo or species misidentification. If more than one plot is visited by an animal in the tag's capture history, this indicates a tag number typo. Small mammals often do not range further than the distance of one plot. Use comments on sexual characteristics, age class, location and appearance to resolve discrepancies. Use photos to resolve discrepancies on species identification if available. Highlight discrepancies in yellow and provide details in the comments. The project manager determines if data is excluded or deleted.

d. Example: A tag code is captured 6 times and identified as 2 different species (CLRU 4 times and MIOE 2 times).

   i. Examine which species was identified at time of the new capture. New captures are handled longer and processed by more experienced crew. Species identification (and sex identification) are more likely to be accurate at the time of initial capture.
   ii. Examine the weight. Often, adult MIMI and MIOE are much larger than CLRU, however juveniles of all species are about the same weight. If the animal is much larger (above 20g) than the typical adult weight of a CLRU (about 20g), it is likely an MIOE or MIMI.
   iii. Use the comments spanning the tag's capture history to provide additional information to inform sex or species determination.
   iv. Assess the plot and trap location to discern if the species identification makes sense. Sort on the plot and trap ID for all captures at that location to ascertain how often each species frequents that particular trap.
   v. Examine photos (observers are instructed to take pictures of animals when sex and species identification are in question).
   vi. Assess the experience of observers involved in species and sex identification spanning the tag's capture history to ascertain which observations are more likely accurate.
   vii. Assess how often animal was identified as each species. Majority rules so if the species is identified 4 times as CLRU and 2 times as MIOE, this supports CLRU.
   viii. Examine the capture history chronology to see if it makes sense. For example, a recapture cannot occur prior to a new capture and a mortality cannot be caught after death.
   ix. Compare tag codes of other MIOE to that of tag in question. A tag code **typo (in bold below)** is a possible cause for discrepancies in species identification. Blue fields in the example below represent some data fields assessed in this example to reconcile discrepancies. Highlight all changes in yellow and provide details in comments. Hit Save.

R	4B**0**9080662	MIOE	F	30
N	4B19080662	CLRU	F	19
R	4B19080662	CLRU	M	18
R	4B**1**9080662	MIOE	F	20
R	4B19080662	CLRU	F	17
R	4B19080662	CLRU	F	20

5. Sort ascending by date, plot, then hour to check if any animals were caught in a single trap more than one time on a plot during a trap check. In high density years, sometimes animals are trapped again after previously being released during the same trap check. Littermates enter traps together. Shrew and voles are captured together.

    a. Examine all captures by trap check trap check date, session and plot (e.g. 8/14/2009, 6 am, RF1 check) to determine if there is more than one capture per trap per session. For example, check if trap 2B listed more than once in the capture history for this trap check.

    b. If there is more than one capture per individual or per trap during a trapping session, assess if this is a duplicate record (entered twice). Duplicate records are identical (except for missing data fields). Delete the record with the least information. If any fields are different (species, time, weight, mort, tag number), this is a real record and represents a second capture for the same trap or individual (see examples 1 and 2 below). The mark/recapture statistics used for data analyses assume that only one animal is caught per trap/session and each individual is only caught once per trapping session. Catching more than one animal per trap/session violates this assumption.

    c. Check to see if the same tag number is listed more than once during the same trapping session. This indicates the same animal (i.e. animal 4B19080662) is caught more than once on the same plot/session (i.e. 8/14/2009, 6am check, RF1 in traps 2B and 4E-see example 2 below). This happens after an animal is released and runs into another open trap during the same trapping session. This violates the assumption of catching the same individual more than once during a trap check. Sorting this way identifies these situations so they can be handled differently for data analyses.

d. Highlight the entire row for these records in red (see examples below). Examine every data field in each record before deleting a duplicate record. Often, the same animal visits the same exact trap location on a plot (e.g. 10C on RF2) repeatedly, with the only distinctions in the records being the different dates, times and hours.

e. Example 1: Two different animals (different tag codes) are caught in same trap (2B) on plot RF1 during same trapping session but at different times. This can also happen when two different animals simultaneously are caught in the same trap together at the same time (e.g. littermates).

date	time	hr	plot	trap	tag	species	sex
8/14/2009	6:40	6	RF1	2B	4B04075D08	MIOE	F
8/14/2009	8:20	6	RF1	2B	4B19080662	CLRU	F
8/14/2009	8:30	6	RF1	4E	4B2A167432	CLRU	M
8/14/2009	8:30	6	RF1	4E	4A2C626157	CLRU	F

f. Example 2: The same animal (4B19080662) is caught twice in two different traps (2B and 4E) on plot RF1 during same trapping session (caught once, released and retrapped). The times and trap locations are different.

date	time	hr	plot	trap	tag	species	sex
8/14/2009	8:20	6	RF1	2B	4B19080662	CLRU	F
8/14/2009	8:30	6	RF1	4E	4B19080662	CLRU	M

g. Sort Excel file by ascending by tag code, N/R and date to ensure each tag has *only and at least one record for new capture* (N). Examine dates, times and trapping session fields to ensure N capture events occur before R (recapture) event(s). New (N) capture records have the earliest date, time and hour and occur prior to recaptures.

   a. If more than one N capture record exists for a particular tag, choose the earliest record as N and change the other to R. This is a typo. Highlight in yellow any changes that are made.

   b. If capture history for a tag only has recapture (R) records and no new animal (N) record, two situations are possible.

i. This is legitimate and the animal overwintered and was recaptured from a previous year. Search for the tag code in the small mammal database for the previous three years. If this is a recaptured overwintered animal, leave the record as R for recapture, highlight in yellow and explain the situation in the comments.

ii. This is a typo. Choose the capture record with the earliest date, time and hour for this tag code and change the capture code to N. Highlight in yellow any changes that are made and provide details in the comments. Hit Save.

h. Examine capture history for each unique tag number to ensure it occurs on only one plot. (i.e. RR1). It is infrequent for animals to foray distances between plots, though it is possible. Movements between riparian (RR1 and RR2) or forested plots (RF1 and RF2) are more plausible due to trails and shorter distances. Forays between forested and riparian plots are highly unlikely due to the greater distances, a stream crossing and rugged terrain. Animals occurring on more than one plot likely represent data entry errors.

i. Refer to comments and field notes to search for information on which crew members conduct each trapping session. At times, the start of a new plot is not recorded in field data notebooks and/or iPads. Highlight it in yellow, change to the correct plot and provide details in comments. Hit Save.

j. Examine mortality records. On occasion, attempts are made to revive hypothermic animals and neither mortality tags nor mortalities data are immediately recorded.
   a. Examine all frozen mortality specimens to ensure they have mortality tags. Inspect all mortality tags and complete any missing information. Weigh mortality specimens by the tale using a Pesola if needed. Use a reader to scan for tag codes if needed. Confirm sex and species identification of all mortality specimens.

   b. Correct errors mortality data errors by reconciling data on mortality tags with records in Excel file and field data notebooks.

   c. Enter any missing or incomplete mortality specimen records into a field data notebook and the consolidated Excel file. Ensure that the mortality field is selected in the Excel file. Hit Save.

k. Inspect all records in the Excel file for “escaped” animals (missing tag code). Type “escaped” in the tag code field and highlight in green. Search on “escaped” to sort and remove these records prior to analysis if required. Hit Save.

l. Spot check the proofed consolidated Excel file (program manager and technician). Delete incomplete records or unresolved errors, correct errors and remove highlighting. Copy and paste into the "Final" sheet. Save file as "CAKN_DENA_SmallMammalsYear_Final,xlsx" in J:\Monitoring\Small_Mammals\CAKN_DENA_SmallMammals_Data\FinalData\Year

SOP 8.2.6 – Saving and Archiving Final Files

Final versions of all deliverables are saved and archived on the CAKN network drive and IRMA. See SOP 9 for details on archiving deliverable to the IRMA data store.

1. Open the Small Mammals Access database. Paste and append the "CAKN_DENA_SmallMammalsYear_Final,xlsx" sheet to the Small Mammals Access database using a table link. Save file as "CAKN_DENA_SmallMammalsYear_Final.accdb." Save the file to the CAKN network drive: J:\Monitoring\Small_Mammals\CAKN_DENA_SmallMammals_Data\FinalData\Year.

2. Sign and date all field data notebooks and field notebooks after proofing is completed. Scan all notebooks and save as a single .pdf named, "CAKN_DENA_SmallMammalsYear_Notebooks." Save the .pdf on the CAKN network folder: J:\Monitoring\Small_Mammals\Scanned Field Notebooks and Databooks\Year.

3. Download images from all iPads, cameras and phones. Cull blurry and redundant images. Batch rename all images "CAKN_DENA_SmallMammalsPhotosYear)". Save photos to the CAKN network folder: J:\Monitoring\Small_Mammals\CAKN_DENA_SmallMammals_Photos_Year. Delete unnecessary backup images of data notebooks from iPads.

4. Certify Archive final versions of proofed consolidated Small Mammals Access database, .pdfs of field notes and field data notebooks and original "SmallMammalSurvey.pov" "Critter.csv," "TrackLogs.csv," and "GpsPoints.csv." in IRMA Data Store (see SOP 9 and deliverables table in narrative): https://irma.nps.gov/DataStore/Reference/Profile/2216930.