How to set up a CPW database

using EcoAssist

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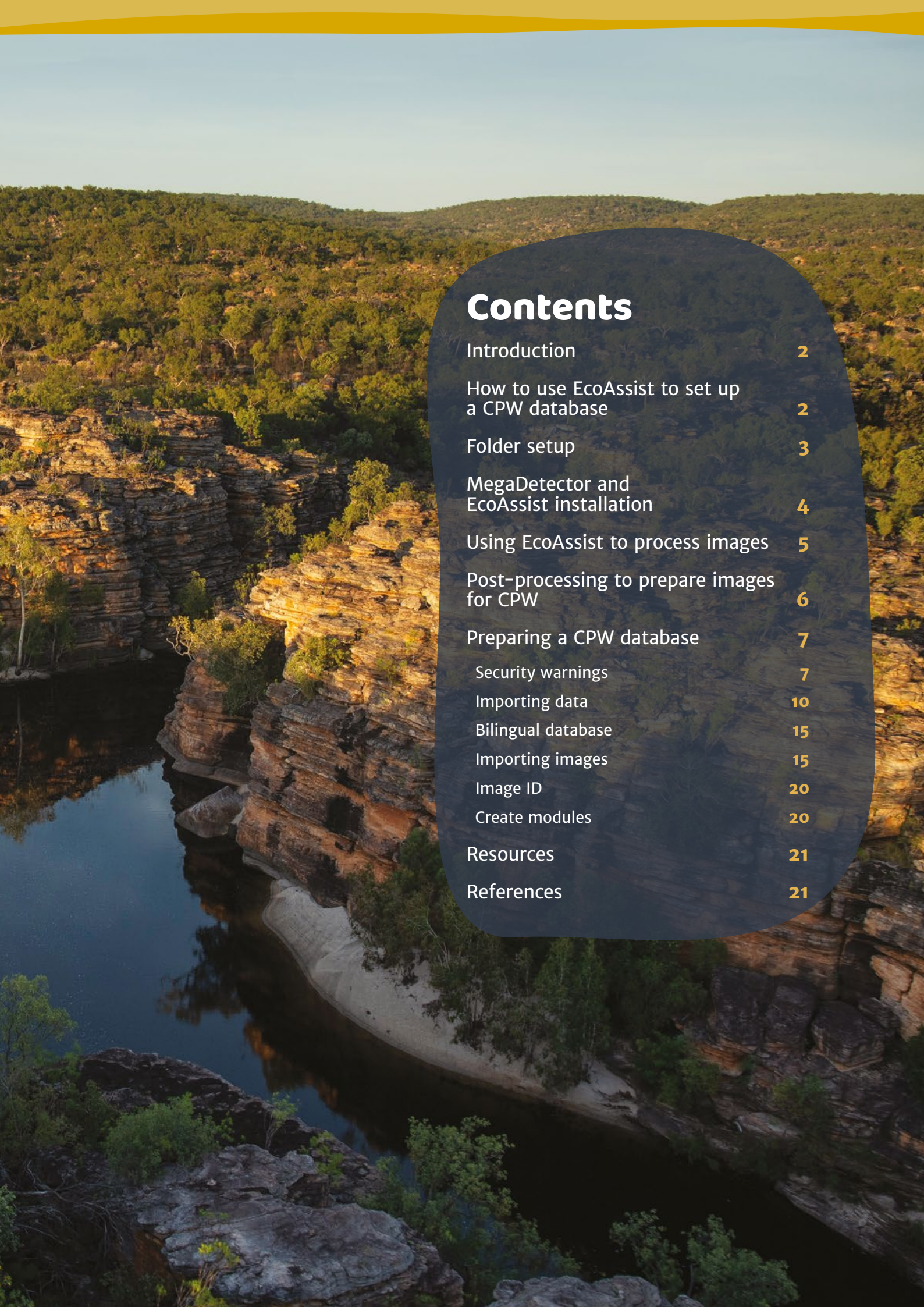
Warddeken Land Management



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Introduction

The Warddeken Land Management Mayh Project runs the largest species-monitoring network established by an Aboriginal organisation or Indigenous Protected Area (IPA) in Australia. Co-designed by Bininj leaders and Elders to detect long-term changes in key species, the project operates across 21 clan estates and involves Landowners from across the IPA.

To safeguard the health of the Kuwarddewardde mayh (Stone Country animals), Nawarddeken (people of the Stone Country) combine customary practices with modern land management techniques and technologies. One such technology is the use of CPW Warehouse, customised with a bilingual database, which enables Rangers to identify animals in images using language names. Additionally, Warddeken integrates CPW Warehouse with the programs MegaDetector and EcoAssist to identify and remove images without animals. Searching empty images is a lengthy and tedious task and time saved since implementing these programs has empowered daluk (women) rangers to engage in a broader range of land management activities, increasing confidence and technological capacity in the workplace.

This tutorial will guide you through the set-up and basic functions of a CPW Warehouse database, integrated with MegaDetector, EcoAssist and a bilingual database. CPW Warehouse is a versatile program, with good capacity to accommodate the unique needs of your project as you set it up. If required, the resources at the end of this document will guide you through advanced troubleshooting and functionality.

How to use EcoAssist to set up a CPW database

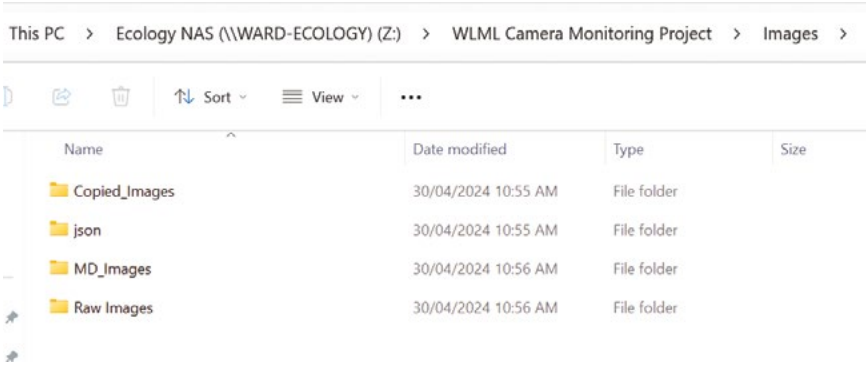
CPW Warehouse is a customisable program designed to facilitate archiving, identifying, summarising and analysing photo data collected from remote wildlife cameras.

EcoAssist is a no-code user interface (after installation) that separates images with animals from empty images. EcoAssist does this using MegaDetector's artificial intelligence framework.

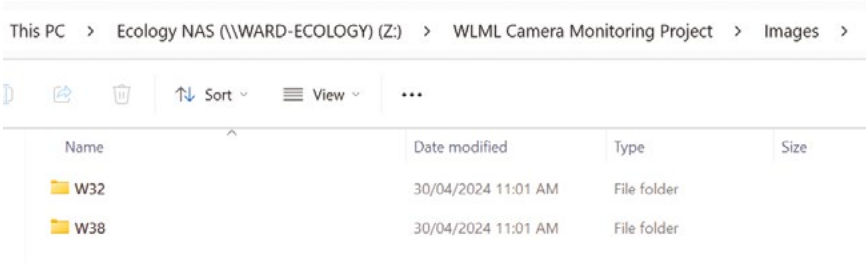
MegaDetector is an 'object detection program' which identifies animals, people and vehicles in images. It also identifies empty images.

Folder setup

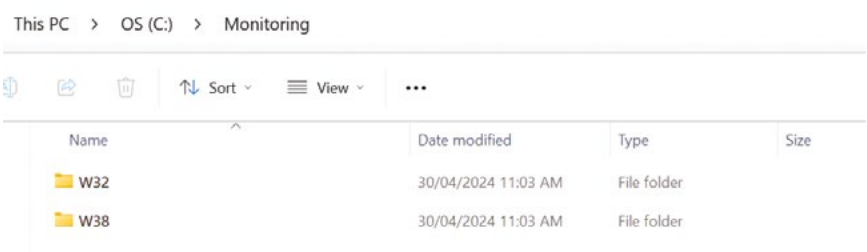
Create a folder for your camera trap images and add the below sub folders.



- Upload your SD cards into the **Raw Images** folder. Each SD card should have its own folder, named after the camera number.
- If there are multiple folders on the SD card, copy the first folder's images across. Then, select all images in the second folder and rename them so that the number in the name is 10,000. If there is a third folder, select all and change the number to 20,000 and so on. Then copy those images to the folder. When there are multiple folders containing over 10,000 images on a single SD card, this preserves the order that the images were taken, so that we can easily find raw images if required.



- Create an additional folder for your images on C Drive. EcoAssist will process images directly from this folder. Copy the subfolders containing your raw images to this folder.

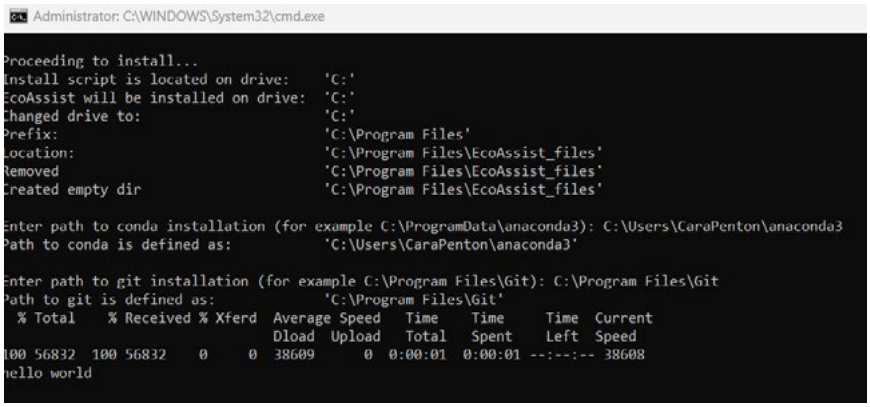


C Drive has less disk space than other drives, so if you have a large number of images, you may need to repeat the EcoAssist processing step multiple times with smaller batches of images, deleting a batch from C Drive as you complete it, then copying the next batch of folders across.

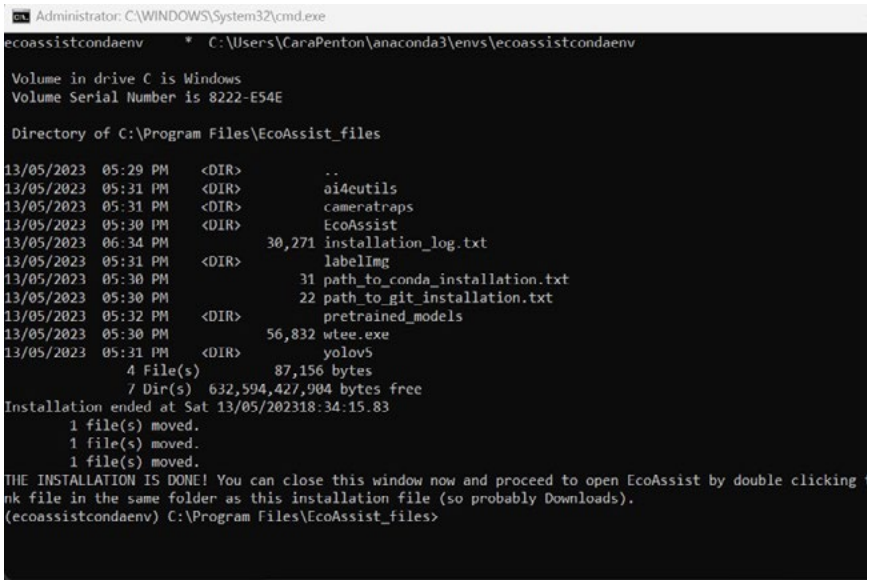
MegaDetector and EcoAssist installation

EcoAssist
No-code platform to train and deploy ML

- Install MegaDetector and EcoAssist from **github.com/PetervanLunteren/EcoAssist#windows-installation**.
- Download packages Git and Anaconda directly to your C Drive from **Gitforwindows.org** and **anaconda.com**.
- Right-click to open EcoAssist as an administrator on the installation download. A command prompt box will open.
- Specify where Anaconda3 and Git have been downloaded to in your C Drive.



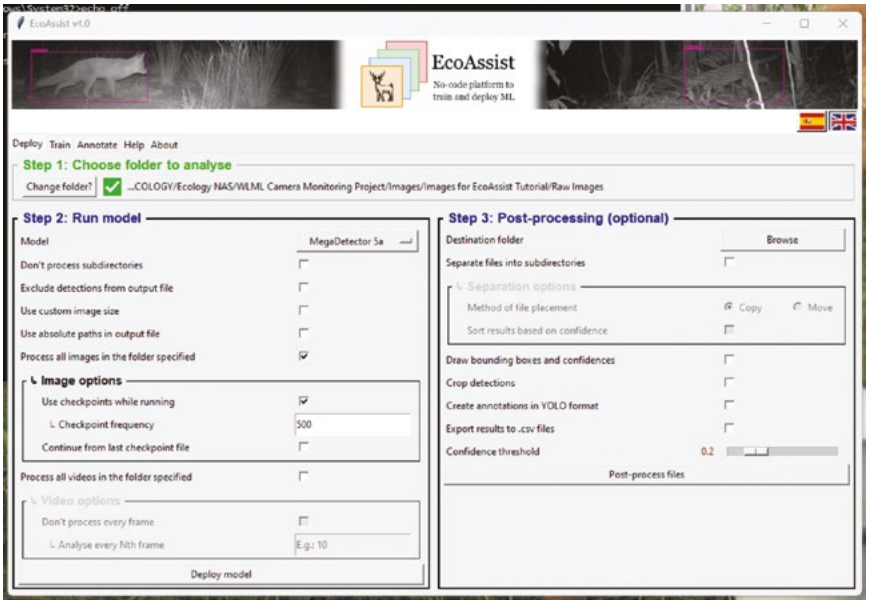
Once entered the prompt will download everything you need to run MegaDetector. This can take up to 40 minutes depending on internet connection and computer processing capacity.



- Move the EcoAssist shortcut from **Downloads** to your preferred area.

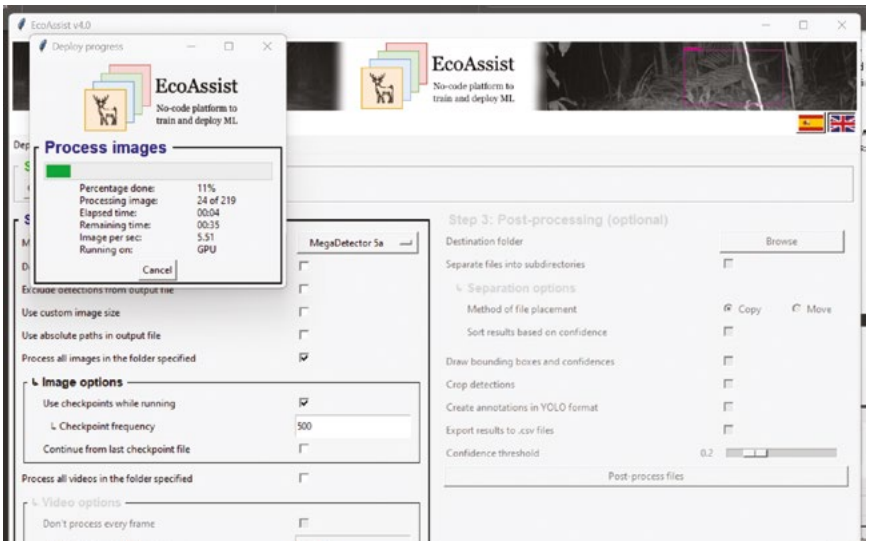
Using EcoAssist to process images

- Open EcoAssist. The program will ask permission to make changes to your computer, click yes. It will initially open a command prompt box, but will convert to a user interface a few seconds later.
- Browse to the folder where your images are stored on C Drive. Select the boxes in the image below and set the checkpoint frequency to 500.



If you have poor internet connectivity or do not have access to a high-powered computer, it may be beneficial to set checkpoint frequency to 50, so that progress is saved every 50 images, rather than every 500.

- Click Deploy model. A progress box will appear.



Depending on the power of your PC and number of images that need to be processed, it may take anywhere from minutes to weeks to complete this step. For example, we used a lower-powered PC to process 20,000 images and it took 24 hours to process. In contrast, we processed millions of images on a high-powered PC, which took around a week and half of 24/7 processing.

You may need to change the settings on the PC so that it doesn't go to sleep if left to process overnight.

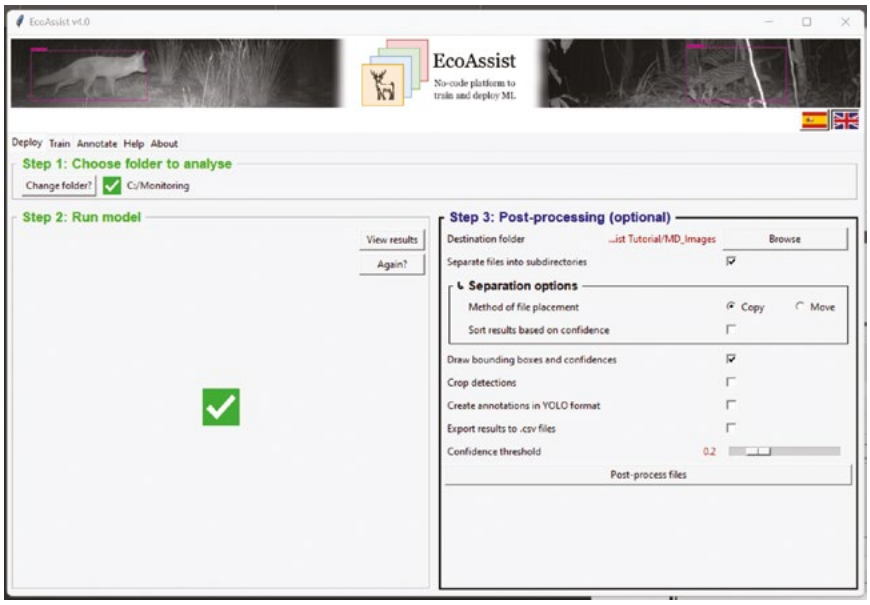
- Once image processing is complete, an image recognition JSON file will be added to your image folder in C Drive.

Post-processing to prepare images for CPW

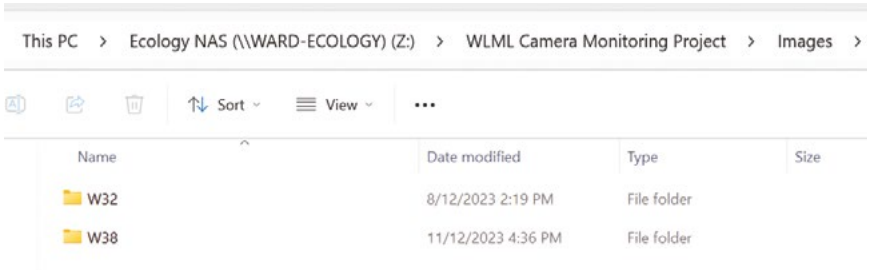
There is an option to draw bounding boxes around the animals, to expedite the identification process. Leave this box unchecked if you would like to encourage thorough searching of images.

Use the post-processing function to automatically group images into separate entities (animals, people, vehicle, empty) with their own folders.

- Browse to the location where the post-processed images will be saved (**MD_Image**s). Select **Copy** in **Separation options**.



- Once post-processing is complete, open the **MD_Images** folder, select your desired entity and the camera you are interested in. The animal folders can now be uploaded to CPW. The image recognition JSON file can be moved from C Drive into the JSON folder you created earlier.



Preparing a CPW database

- Download a copy of CPW (Version: 4.3.0.6) and the user manual below.

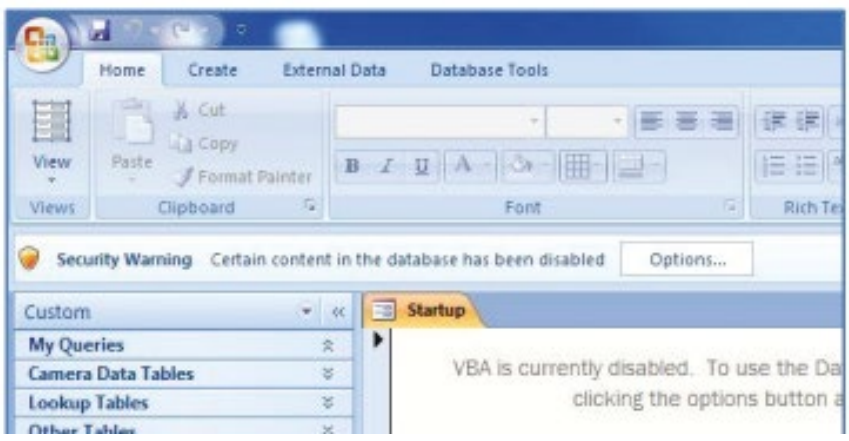
The user manual contains detailed instructions and troubleshooting which is not covered in this general set-up document.

Colorado Parks & Wildlife – Software: CPW Photo Warehouse (**state.co.us**).

- When making a new CPW database, copy the download into the desired location and re-name it, rather than writing over the top of the download.
- Open CPW. The CPW switchboard should appear.

Security warnings

If a security warning or a message indicating that VBA code is blocked appears, you will see a screen similar to below. To fix it, you will need to save the folder containing the database as a **Trusted Location**. Depending on which version of Windows you are operating, try one of the below two options.



This image and option one text from *CPW User Manual*, Newkirk, E. S. 2016

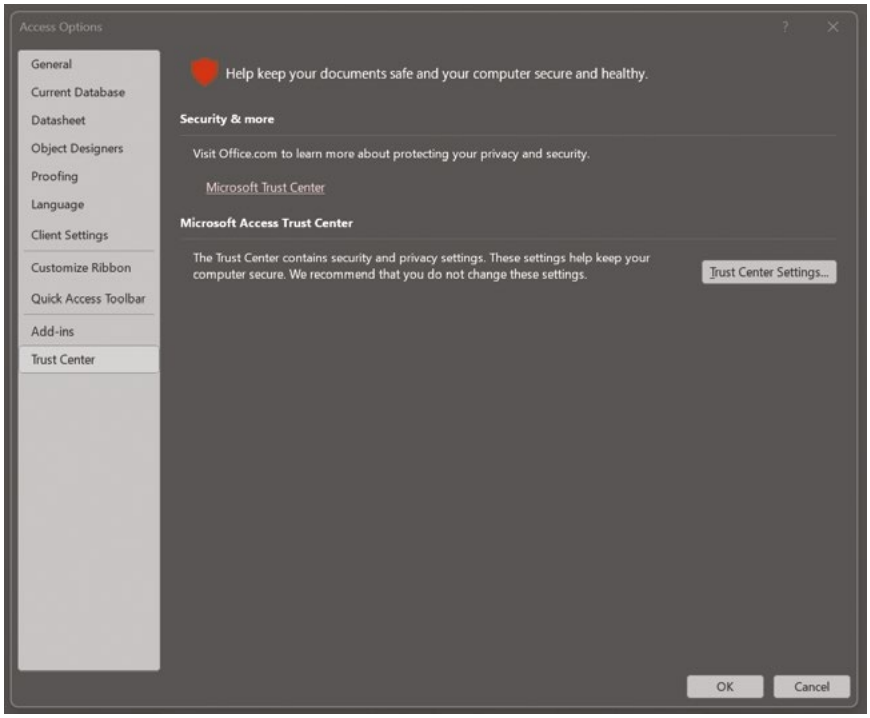
Option one

First, open Access (CPW uses Microsoft Access to store and make data connections) from the **Start** menu. You should see a welcome screen with options to build a new database, open an existing one, get content from Microsoft Online, etc. Click the **Office** Button. Now click **Access Options** → **Trust Center** → **Trust Center Settings** → **Trusted Locations**. Check to see if the folder where you want to save the database is included in the list. If not, you can add it by clicking the **Add New Location...** button. Note that subfolders are not necessarily included, so a database saved in a folder within **My Documents** may not work even if **My Documents** is a trusted location. If you want subfolders of a particular location to be trusted make sure to check the box for that option.

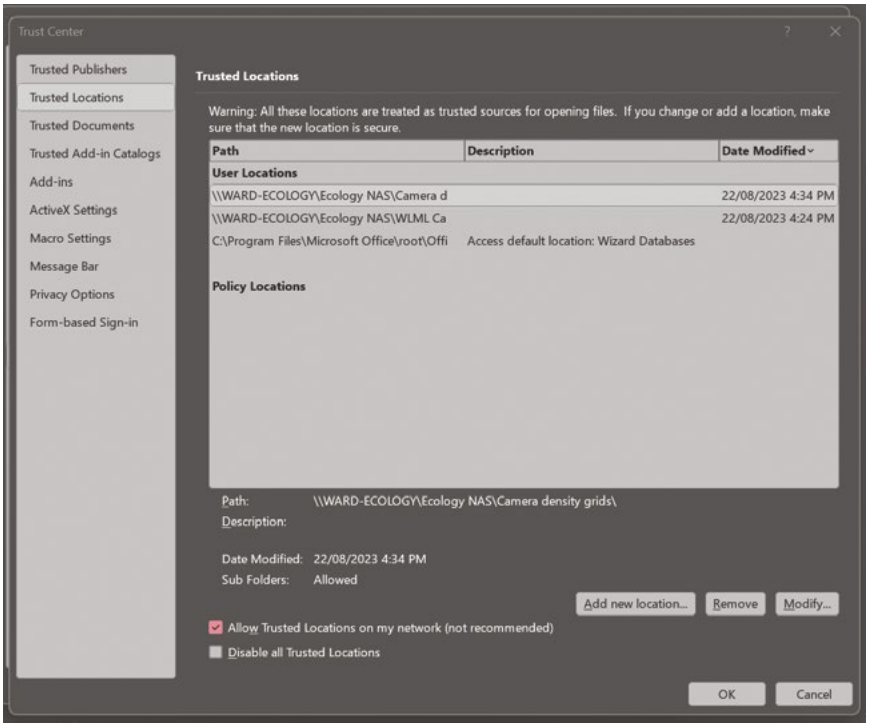
When the above steps are complete, restart the application and it should display the above switchboard.

Option two

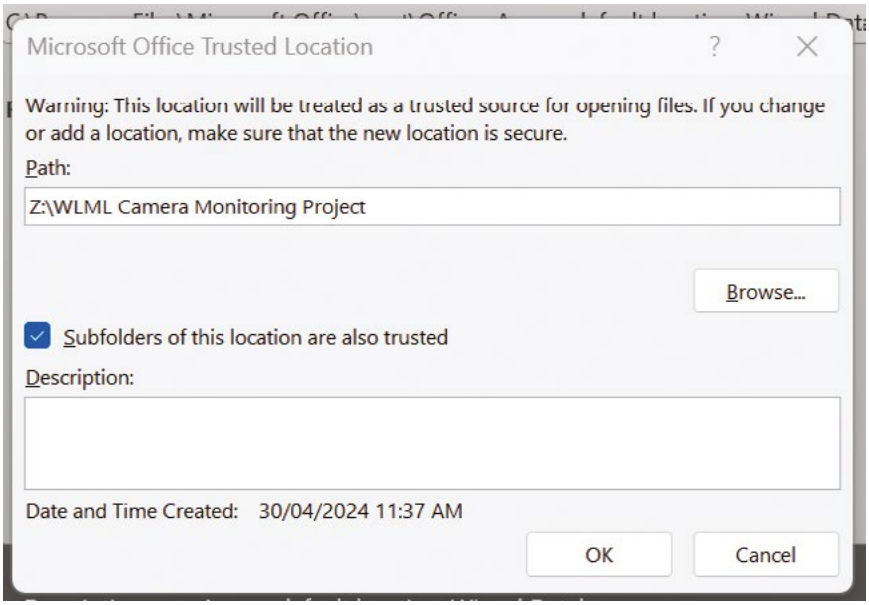
Click **File** → **Options** (in the bottom left corner of the screen) → **Trust Centre** → **Trust Centre Settings**.



Then click **Trusted locations** → **Add new location**.



Browse to the folder where the database is stored. Check **Subfolders of this location are also trusted** if required, then click **OK**.



Importing data

In this tutorial, we will import data directly to tables.

You can set up a database using the options on the switchboard or by accessing the database tables directly. If you have a small number of cameras, using the switchboard and entering data manually may be feasible. If there are many cameras, data can be imported directly to CPW tables, saving time and reducing the likelihood of error. Data can also be cut-and-pasted from Excel or typed directly into tables.

There is an example of Warddeken's species spreadsheet included at the end of this section. This spreadsheet is where we combine common, scientific and language names to form the bilingual database. Using this as a template for your species list, the end user will be able to tag images using language or common names.

You will need three items before you can upload images:

1. A unique name and number for the study area.
2. A spreadsheet or text file with camera numbers and locations (with coordinates).
3. A list of species you expect to see, (including Latin names) and any additional details you might want to add (e.g. sex, collared, language names). You can also add the species as they are identified through the 'photo ID form'.

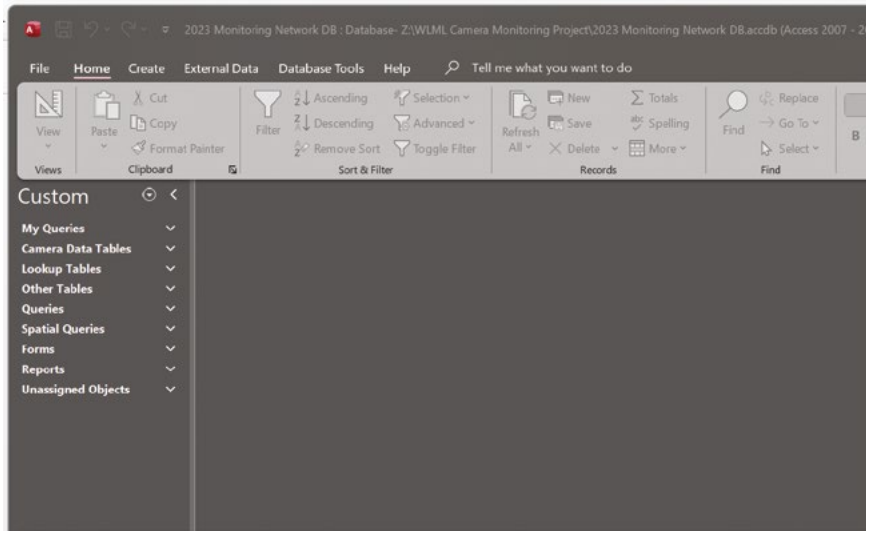
Optional add-ins (recommended):

4. Species groups, such as mammal, bird, reptile, amphibian; native or introduced, or events such as fire or flood.
5. A list of names of observers.

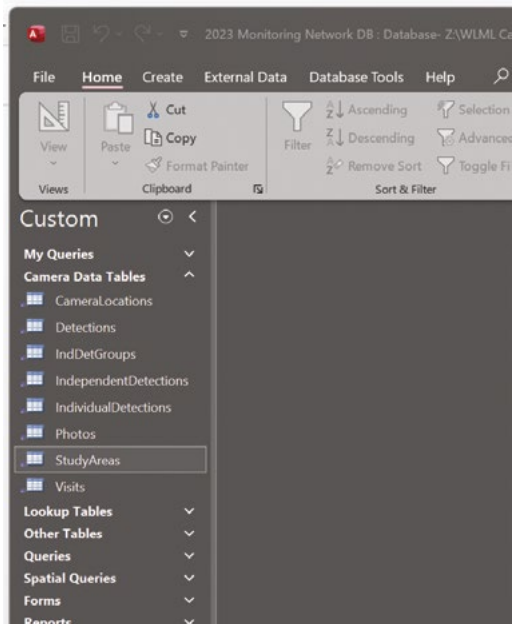
In order for any file to upload to CPW correctly, the column headings on your spreadsheet must match the column headings in the CPW table exactly. You can add, rename and re-order columns in CPW prior to uploading files.

In this tutorial, we have used text files. Create an Excel spreadsheet for your data and save it as a tab-delimited text file to match. However, importing other file types is a very similar process.

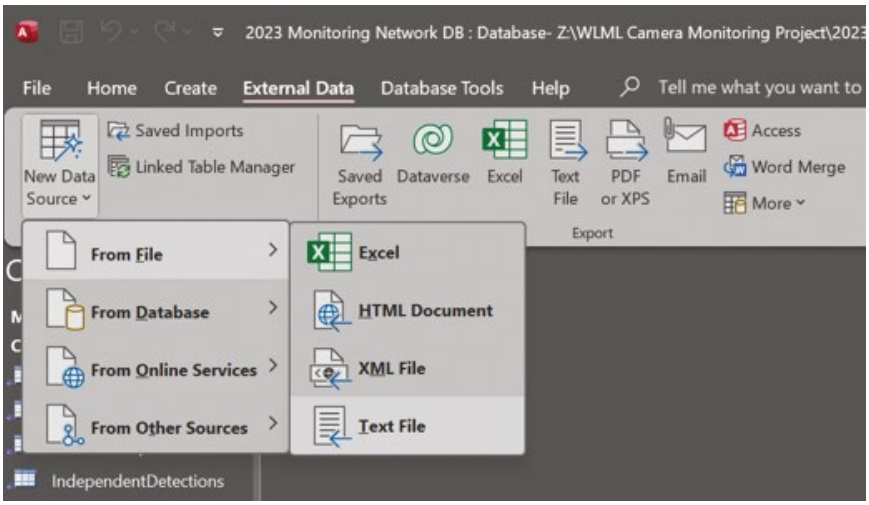
- To import directly into tables, click the **X** to close the switchboard form and the Access database will appear. You can re-open the switchboard anytime by double clicking **Switchboard** in the **Forms** section on the left of the page.



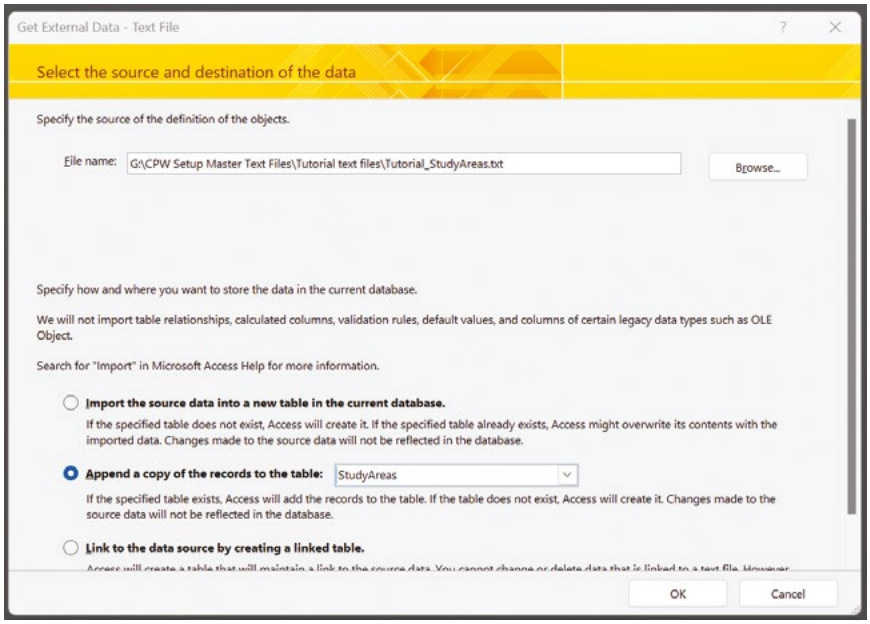
- Enter the Study Area by clicking on the **Camera Data Tables** drop-down menu and selecting **StudyAreas**.



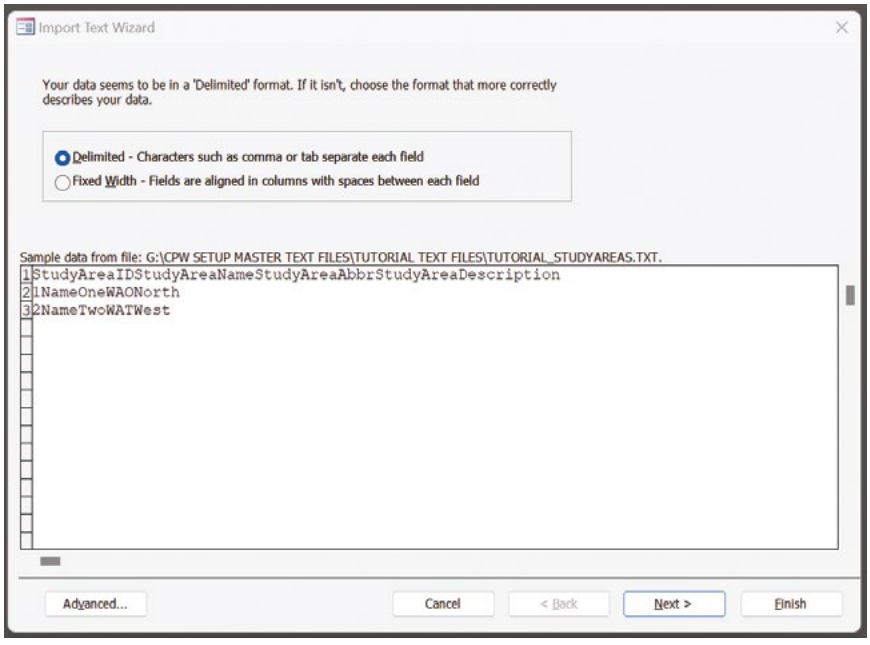
- Select **External Data** → **New Data Source** → **From File** → **Text File**.



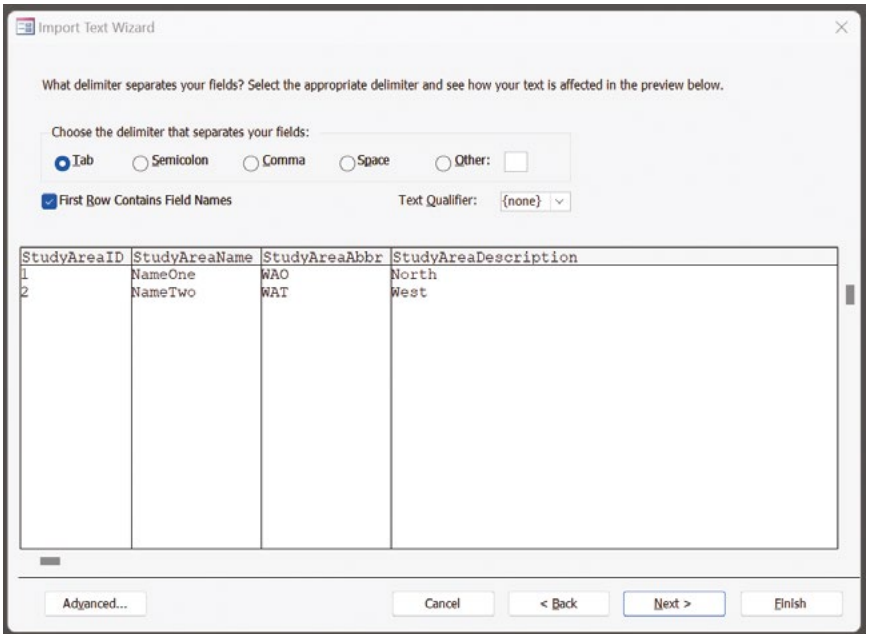
The Data Wizard will appear. **Browse** to your file, then select **Append a copy of the records to the table** → **Select** the relevant CPW table from the drop-down menu and click **OK**.



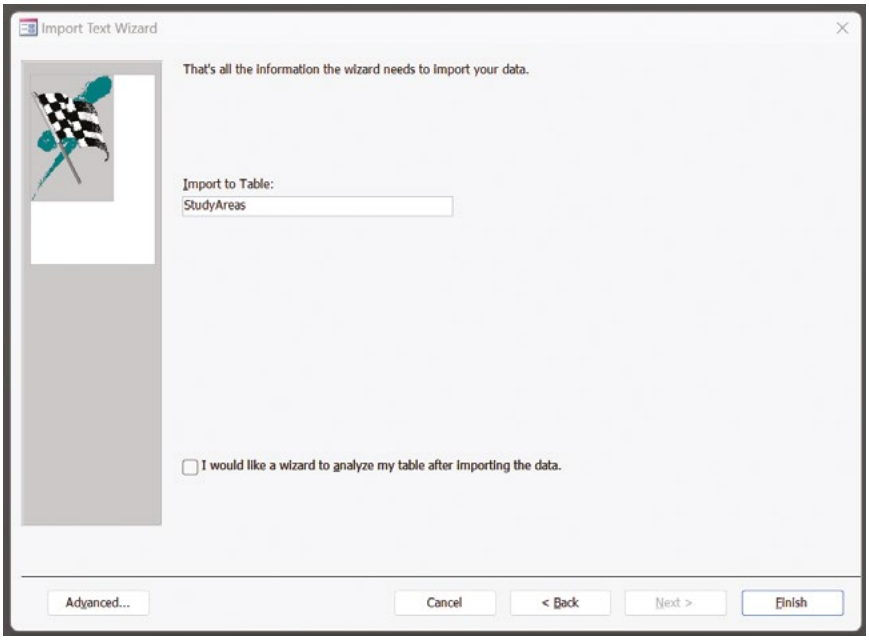
Select **Delimited**, then click **Next**.



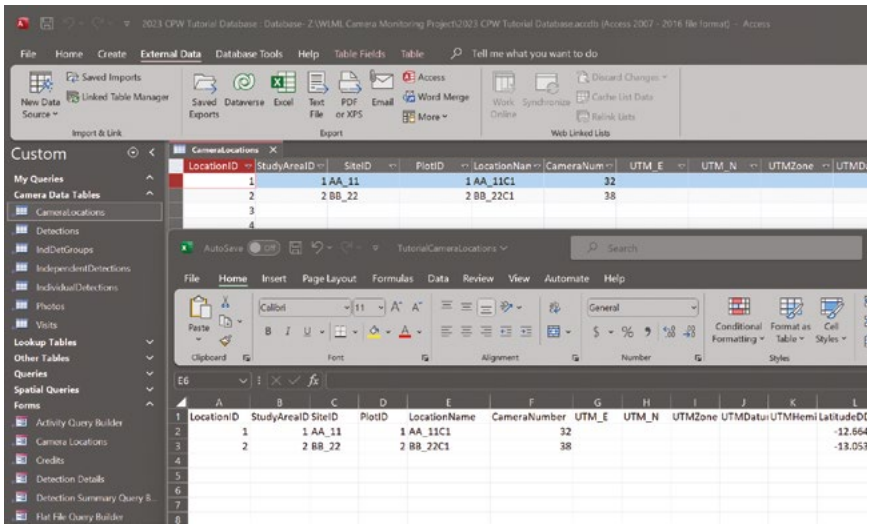
Select **Tab** as the delimiter and check **First Row Contains Field Names** if your text file contains column headings. A preview of your table will appear as you select options. Click **Next**.



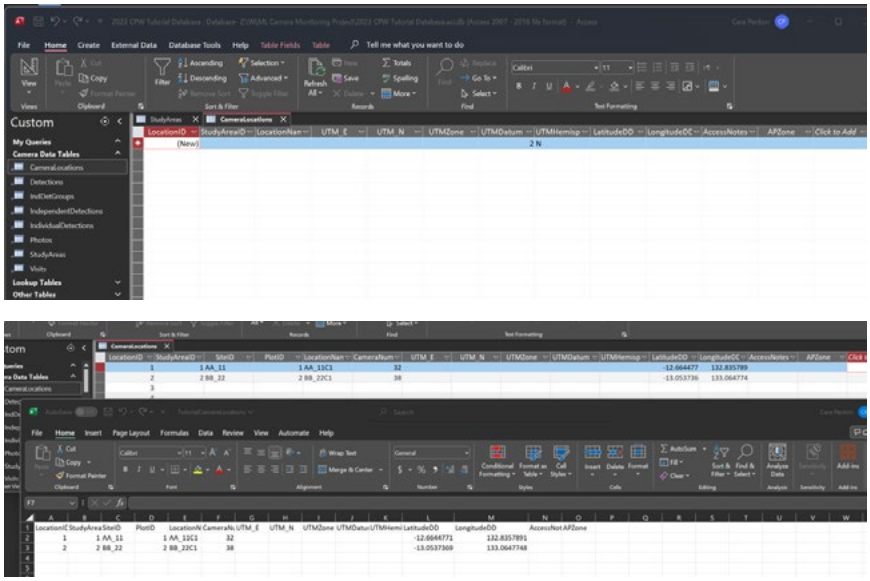
Double check that the correct table has been selected and click **Finish**.



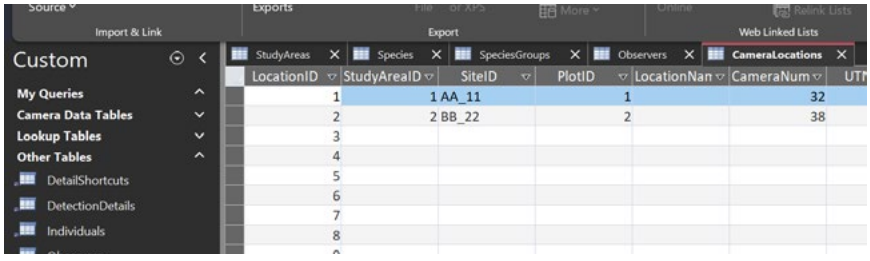
The table should match your text file or spreadsheet.



- To enter camera locations, repeat the above import process, ensuring the columns in your text file match the columns in CPW exactly. You can add, rename or re-arrange columns to suit your requirements. The below picture shows the unmodified camera locations table and the second image shows additional columns we have added to suit our operations.



Repeat the import steps for species list, species groups and observers. These three tables can be found under the **Other Tables** drop-down menu.



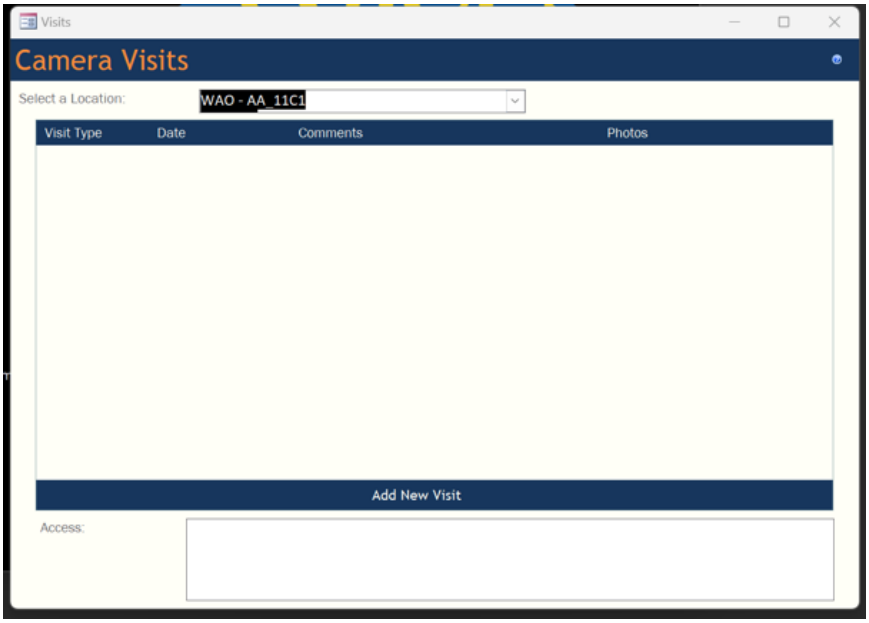
Bilingual database

This is Warddeken's species list. We have added an additional column for language names (**KunwokName**) and also added language names to the **ShortName** column. If we do not have a language name, we use the common name. Importing the species list enables users to tag images in language or common names.

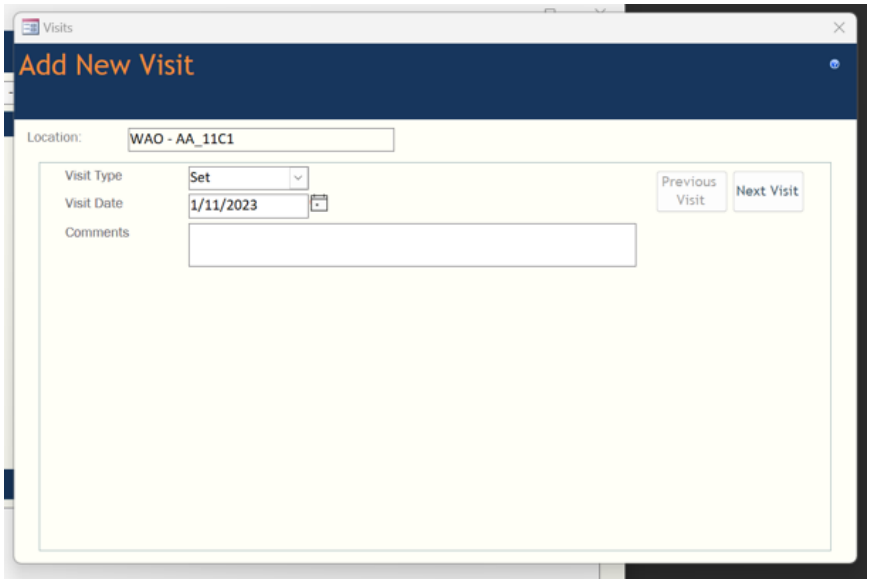
SpeciesID	CommonName	KunwokName	ScientificName	Genus	Species	ShortName	Non-native
1	Australian Magpie		Cracticus tibicen	Cracticus	tibicen	Australian Magpie	0
2	Agile Wallaby	kornobolo	Macropus agilis	Macropus	agilis	kornobolo	0
3	Agile Wallaby Female	merlbbe	Macropus agilis	Macropus	agilis	merlbbe	0
4	Azure Kingfisher		Ceyx azureus	Ceyx	azureus	Azure Kingfisher	0
5	Banded Fruit-dove		Ptilinopus cinctus	Ptilinopus	cinctus	Banded Fruit-dove	0
6	Banded Honeyeater		Cissomela pectoralis	Cissomela	pectoralis	Banded Honeyeater	0
7	Barking Owl		Ninox connivens	Ninox	connivens	Barking Owl	0
8	Agile Wallaby Male	warradjangkal	Macropus agilis	Macropus	agilis	warradjangkal	0
9	animal	mayh	animal			mayh	0
10	Antilopine Wallaroo Female	kalabah	Macropus antilopinus	Macropus	antilopinus	kalabah	0
11	Antilopine Wallaroo Male	karndayh	Macropus antilopinus	Macropus	antilopinus	karndayh	0
12	Blue-winged Parrot		Neophema chrysostoma	Neophema	chrysostoma	Blue-winged Parrot	0
13	Australian Owlet-nightjar	lablab	Aegotheles cristatus	Aegotheles	cristatus	lablab	0
14	Brown Quail	djirndih	Coturnix ypsilophora	Coturnix	ypsilophora	Brown Quail	0
15	Bush Stone-curlew		Burhinus grallarius	Burhinus	grallarius	Bush Stone-curlew	0
16	Carpentarian Grasswren		Amytornis dorotheae	Amytornis	dorotheae	Carpentarian Grasswren	0
17	Australian White Ibis	kernalk	Threskiornis molucca	Threskiornis	molucca	kernalk	0
18	Bar-shouldered Dove	korlobok	Geopelia humeralis	Geopelia	humeralis	korlobok	0
19	Bird	mayhmayh	mayh mayh	Bird	Bird	mayhmayh	
20	Emerald Dove		Chalcophaps indica	Chalcophaps	indica	Emerald Dove	0
21	Black Flying-fox	murru	Pteropus alecto	Pteropus	alecto	murru	0
22	Black Wallaroo Female	djukerre	Macropus bernardus	Macropus	bernardus	djukerre	0
23	Black Wallaroo Male	barrk	Macropus bernardus	Macropus	bernardus	barrk	0
24	Black-footed Tree-rat	bakkadidji	Mesembriomys gouldii	Mesembriomys	gouldii	bakkadidji	0

Importing images

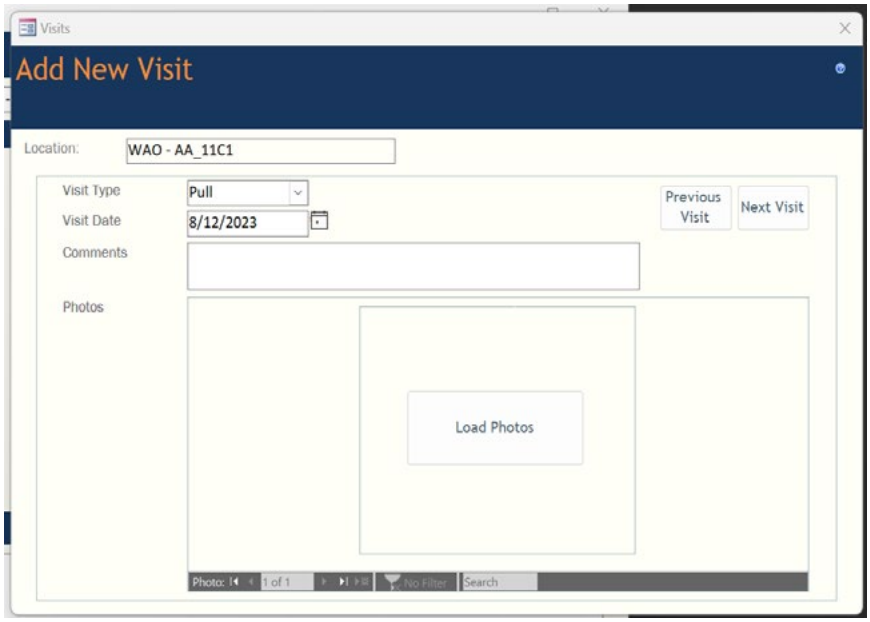
Open the switchboard (double click **Switchboard** in the **Forms** section on the left of the page), and select **Add or Edit Visits**. Under the **Select Location** drop-down menu, all of your cameras should appear as location names, prefixed with a study area acronym. Select a location and click the **Add New Visit** button.



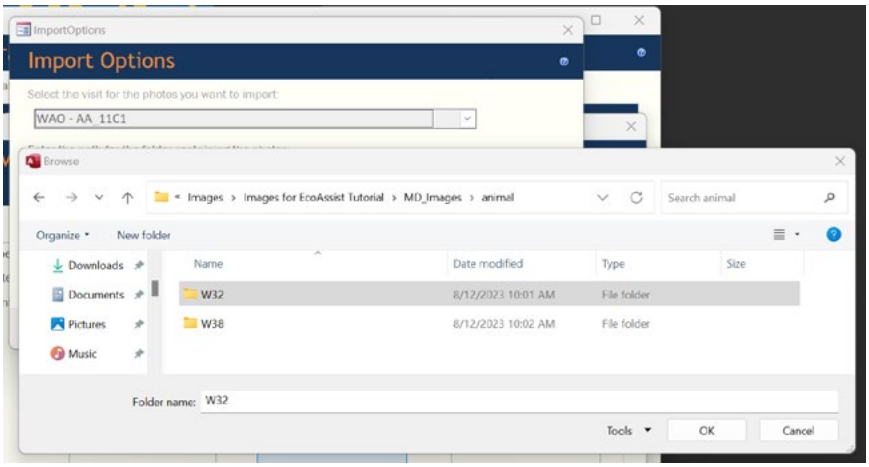
Select **Set**, **Check** or **Pull** from the visit types (set is when you set the camera up, pull is when you retrieved it and check is if you checked the camera in between setting and pulling) and add the date that these occurred. Select **Next Visit** to enter additional visits.



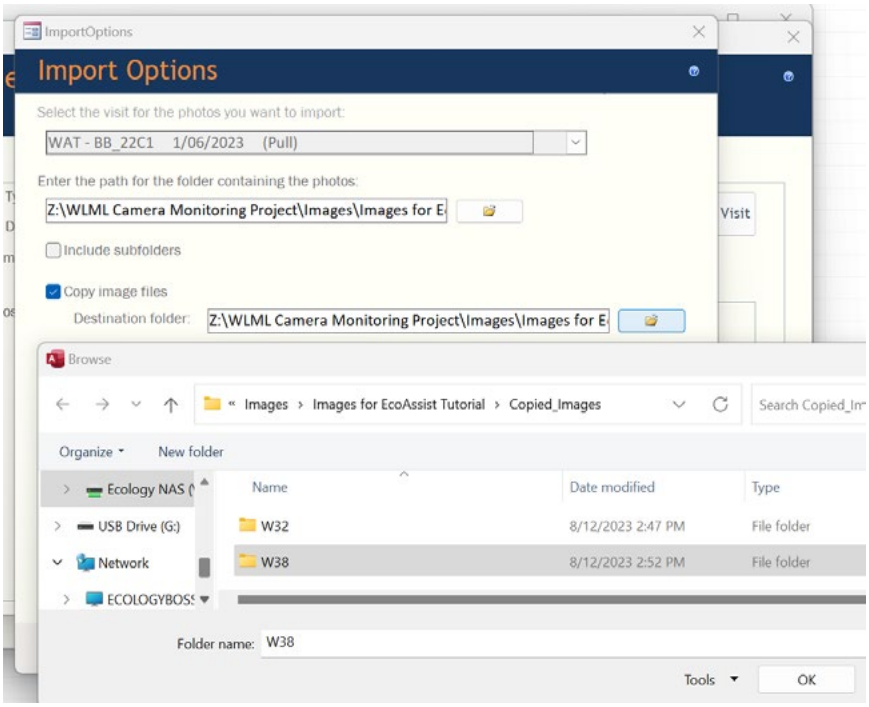
Once you have entered a set and a pull date, a **Load Photos** option will appear. Select this.



Browse to the folder containing animal images: **MD Images** → **animal** and select the camera that corresponds with the selected location and click **OK**.

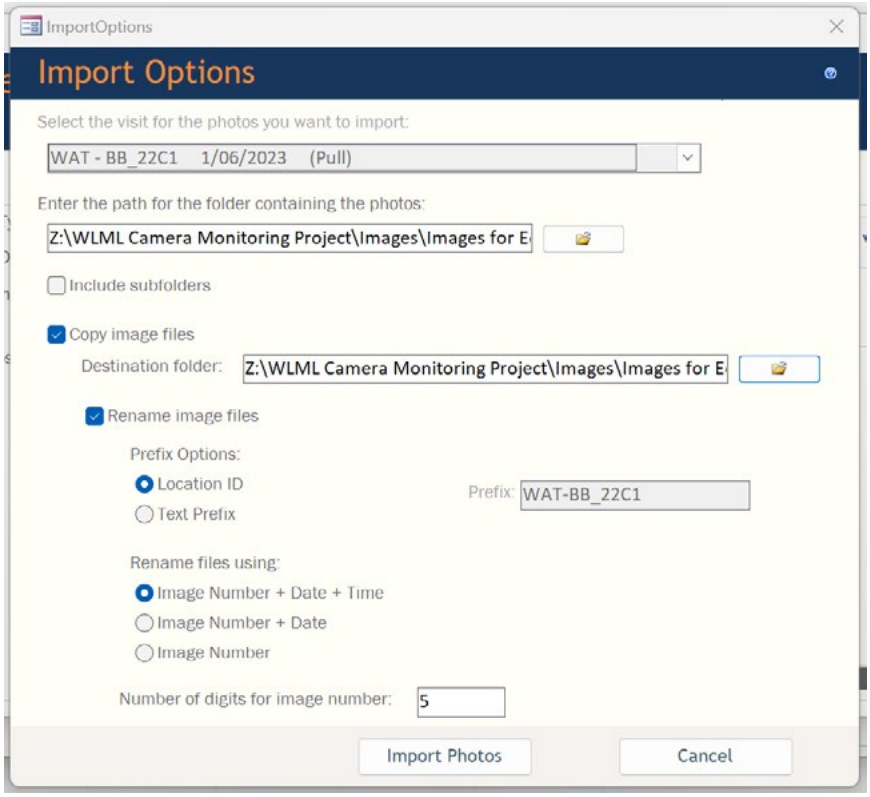


Check **Copy Image Files** and browse to the destination folder, in this case it is the **Copied Images** folder you made earlier. Once inside the **Copied Images** folder, create a new folder for the copied images. You can name this folder after the camera number or the location code (below) for this camera.

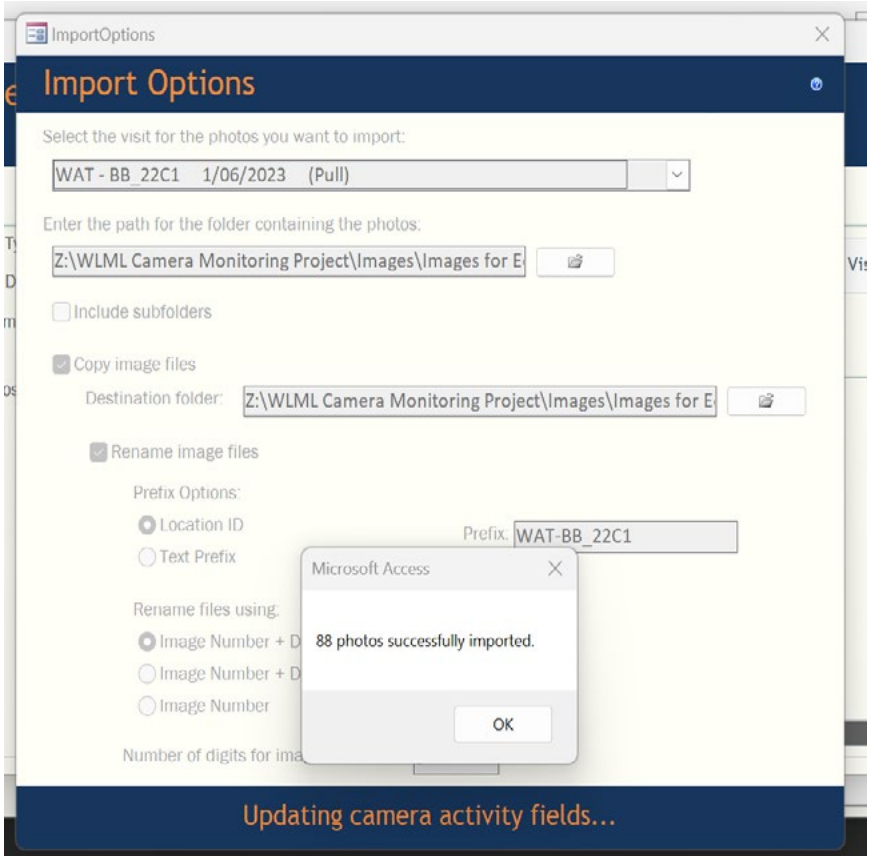


When EcoAssist returns processed images, they will no longer be in chronological order. Renaming the images retains the order.

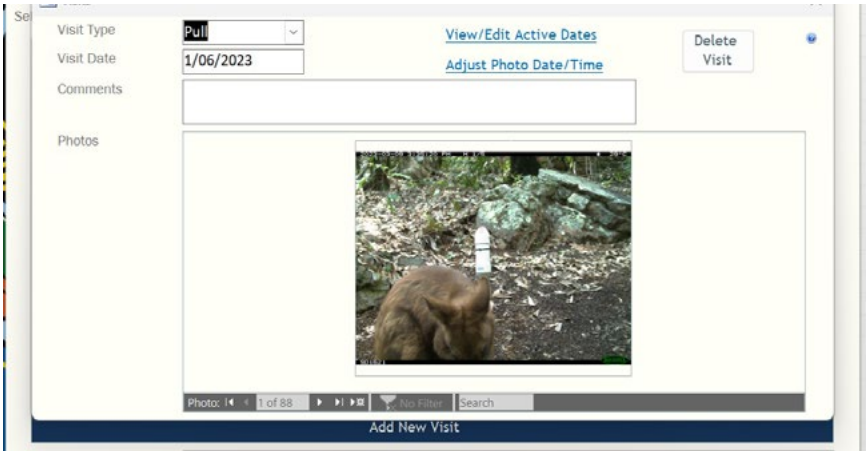
Rename the image files to prefix with location ID and rename with image number, date and time. Click **Import Photos**.



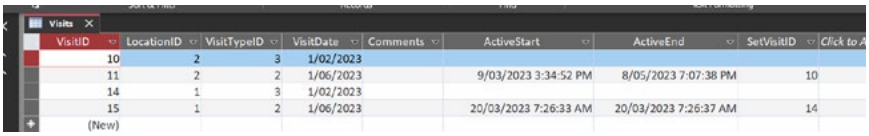
This screen will display if a folder of images has uploaded correctly.



When you click **OK**, you will see that images from that camera have replaced the **Load Photos** button in the camera visits form.



- Repeat this process for all cameras.
- As you add visits and import images, the visits table will automatically populate the set and pull dates (under visit type ID and visit date). You will also notice that CPW has automatically detected the active start and end dates for each camera.



If the camera's date and time were incorrect during the deployment, you can adjust this by selecting **Add or Edit Visits** on **Switchboard** → **Select The Location**. Click the **Edit** button on the **Pull** line → **Adjust Photo Date / Time**. From here you can add or subtract days from the first image on the camera and CPW will automatically adjust the remaining images and update the active start and end dates in the visits table.

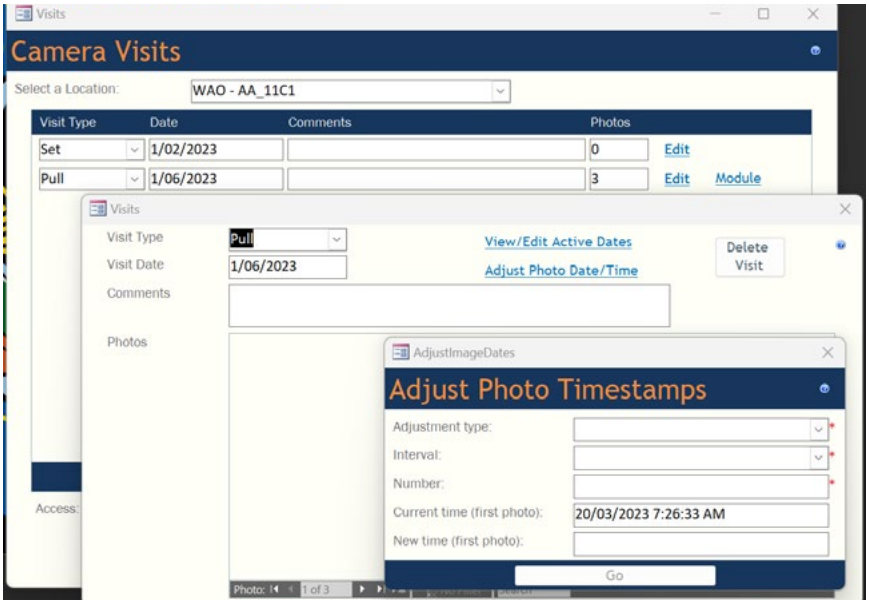


Image ID

To identify images, select **ID Photos** on **Switchboard** → select your name from the drop-down menu (if you added observers during setup).

See page 23 of the CPW User Guide for details on creating and uploading modules.

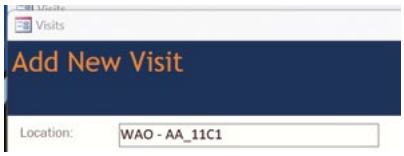
Select a location and you can now use the photo ID form to ID images.

Create modules

CPW can produce 'modules' which can be emailed, shared via sharing services or copied to external hard drives if you have rangers who would like to ID animals from an external PC or laptop. A single module contains a database and images for a single camera. Rangers can ID animals, but will not have access to any other CPW functions. These modules can then be uploaded to CPW when complete.

In order for the modules to upload correctly, the module name must match the location code (below image) exactly. The modules can be renamed once on the hard drive or receiving PC. Only the module database needs to be uploaded to CPW, the photo folder is not required after image ID is complete.

You can close the program at any time and your work will save automatically.



Resources

Warddeken Land Management – How to set up a camera trap for biodiversity monitoring projects
https://healthycountryai.org/files/WarddekenCameraTrapSetup.pdf

Warddeken Land Management – How to set up a Timelapse database using EcoAssist
https://healthycountryai.org/files/WarddekenTimelapseDBSetup.pdf

EcoAssist
addaxdatascience.com/ecoassist/

EcoAssist GitHub repo
github.com/PetervanLunteren/EcoAssist?tab=readme-ov-file#windows-installation

How do I get started with Megadetector?
wildlabs.net/event/how-do-i-get-started-megadetector

CPW Photo Warehouse
cpw.state.co.us/learn/Pages/ResearchMammalsSoftware.aspx

References

Newkirk, E. S. (2016). *CPW Photo Warehouse.* Colorado Parks and Wildlife, Fort Collins, Colorado, USA.

Telstra Foundation

Karrkad Kanjdji Trust