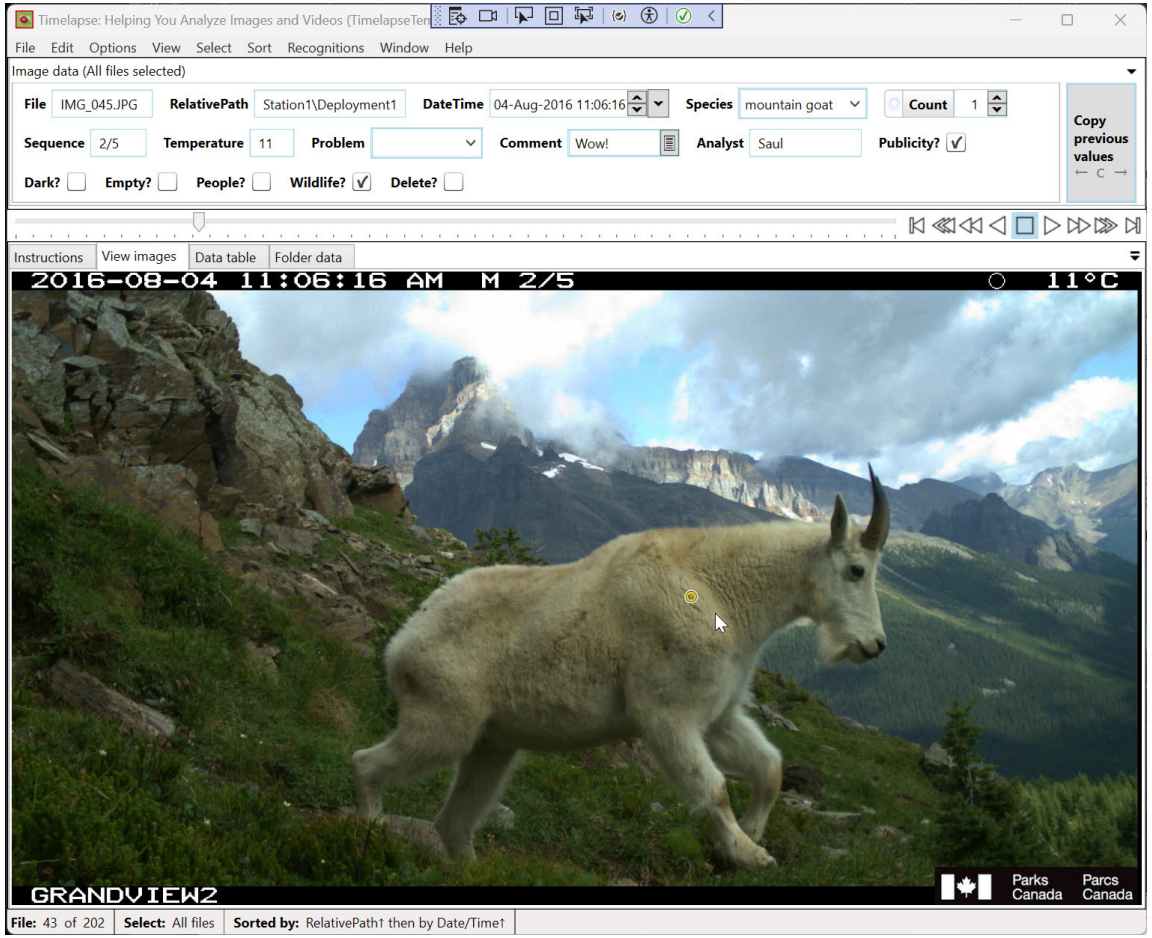
Timelapse Quick Start Guide

A minimalist guide to downloading and using Timelapse to tag image and video files



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Timelapse Quick Start

A minimalist guide to downloading and using Timelapse to tag image and video files[1]

This QuickStart guide provides a very brief explanation of how to download and use Timelapse to load, inspect, and tag a set of image and video files. Its purpose is solely to get you started: only a handful of the most basic Timelapse features are demonstrated as part of a simple workflow

This step by step guide will show you how to tag a few of the files in the *PracticeImageSet* folder (available on the Timelapse Download page). That folder includes a template that specifies what data fields will be displayed by the Timelapse interface. A later section of this guide will show you how to create your own template.

The guide also has a companion video, which mirrors all the steps shown here. It is also available on the Timelapse Download page.

Beyond this guide. While this guide will get you started, there are many TImelapse features you should know about that are not discussed here. It is well worth your time to explore those features, as they will help you construct a truly efficient workflow for tagging files.

Other resources go beyond the Timelapse basics discussed in this guide. Each introduces you to the very rich set of facilities offered by Timelapse.

1. ***Other guides.*** We recommend reading (or at least scanning) the Timelapse Reference Guide and Timelapse Template Guide, and watching the 1st webinar listed at the bottom of the Timelapse About page.
2. ***Videos*** are available on the Timelapse Videos page that illustrate individual features in depth.
3. ***Frequently asked questions*** on the Timelapse FAQ page list common questions and answers.

[1] What you see when you run Timelapse software may not exactly match the screen images in this guide, due to updates made in the software after these screen images were taken. These differences should not affect your general understanding.

Table of Contents

Timelapse Quick Start 2
The Problem 3
The Timelapse Software 4
TimelapseTemplateEditor 4
Timelapse 4
Installing Timelapse 5
Installing the Practice Image Set 5
Loading the Practice Image Set 6
The Timelapse Interface 7
A Basic Workflow for Tagging Files 9
Step 1. Select a Working Subset of Files 10
Step 2. Copy a Field's Value to All Selected Files 10
Step 3. Populate a Field from a File's Metadata 11
»What is file metadata and why is it useful? 11
»Populate Temperature and Sequence data fields with file metadata 11
»The Copy Previous Values button 13
Using the Overview to Tag Multiple files 13
QuickPaste 14
Exporting your Data 16
Correcting Date and Time Errors 17
Creating your own Custom Template 18
An Image Recognition Teaser 20
A Folder Data Teaser *aka* Metadata 22
The Template can define folder-level data 22
Filling in folder-level data in Timelapse 23
Beyond the Basics 25

The Problem

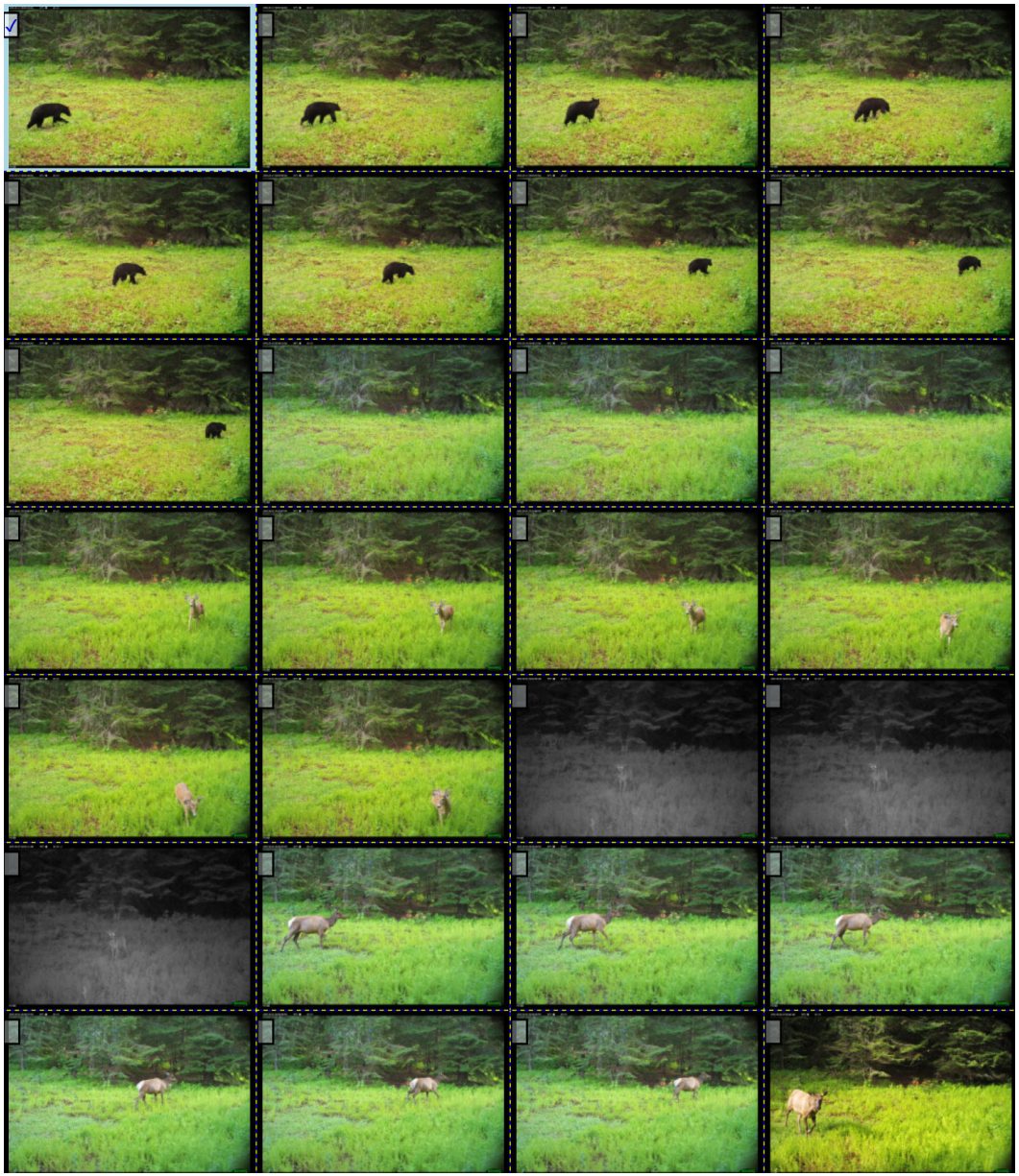
Camera traps, also called ***field cameras*** or ***wildlife cameras,*** capture images or videos of events at strategic locations, either at regular intervals or when any motion is detected. These are saved as photo or video files on a camera card. Cards are periodically retrieved from the camera, where its files are uploaded to a computer and stored in one or more folders.

Analysts then visually examine each image or video to turn it into meaningful data. They encode what they see by filling in data fields, each field representing a ***tag.*** Tags record anything of interest: descriptions, the entities present in the scene (vehicles, people, animals, particular species) and their counts, conditions (weather, foliage movement, etc), generic comments, and more. Each project usually specifies its own unique tags of interest.

For example, consider a project that captures wildlife use of an area over time. After files are retrieved, the analyst has to visually inspect a huge number of images or videos and encode what is seen in each file as tag data, such as in the examples below.

- *File and Relative Path*: Image file name/folder location.
- *DateTime*: When the image or video was taken.
- *Species*: The species seen in an image.
- *Count*: The number of each species present.
- *Sequence*: Position in a motion-triggered sequence.
- *Temperature*: The ambient temperature in Celsius.
- *Problem:* Indicate why this image is hard to evaluate
- *Comment*: any comments the analyzer wishes to add.
- *Analyst*: Person who analysed this image.
- *Publicity?* Is image is useful for publicity purposes.
- *Dark?* Is this a dark (nighttime) image?
- *Empty?* Are no people or wildlife present?
- *People?* Are people present?
- *Wildlife?* Is wildlife present?
- *Delete?* is this file as a candidate for deletion?

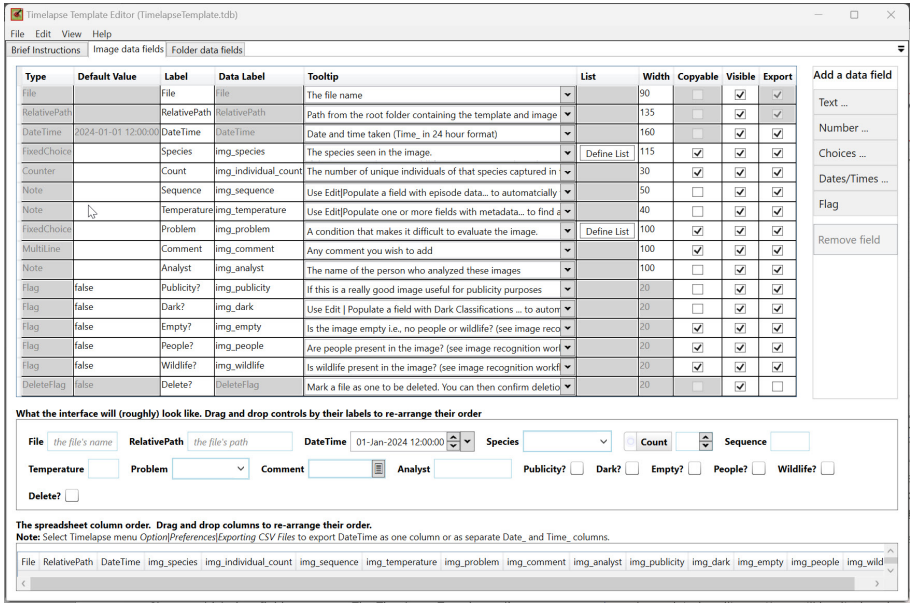
The problem is that visually analyzing and tagging data from the massive number of images produced by camera traps can be tedious and expensive.



The Timelapse Software

Timelapse is free software designed to simplify tagging of image and video files[1]. It consists of two programs, briefly described below. Both run in Microsoft Windows, or an Apple computer running a Windows emulator.

TimelapseTemplateEditor

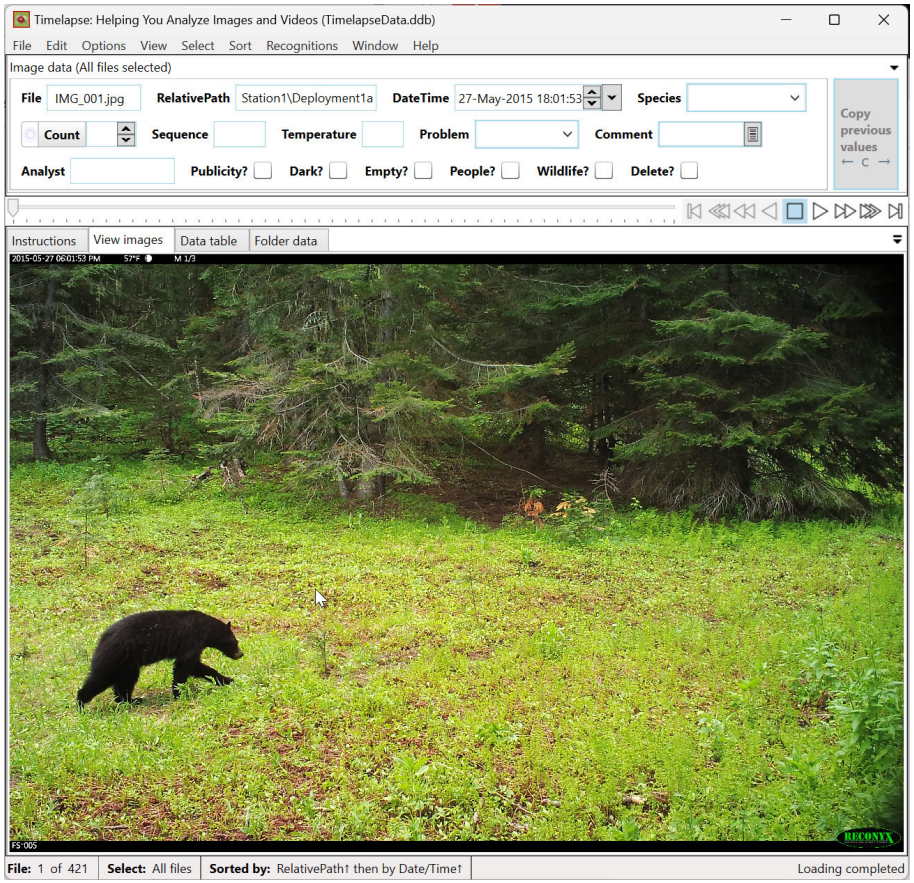


A project manager uses the ***Timelapse Template Editor*** to create a custom project-specific ***template*** specifying the data fields that analysts will use to tag each image. This means that ***any data field can be defined***. See the Timelapse Template Guide for details.

For example, the above screenshot of the Timelapse Template Editor defines fields for wildlife monitoring as described on the previous page. Each row defines its type and default value, how that field should appear in the Timelapse user interface (e.g., labels, tooltip, field visibility and width...) and as rows and columns exported to a CSV file (data label, export...). This means that Timelapse can be customized to a broad variety of domains and purposes, e.g., wildlife ecology, fisheries management, social studies, laboratory instrumentation monitoring, etc.

[1] To avoid excessive repetition, this manual will generally use ***images*** as a generic term that covers both image and video files. While differences exists, the process for tagging images and videos is mostly identical.

Timelapse

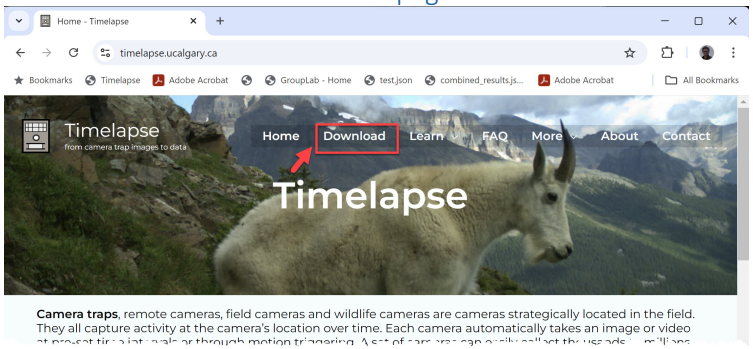


The template is dropped into a folder that contains the image and video files, usually organized as sub-folders. This is collectively called the ***image set***. The analyst then uses ***Timelapse*** to open that the image set. Timelapse automatically finds all image and video files, and extracts information from them (e.g., file name, file location, date and time the image was taken). The main Timelapse window then displays the image along with a series of fill-in data fields corresponding to what was specified in the template. Various tools are available for displaying and navigating through the image or video files, for tagging them, and even for running image recognition progams. The analyst inspects each image and video, and tags them by filling in their data fields.

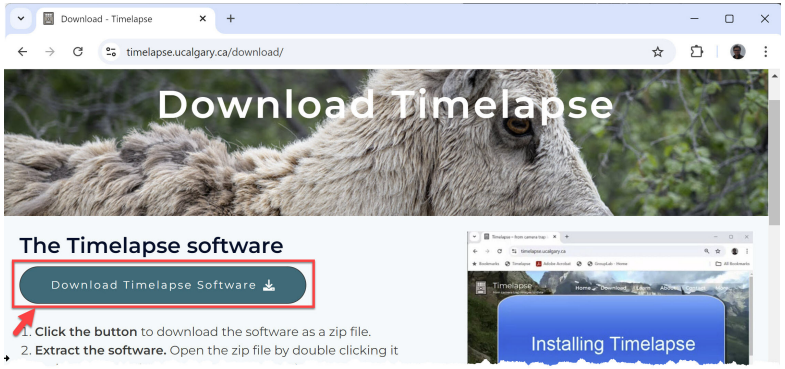
Timelapse includes many features for making this process efficient.

Installing Timelapse

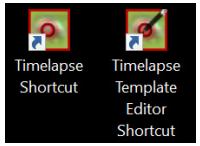
1. Go to the Timelapse web site: https://timelapse.ucalgary.ca
2. Follow the links to the Download page.



3. On the download page, read the instructions and watch the video on how to download, install and run the Timelapse. The download will be a single zip file named *Timelapse-Executables.zip*).



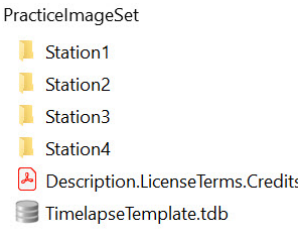
4. Extract the contents of that file to a convenient location (e.g., your desktop). You should now have a folder called *Timelapse*.
5. Within that folder, you will see two programs: *Timelapse.exe* and *TimelapseTemplateEditor.exe.* As all other files in that folder are required by Timelapse, leave the Timelapse executables in that folder.
6. For convenience, create shortcuts on your desktop to these programs.



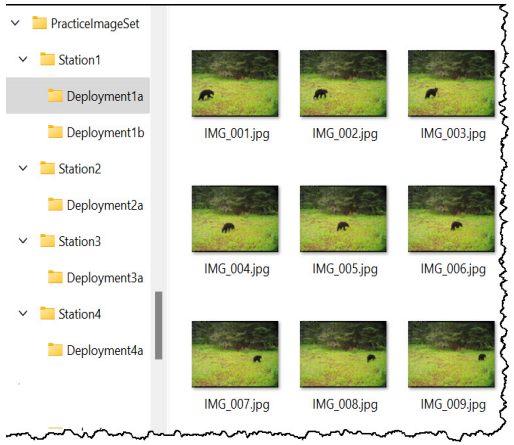
Installing the Practice Image Set

1. From the Timelapse Download page, select the link for the Practice Image Set to download the *PracticeImageSet.zip* zip file. Extract its contents (a folder called *PracticeImageSet*) to a location of your choosing.

2. The *PracticeImageSet* folder contents should look something like this.



   - The *TimelapseTemplate.tdb* file is a template specifying the data fields to be shown in Timelapse.
   - Each numbered *Station* folder represents a single camera at a particular location.
   - *Station* folders contain one or more numbered *Deployment* sub-folders, each representing the contents of that camera station's SD card as its images and video files are periodically retrieved.

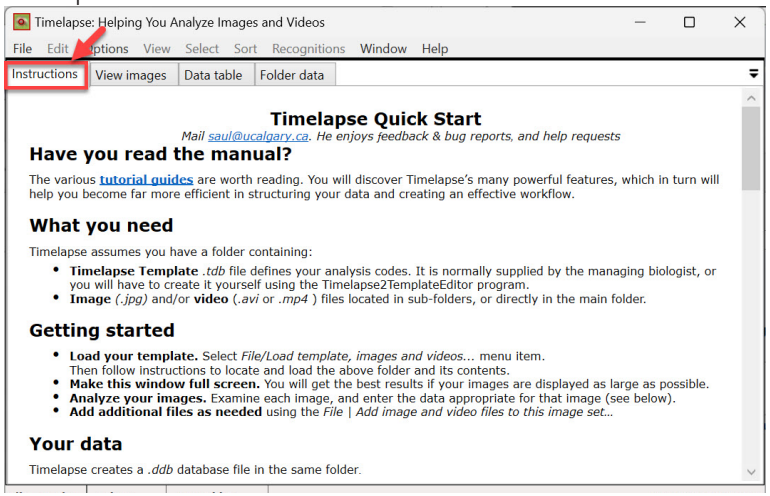


Note. The template, folder structure, and the particular images and videos in each folder will be used by this and other Timelapse guides to demonstrate particular Timelapse features.

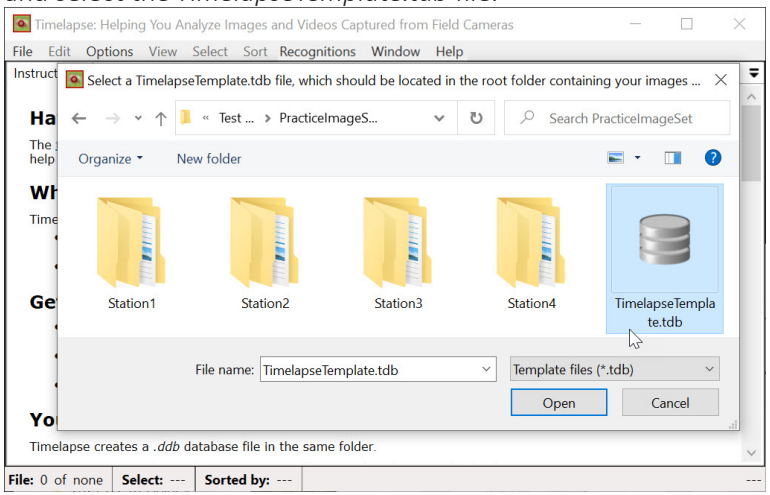
Loading the Practice Image Set

The next step is to load the template, images and videos in the *PracticeImageSet* folder into Timelapse.

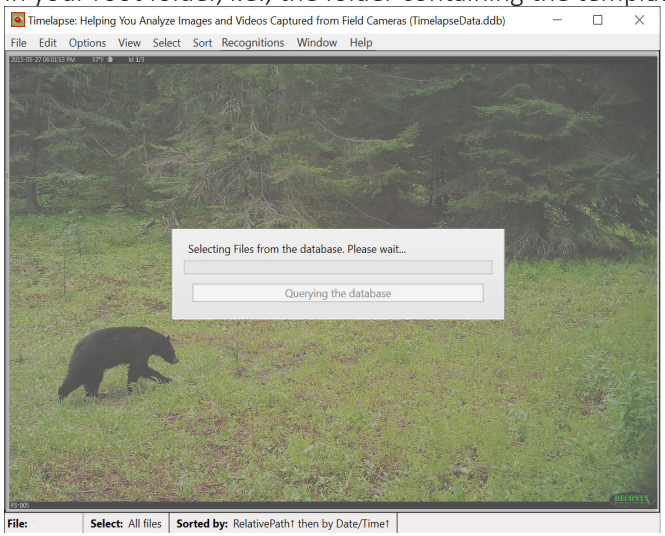
1. **Start the Timelapse software** through its icon or shortcut. A window appears with brief documentation of Timelapse's main features. You can revisit this documentation at any time by selecting the ***Instructions*** tab at the top.



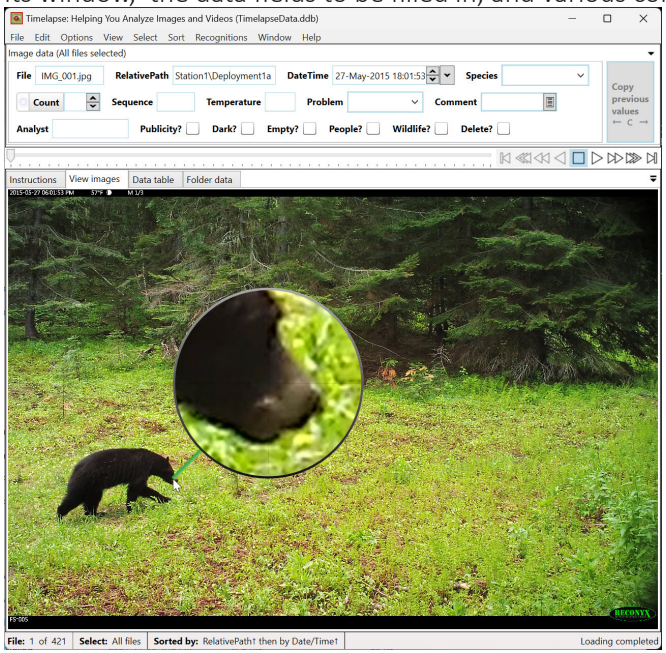
2. **Load the image set.** Select *File | Load template, images, and video files…* Navigate to the *PracticeImageSet* folder (which will be the ***root folder)***, and select the *TimelapseTemplate.tdb* file.



3. **Wait for your images to be loaded.** Timelapse displays feedback as it searches for and loads all images and videos contained within the root folder and its sub-folders. It also creates a database (*TimelapseData.ddb*) in your root folder, i.e., the folder containing the template.

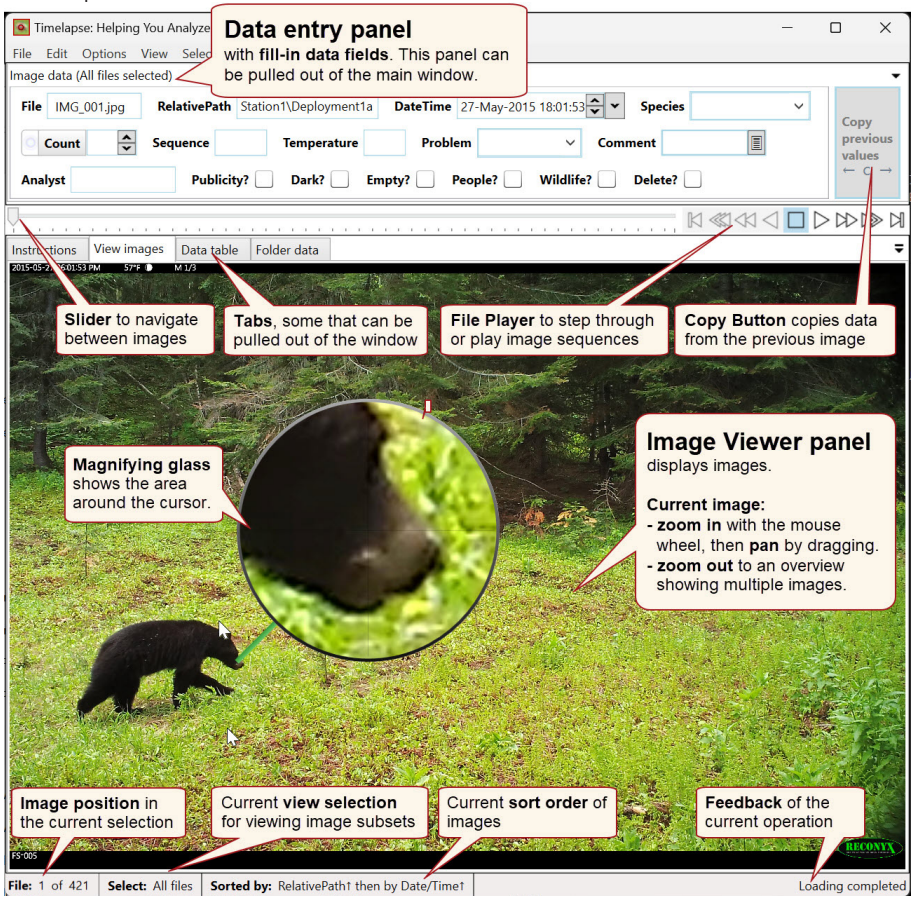


4. **Begin analyzing images.** Timelapse displays the first image in its window, the data fields to be filled in, and various controls.



The Timelapse Interface

The primary view. You should now see a set of data fields (some filled in) at the top, and the first image in your image set at the bottom. The basic Timelapse controls are annotated below.



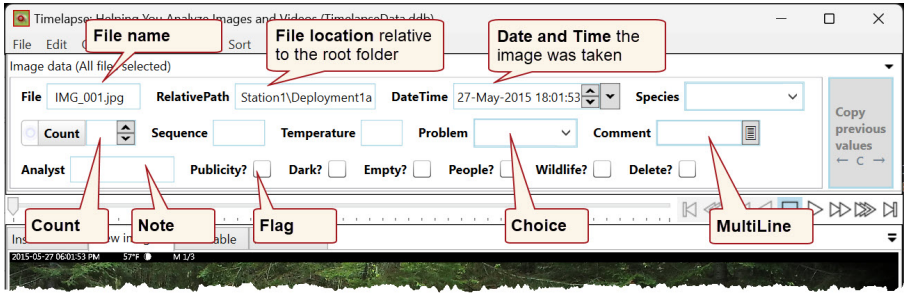
Note. You can display or hide the magnifying glass by the menu selection *Options | Magnifying Glass | Display magnifier,* or by keyboard shortcut *M.*

The data entry panel contains the various data fields as specified in the template. The data panel can be pulled out of the window by grabbing its title bar, and put back in by selecting *Dock* from the title bar's ˅ menu.

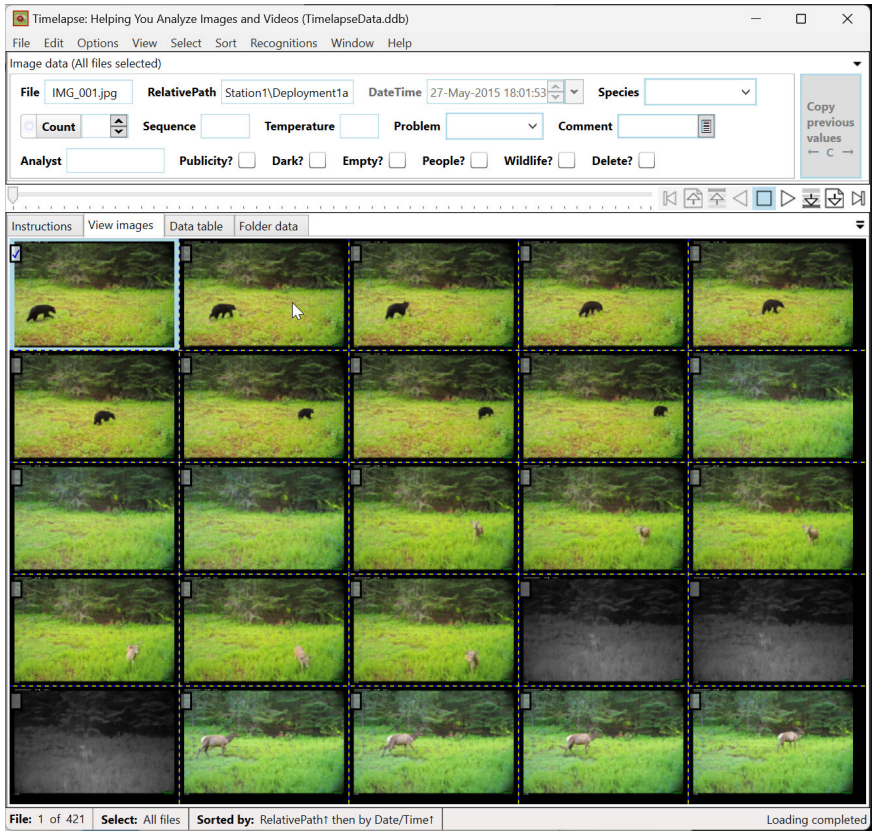
Four of these fields are standard default fields provided by Timelapse itself. The first three (top), are automatically filled in by Timelapse when it first loads an image: *File* with the file's name, *RelativePath* with the file's location relative to the root folder, and *DateTime* with the date the image was taken. The *Delete?* control (bottom right) allows a user to tag a file for later deletion.

Other data fields are custom to the project: the project manager had specied their presence and appearance in the template. Most are presented as familiar controls, where each simplifies data entry and restricts input to a particular data type. Using Timelapse jargon, *Counters* allow numeric entry by entering or selecting a number, or by clicking on a part of the image (which also leaves a visible marker at that location). *Notes* and *MultiLines* allow single or multi-line free-form text entry. *Flags* provide checkboxes for setting true/ false values. *Choice* provides a drop down menu for making a single selection.

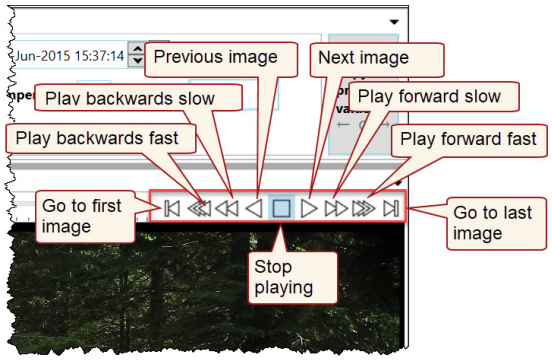
Other types of data fields (not shown) could have been specified in the template. An *AlphaNumeric field* restricts its text to letters, numbers, under-score and dash. *Integer, IntegerPositive*, *Decimal* and *DecimalPositive* restrict input to particular number types. *DateTime_*, *Date_* and *Time_* fields restrict input to different combinations of dates and times. *MultiChoice* allows several items to be selected from a menu at a time, rather than just one.



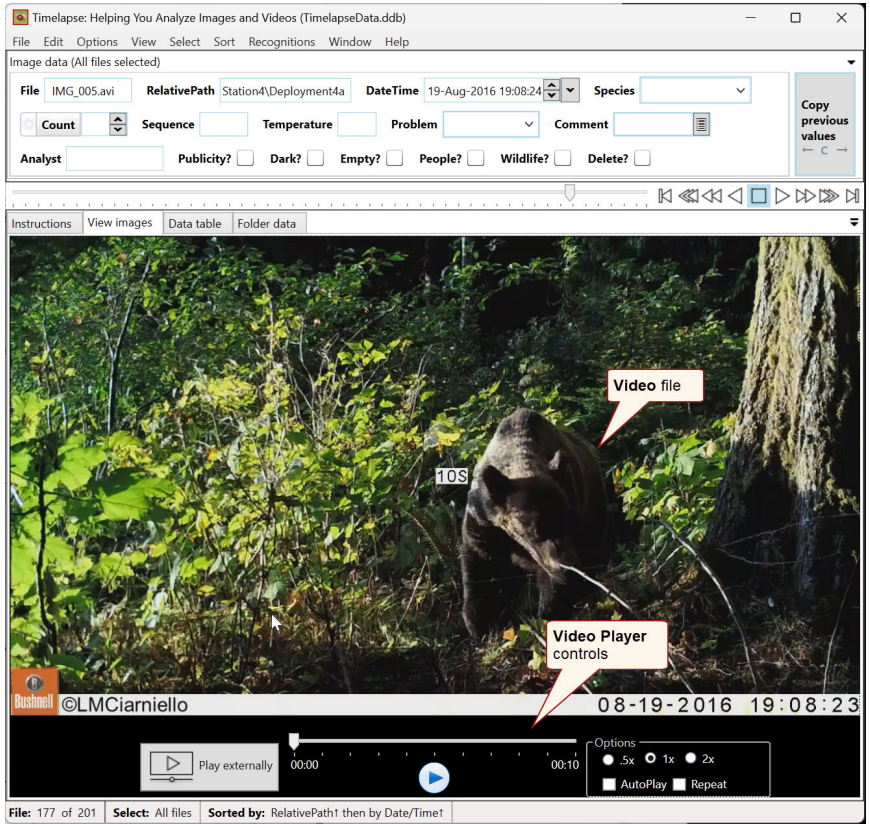
The Overview displays multiple images. The overview appears when you zoom out of an image. To do this, select *View | Zoom out* from the menu, or your mouse scroll wheel, or via the keyboard shortcut keys **< >**. Try both directions . One directon zooms out to the overview, the other zooms into the image.



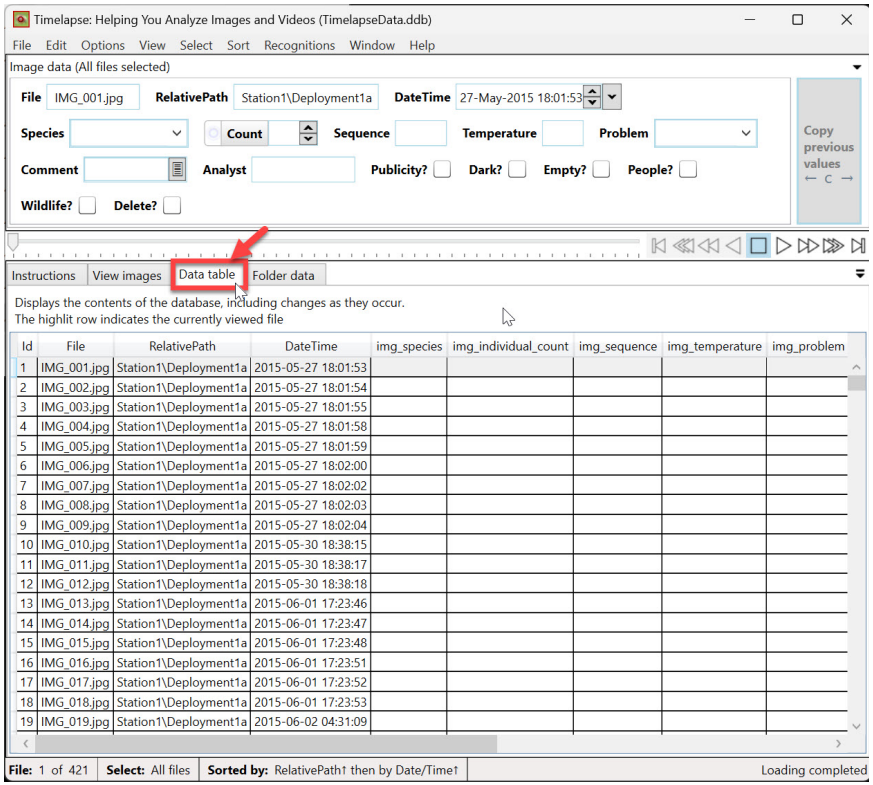
The FilePlayer lets you scroll through the images an image, a row or page at a time. Alternately, you can use the **slider** or **arrow keys** to navigate through your images.



The Video player appears when the file is a video. It allows you to scrub through the video, control its playback speed, auto-play or repeat the video, zoom into the video image, and even play the video in an external video player of your choosing.



The Data Table appears when you click on the *Data Table* Tab. It lists the current contents of the database. Each row is the data associated with a particular file, while each column represents a data field.



Note. There are several differences in how data columns appear when compared to the data fields visible in the data entry panel.

- *Column headers may not match the labels of the fill-in data fields.* The Timelapse template defines two different labels for each data field: a text label that appears next to the data field in the user interface, and a data label that names the database column that stores that data. The data table shows the database column names.
- *The data table contains extra data columns.* The template includes options to show or hide various data fields in the user interface. For example, if (say) the visibility of the Dark? data field was turned off, it would not be visible in the user interface controls but would still be displayed in the Data table.

A Basic Workflow for Tagging Files

A *workflow* for image tagging is a sequence of tasks that an analyst roughly follows for inspecting images and producing tagging data.

There are many workflow variations in how analysts can inspect and tag images. The workflow steps summarized below and detailed in the following sections were chosen to illustrate a few of Timelapse's basic features for image inspection and reasonably efficient data entry. As a simplified workflow, it omits other valuable Timelapse's capabilities (e.g., Image Recognition, Metadata) detailed in other Timelapse Guides.

1. If your task involves only a subset of files, select that as a working subset.
2. Use a single operation to fill in certain fields for all your selected files, including fields:
   a. that should contain exactly the same value for all the files;
   b. that can be automatically populated with each file's metadata.
3. Visually inspect each file to fill in the remaining fields. You can choose from various Timelapse features to make this process efficient:
   a. The ***Copy previous values*** button
   b. The ***Overview***
   c. Creating and using ***QuickPaste*** shortcuts.
4. Export your data to a CSV file that can be viewed in a spreadsheet program.

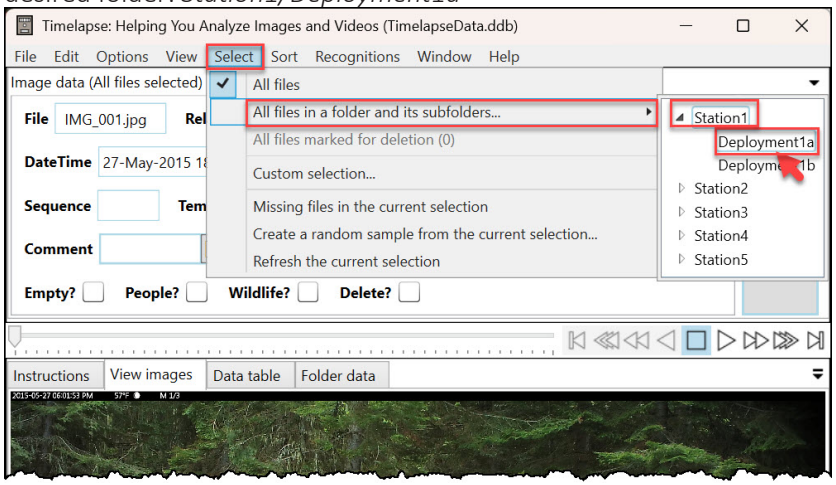
The following sections illustrate each of these workflow steps.

Step 1. Select a Working Subset of Files

In this scenario, you are asked to tag files recently retrieved from an SD card and located in the folder: *Station1/Deployment1a*. To ensure that only those files are tagged, you can ask Timelapse to select and display only files within that folder.

Timelapse includes a powerful database query engine that you can use for this purpose, where particular queries are available under the ***Select*** menu. Folder selection is one such query.

1. From the ***Select*** menu, choose ***All files in a folder and its sub-folders...*** which then displays a list of all folders in the image set. Choose the desired folder: *Station1/Deployment1a*

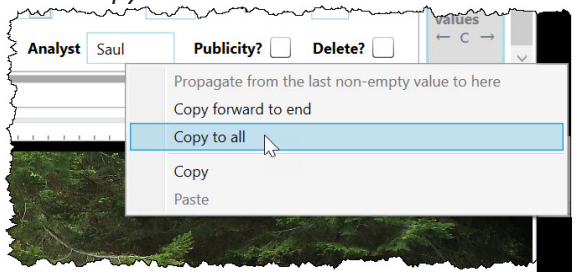


2. Only files in that folder will now be displayed. The status bar verifies that: it is displaying the 1st of the 42 files found in that folder , and that Select is set to *Files in a specific folder*.

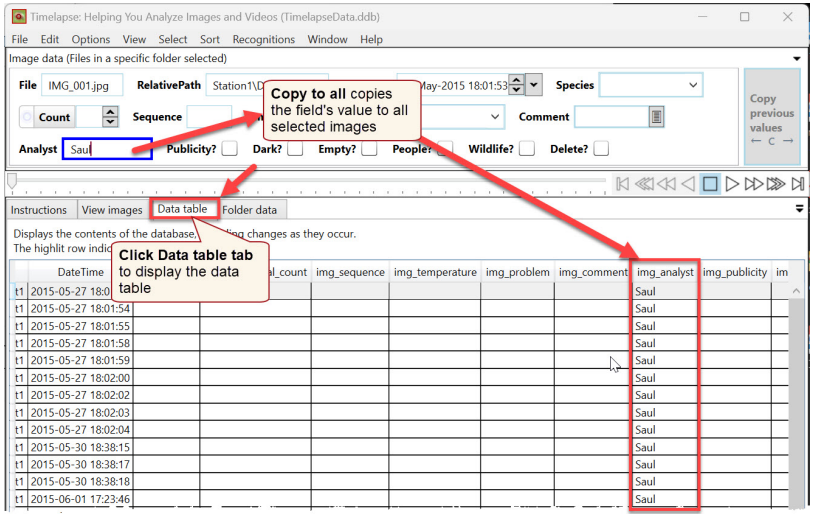
Step 2. Copy a Field's Value to All Selected Files

The ***Analyst*** data field should contain your name. While you could type it in repeatedly as you inspect every file, that would be tedious. Instead, you will use Timelapse's ***Copy to all*** shortcut that lets you efficiently copy a field's contents to every single image.

1. In the 1st file, type your name into the ***Analyst*** data field.
2. Raise the ***Analyst*** context menu by right-clicking the data field.
3. Select ***Copy to All*** from that menu.



4. Timelapse will use this field's current value to fill in all images' ***Analyst*** field in the current selection. You can verify this in several ways.
   a. Navigate through the files using the slider, the file player, or the left/right arrow keys on your keyboard. Inspect the ***Analyst*** data field's value, which should be the same across all files.
   b. Select the ***Data Table*** tab and scroll to the ***img_analyst*** column. All files should have the Analyst name filled in.



Step 3. Populate a Field from a File's Metadata

What is file metadata and why is it useful?

Image and video files almost always contain *metadata*: data describing various properties of that file. Metadata is often written to the file when an image or video is taken. The examples below illustrate different metadata that could be included in camera trap files.

- ***Exif standard*** defines what metadata JPEG image files should include, such as camera model, exposure time, whether a flash was used, etc.
- ***File metadata*** describes general file attributes, e.g., its size, creation time...
- ***Makernotes*** are camera and model-specific data that the camera manufacturer decides to include. For example, some camera trap models record the ambient temperature at the time an image was taken.
- ***Video metadata*** is idiosyncratic, where what is recorded can vary greatly. Its metadata may or may not include fields such as the video frame rate, duration, audio sample rate, etc.

While most recorded metadata will be of little use to you, some may be quite valuable. Some examples are below.

- *Date the image or video was taken.* When files are first loaded, Timelapse examines each file for metadata that records the time the camera took the photo. This is more reliable than using the file system's creation data, as that may change when files are copied.
- *Ambient temperature.* The temperature at the time the image was taken.
- *Event type.* Whether the camera took the image in ***timelapse mode*** (i.e., at specified time intervals) or ***motion-triggered mode*** (i.e., when motion was detected).
- *Sequence.* Some cameras, especially when motion-triggered, will take a sequence of images. The sequence metadata records where the image is in that sequence (e.g., 1 of 3).

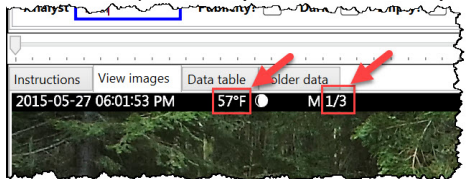
Caveat. There is no guarantee that your images or videos will include the desired metadata. Even if it does include that data, you may still have to determine the name of the metadata field, and perhaps even the format of the data recorded in that field. As we will see, Timelapse includes facilities for inspecting the metadata of a typical image, associating metadata fields of interest with data fields of your choosing, and finally having Timelapse populate those data fields with the metadata values found in each file.

Populate Temperature and Sequence data fields with file metadata

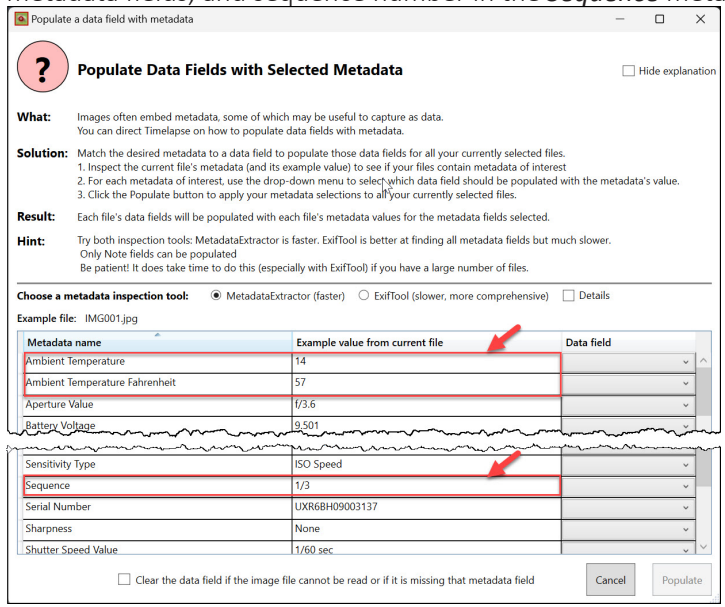
For the next step, you will populate two fields with each file's metadata.

1. Go back to the first image. You'll notice that this image displays various information about itself in the black banner at the top of the page:
   - » date and time (which Timelapse extracted to its DateTime data field),
   - » temperature at the time the image was taken (57°F),
   - » phase of the moon (the partially filled in circle),
   - » that it was motion triggered (the M), and
   - » the sequence number (1/3).

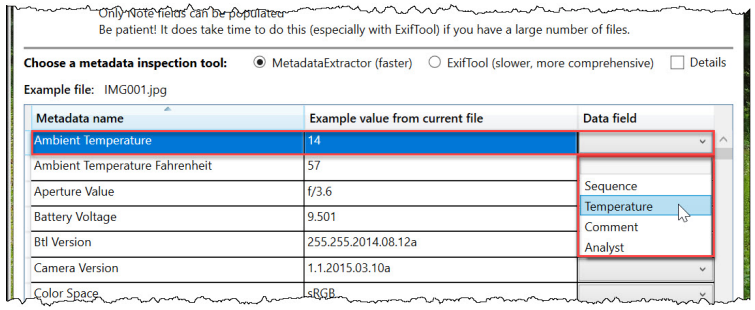
   Of these, you would like to record the temperate and the sequence number in your ***Temperature*** and ***Sequence*** data fields.



2. Inspect a typical file to see what metadata was actually recorded. Select ***Edit | Populate one or more fields with any metadata…***. A dialog box appears allowing you to inspect the metadata included in the current file. We see temperature (°F and °C) recorded in two ***Ambient Temperature*** metadata fields, and sequence number in the ***Sequence*** metadata field.

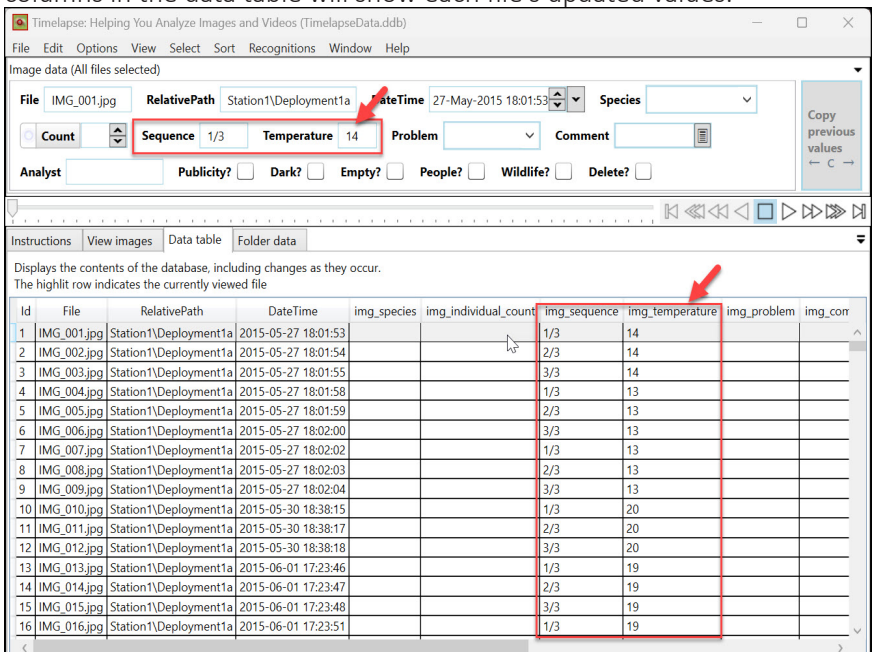


3. Associate that metadata with a Timelapse data field. Using the drop-down menu in the ***Data field*** column, link:
   - » ***Ambient Temperature*** metadata to the ***Temperature*** data field
   - » ***Sequence*** metadata to the ***Sequence*** data field (not shown).



4. Click ***Populate***. The dialog will then provide feedback. All files that have those metadata fields will be updated with the file's metadata values.

The ***Temperature*** and ***Sequence*** data fields in the data entry panel will now display the extracted metadata values for the current file. Similarly, those columns in the data table will show each file's updated values.

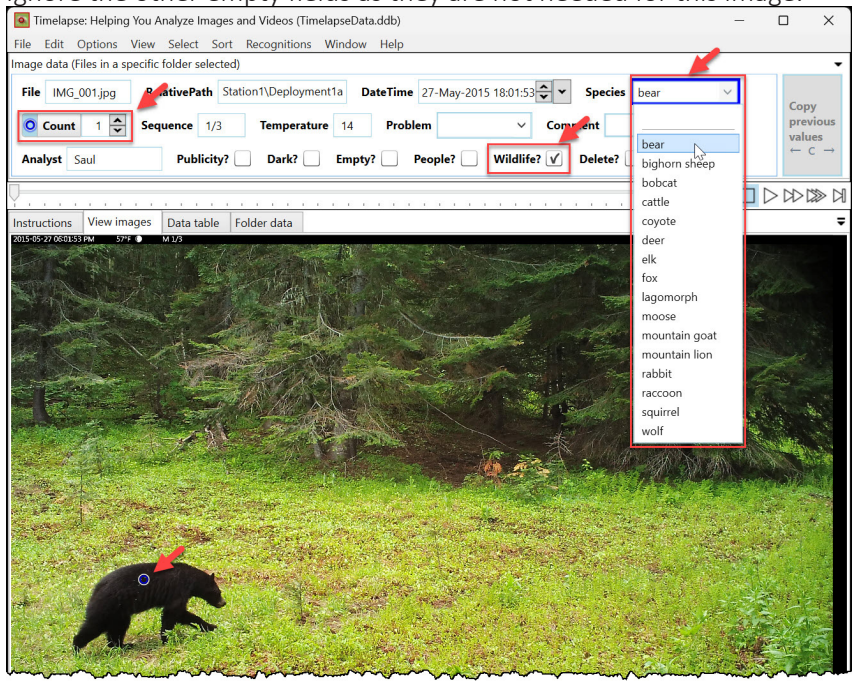


Note. Timelapse has alternate (better?) ways to determining sequences. See ***Episodes*** in the ***Timelapse Reference Guide.***

Step 4. Inspect each file to fill in the remaining fields

You will now have to visually inspect each file to fill in the remaining data fields as needed. You can, of course, do this by manually selecting and adding data to the appropriate fields.

1. Tag the remaining fields for the first image.
   a. As there is a single bear visible in this image, set ***Species*** to *bear* using its drop-down menu, and click the ***Wildlife?*** checkbox.
   b. At the same time increment ***Count*** to *1*. You can do this by typing or clicking the field's up/down buttons. Alternately, click the ***Count*** label, and then click atop the bear. A marker will be left atop the bear, and the count will be incremented from 0 to 1. A right-click on the marker will have the opposite effect.
   c. Ignore the other empty fields as they are not needed for this image.

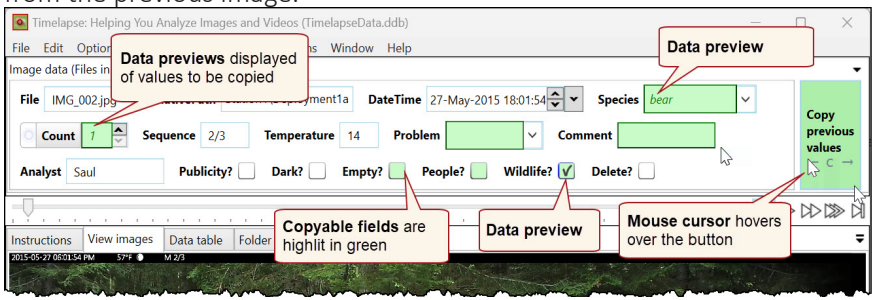


While you can repeat this process for all remaining images, the next few sections highlight shortcuts that make the file by file Inspect/Fill in... task much easier and efficient.

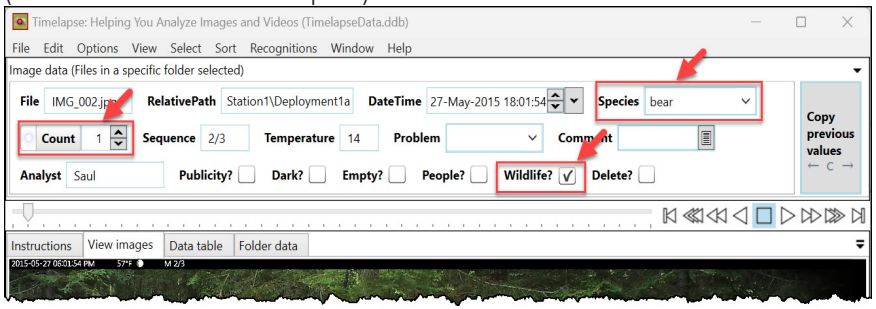
The Copy Previous Values button

Camera trap images often produce long sequential runs of similar images, where an analyst would repetitively tag each image with identical values. The ***Copy previous values*** button located on the right side of the data entry panel offers one way to make repetitive data entry more efficient. Use this button to selectively copy data values from the previous to the current image. The template's ***Copyable*** checkbox determines which data fields are copied over.

1. Go to the next image IMG_002.jpg using the keyboard right-arrow key. This image is highly similar to the preceding image, as it contains the same single bear.
2. Hover over the ***Copy previous values*** button. The fields that will be copied are colored in green, along with a preview of the values to be copied over from the previous image.



3. If the preview is what you want, click the button to copy those values. All those fields are then updated to the values from the previous image. (Count markers are not copied).

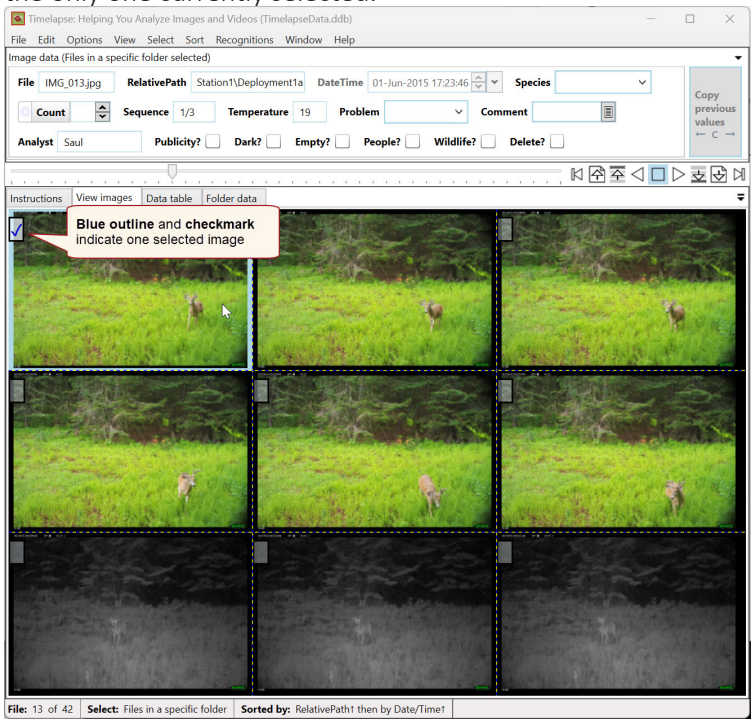


4. Do the same with the next seven images (IMG_003.jpg- IMG0009.JPG, as they would also be tagged with the same data.
5. The next three images are empty. For the first image, click the ***Empty*** checkbox and select '*wind triggered*' from the ***Problem*** menu. Then use the ***Copy previous value button*** to tag the other two images.

Using the Overview to Tag Multiple files

The ***Overview***, introduced earlier in this guide, is useful for inspecting and tagging multiple images simultaneously. It is especially efficient if what you are looking for is clearly visible in these smaller images.

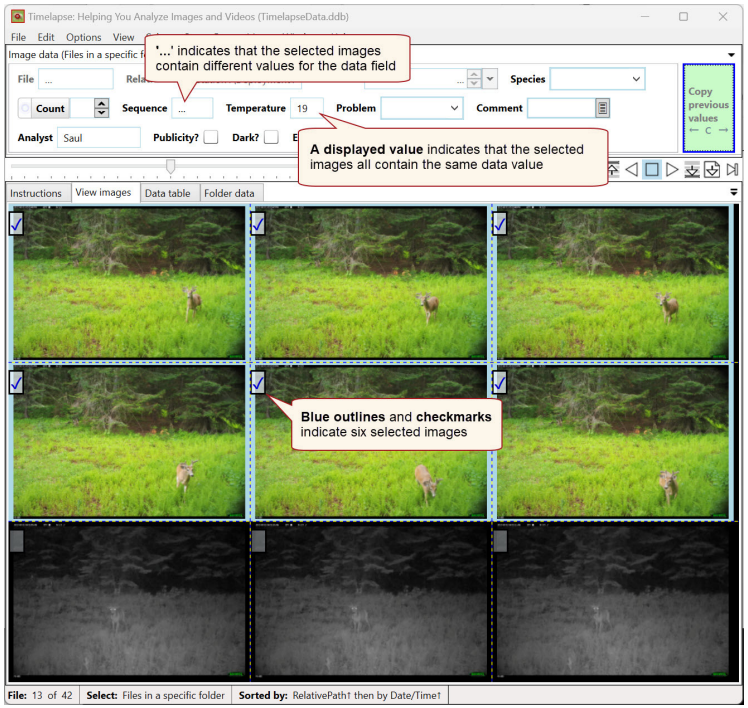
1. Go to the next image, IMG_013.jpg, which contains a deer in it. Use the scroll wheel or the < key on the keyboard to zoom out to the overview. The Data Entry panel currently shows the values of the first image. The checkmark and the blue border around the first images denotes that it is the only one currently selected.



Note. Multiple selection of images in the overview follows the standard Window multiple select mechanisms.

- ***Clicking an image*** selects that image, and unselects all others.
- ***Dragging*** selects the image sequence dragged over.
- ***<Shift> click*** extends the selection to the clicked on image.
- ***<Control> click*** selects/unselects an image without affecting others.

2. The first six images clearly contain one deer. Select those images by dragging the cursor from the first to the sixth image.
   - » The six selected items are now checkmarked and bordered in blue.
   - » If the data field for all selected images contain the same value, that value will be displayed. Otherwise, an ellipsis … is displayed indicating that the values differ across image.



3. Set ***Species*** to deer, and ***Count*** to 1. All selected images will be updated. You can check this (as usual) by switching to the Data Table tab.

Id	File	RelativePath	DateTime	img_species	img_individual_count	img_wildlife	img_sequence	img_temperature	img_f
12	IMG_012.jpg	Station1\Deployment1a	2015-05-30 18:38:18			false	3/3	20	
13	IMG_013.jpg	Station1\Deployment1a	2015-06-01 17:23:46	deer	1	true	1/3	19	
14	IMG_014.jpg	Station1\Deployment1a	2015-06-01 17:23:47	deer	1	true	2/3	19	
15	IMG_015.jpg	Station1\Deployment1a	2015-06-01 17:23:48	deer	1	true	3/3	19	
16	IMG_016.jpg	Station1\Deployment1a	2015-06-01 17:23:51	deer	1	true	1/3	19	
17	IMG_017.jpg	Station1\Deployment1a	2015-06-01 17:23:52	deer	1	true	2/3	19	
18	IMG_018.jpg	Station1\Deployment1a	2015-06-01 17:23:53	deer	1	true	3/3	19	
19	IMG_019.jpg	Station1\Deployment1a	2015-06-02 04:31:09			false	1/3	10	

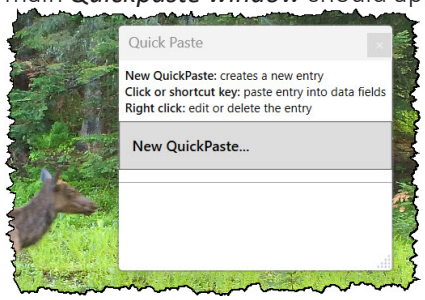
4. Use the controls on the File Player to scroll over those two rows. 
The next three images contain two deer in them, but if you aren't sure, double click the first one to display that image in full size (Each has 2 deer). Tag those three by whatever means you wish.

QuickPaste

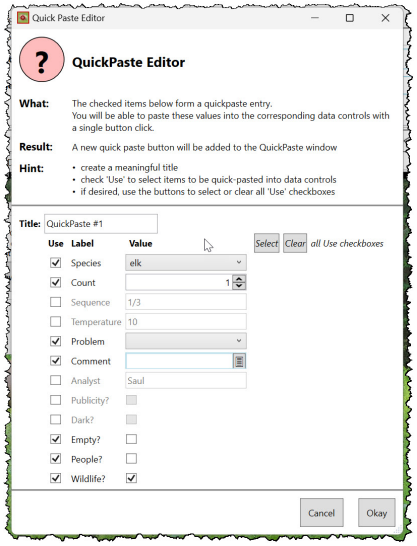
When tagging images, you will often notice that certain patterns may frequently occur, where the same tags are entered over and over again. While the two previous shortcuts help over sequential runs of similar images, you would still have to re-enter tags when that run changes to an image with a different pattern. For example, consider the case where you just tagged 3 images containing 1 deer, then 6 images with two elk. The next image now contains a single deer. Because the tags would differ from the prior elk image (***Species*** = elk, ***Count*** = 2), you would have to manually re-enter the tags ***Species*** = deer, ***Count*** = 1. This introduces inefficiencies when tagging a very large image set.

Timelapse includes a powerful facility called ***Quickpaste*** to help. Quickpaste lets you define a set of ***Quickpaste entries***, where each entry describes what data fields to use and their tagging values (e.g., ***Species*** = deer, ***Count*** = 1). Each entry is then presented as a ***Quickpaste button***. Selecting that button pastes those tag values in the corresponding data field. That is, a single button click replaces you having to manually fill in multiple data fields.

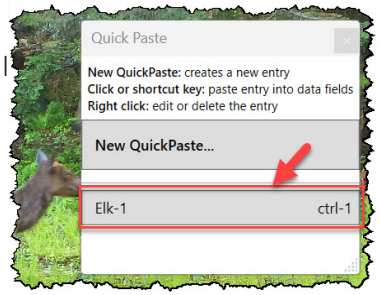
1. Determine tagging patterns. You can do this as you preview your images, or as you are tagging them. Since our practice image set is small, let's assume you noticed the following common tagging patterns.
   - » ***Empty*** = checked, ***Problem*** = wind triggered
   - » ***Species*** = deer, ***Count*** = 1, ***Wildlife?*** = checked
   - » ***Species*** = elk, ***Count*** = 1, ***Wildlife?*** = checked
   - » ***Species*** = bear, ***Count*** = 1, ***Wildlife?*** = checked
2. Go to the next image (IMG_022.jpg), which contains a single elk in it.
3. Tag the image with ***Species*** = elk, ***Count*** = 1, ***Wildlife?*** = checked.
4. Select ***Edit | Show Quickpaste Window*** (or the keyboard shortcut ***Q***). The main ***Quickpaste window*** should appear.



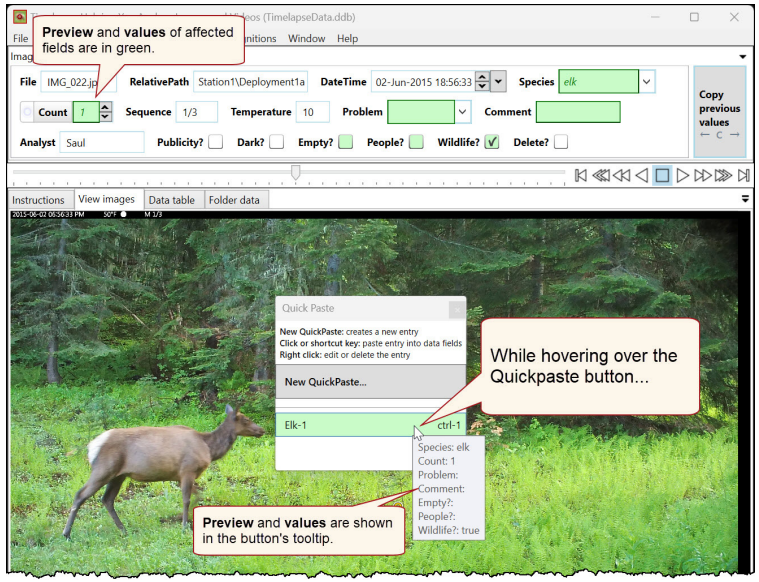
5. Click the ***New QuickPaste...*** button. This raises the ***QuickPaste Editor***, which will allow you to define a ***Quickpaste entry***. You may notice that:
   - » all custom data fields are displayed
   - » ***Value*** fields are populated by the tags set in the current image,
   - » The ***Use*** checked state defaults to each data field's ***Copyable*** status as set in the Timelapse template.



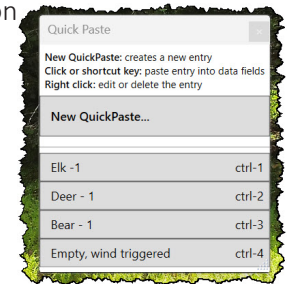
6. Edit the entries as needed.
   a. Edit the ***Title*** to a meaningful label. For example "Elk- 1".
   b. Accept the other settings as is. They are appropriate, as:
   - » ***Species***, ***Count and Wildlife*** values should be 'elk', '1' , 'checked';
   - » ***Problem***, and ***Comment*** values should be cleared;
   - » ***Use*** for all other data fields should be unchecked, as we don't want to over-write their values.



7. Select ***Okay***. The Quickpaste Window will now show the newly created Quickpaste button.
8. Go to the next image, which also contains an elk. When you hover your mouse cursor over the Elk-1 Quickpaste button, you will see a preview of which fields will be affected and their values.
   The Button's tooltip also displays a summary of what will happen.



9. When you click the Elk-1 button, the fields will be updated.
10. Tag the next 10 images using the Elk- 1 Quickpaste button. You can do this in two ways:
    - » by navigate to each elk image and pressing the Elk- 1 button;
    - » by zooming out to the Overview, selecting the elk images, and tagging all of them at once by pressing the Elk- 1 button.
11. Create three other Quickpaste entries for common patterns by selecting and editing the appropriate fields in the Quickpaste Editor.
    - » Deer- 1 and Bear - 1 similar to the above.
    - » Empty, wind-triggered (for Problem).



12. For images IMG_034.jpg to IMG_036.jpg, use the Quickpaste button to fill in the appropriate fields (i.e., include Empty as checked, and Problem as wind-triggered
13. Navigate and tag the remaining Bear images in this image set using the Quickpaste buttons. Feel free to set ***Publicity?*** for great shots, or to add your thoughts to ***Comments*** as desired.
14. When you are done, take a look at the data table, which is now filled in with all desired tags for the Station1\Deployment1a folder.

Exporting your Data

Now that you have finished tagging that folder, you may be wondering how to get that data out of Timelapse for further processing.

There are two ways.

- Export your data to a ***CSV (comma-separated value) file***, a standard data file format that can then be opened by myriads of software. Examples include spreadsheet packages such as ***Excel***, or the ***R*** statistical software package. This is what most Timelapse users do.
- If you are database-savvy, you can just access the database directly. The ***Timelapse Database Guide***, available on the Timelapse web site Guides page, describes the Timelapse database structure.

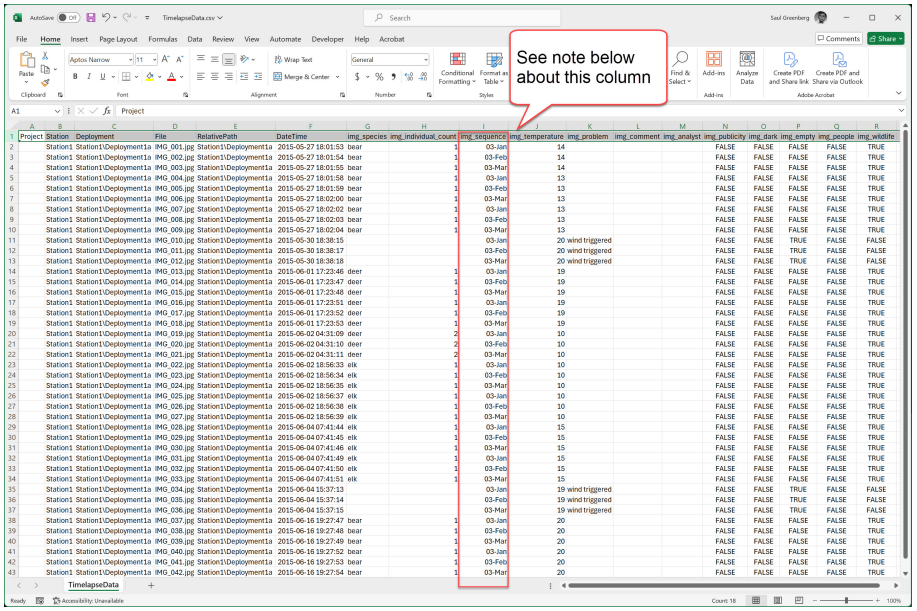
Exporting data to a CSV file is easy. To illustrate, let's export only the data you just tagged for the files in the *Station1\Deployment1* folder.

1. If needed, open the ***Select*** menu, choose ***All files in a folder and its subfolders...*** and select *Station1\Deployment1.*
2. Select ***File | Export the data in the current selection as a CSV file and preview in Excel...***
3. When asked, save the file to a location of your choosing. Excel should then open that file. You can now use any of the standard Excel facilities on that file.

Note. If you don't have Excel, you can choose ***File | Export the data in the current selection as a CSV file...*** and then open the exported file in an editor or package of your choosing.

There are several other important features related to CSV files that are described in the full manual. For example:

- ***Choose which data fields to export.*** The Timelapse Template editor includes an ***Export*** checkbox for each data field. Only those data fields that are checked will be exported as columns in the CSV file.
- ***Export various Date and Time fields in various formats.*** Formats can be specified in the Timelapse Preferences dialog via ***Options | Preferences***.
- ***Import data from a CSV file into Timelapse*** (albeit with some restrictions).



Why is Excel showing *Sequence* data as dates? Excel, when opening a *CSV* file, examines each field to determine its type. This leads to issues when your data resembles Excel's many *Date* formats. For example the ***Sequence*** column data, populated from metadata, has text resembling *1/3.* Excel interprets this as a date, stores this into its own internal date format, and displays it as a date e.g., *03-Mar*.

Yes, totally dumb. This is a known issue with Excel. Fortunately, various Excel web pages detail how to stop the above from occurring (e.g. this link).

The list below summarizes several different approaches.

- Import the file using Excel's ***Data*** | ***From Text/CSV***, which will display options for handling a particular column's data.
- Change the file's *.csv* suffix to *.txt* and open it in Excel as a text file. Again, column data-handling options will be displayed. You will have to select '*Delimited*' with the '*Comma*' as a delimiter, and change the img_sequence Column data format to '*Text*'.
- Insert a leading space in front of each data field, which tells Excel to interpret the data as plain text. Timelapse's ***Options | Preferences | DateTime*** panel gives you that option for automatically doing this for Timelapse's various *Date / Time* fields, but not for *Note* fields such as the one holding your *Sequence* data. As this means you would have to change each sequence field manually, the other options are preferred.

Correcting Date and Time Errors

Date and time errors are fairly common, for example, when camera traps are initially set to the wrong date or time, or don't account for daylight saving time changes. Timelapse includes various facilities to correct common date/time errors, found under the ***Edit | Date correction***... menu:

- Re-read dates and times from file...
- Correct for standard and daylight savings time changes...
- Correct for cameras not set to the right date and time...
- Correct for cameras whose clock runs fasts or slow...
- Check and correct ambiguous dates...
- Populate one or more date/time fields with metadata...

To illustrate one of these, let's pretend that, due to a camera flaw, the video files (but not the jpg files) in the *Station4\Deployment4a* folder incorrectly recorded the camera's date: all dates off by one day. This means that the date/time imprinted on the image and the image Date/Time metadata (which Timelapse uses to fill in its ***DateTime*** field) are also off by a day.

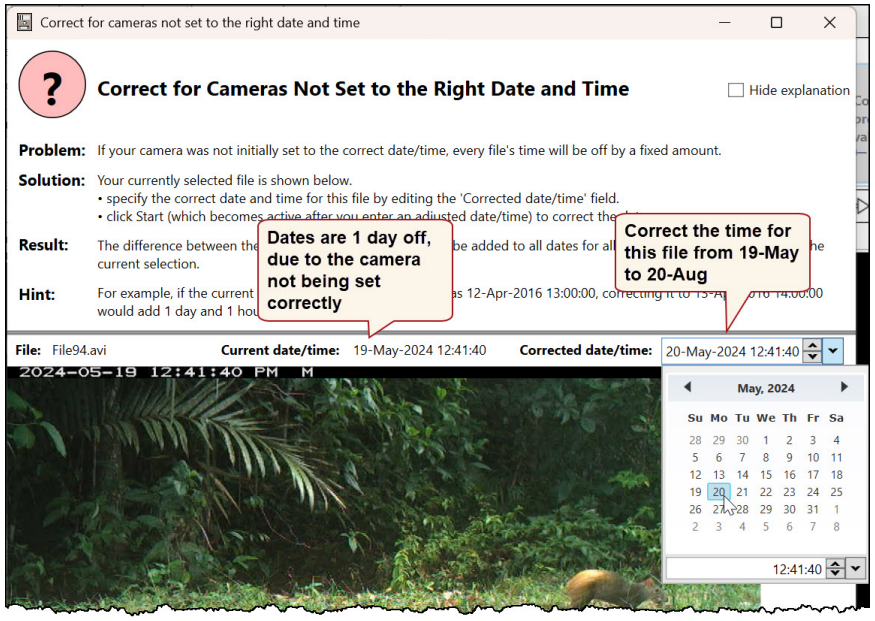
As there are only 8 video files (those with an *.avi* suffix), these could be correct by editing each file's DateTime field. However, if there were many affected files, a better option would be to use the a date correction facility.

1. Narrow the current file selection to display only the affected images. This is easily done by going to ***Select | Custom Selection***. Select and set:.
   - » ***RelativePath*** = *Station4\Deployment4a*,
   - » ***File GLOB*** **.avi.*

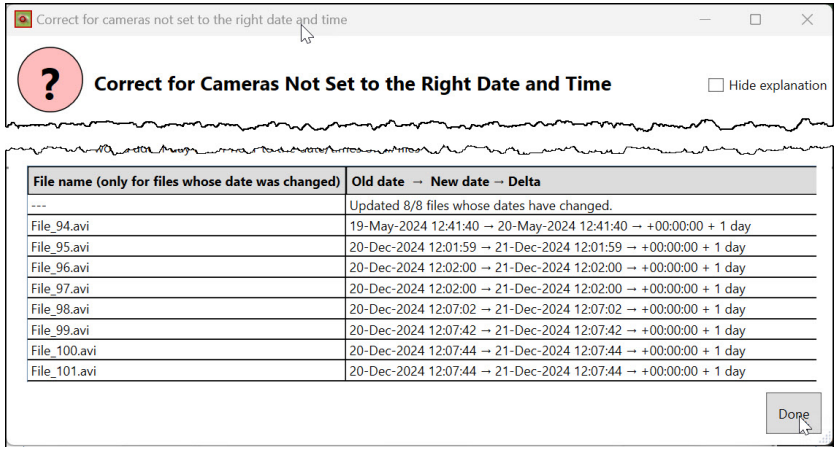
   Note: GLOB is a pattern matching operation, where * matches any combination of characters.

   Timelapse should now be displaying only those files within the *Station4\Deployment4a* whose name match an *.avi* suffix (i.e., the video files).

2. Select ***Edit | Date correction |Correct for cameras not set to the right date and time***... which raises the following dialog. The dialog displays the current file and its currently-set date time.



3. Enter the correct the date/time for that file in the ***Corrected date/time*** field. Then hit ***Start***. Timelapse calculates the difference between the old and new time (in this case one day) from your example, and applies that difference to correct all currently selected files. The dialog provides feedback on what was done to each file.



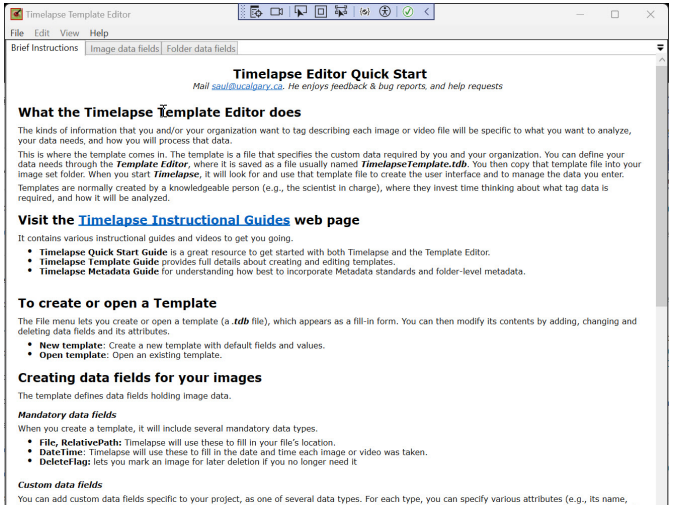
Creating your own Custom Template

In the previous exercise, you used the pre-defined template located in the *PracticeImageSet* folder: a file named *TimelapseTemplate.tdb*. That template defined the data fields of interest for tagging, and how those fields should appeared in the Timelapse interface.

As your own project may have quite different data needs, you can easily create your own template with the ***Timelapse Template Editor***. For example, your project may be concerned with counts of only certain predacious species: bears, bobcats, coyotes, and wolves. Other species, such as herbivores, are ignored. Your interests also includes ground cover, especially if there is snow on it. Your desired tag fields could be summarized as follows.

Data label	Data type	Default value	Choice items
File	File	system-supplied	
RelativePath	RelativePath	system-supplied	
DateTime	DateTime	system-supplied	
Bear	Count	0	
Bobcat	Count	0	
Coyote	Count	0	
Wolf	Count	0	
Ground cover	Choice	unknown	unknown, bare, partial snow, snow covered

4. To follow along, create a folder in a convenient location, and copy the *Deployment1a* folder, currently located under the *Station1* folder into it.
5. Start the ***TimelapseTemplateEditor***, which will display a window with some brief instructions.



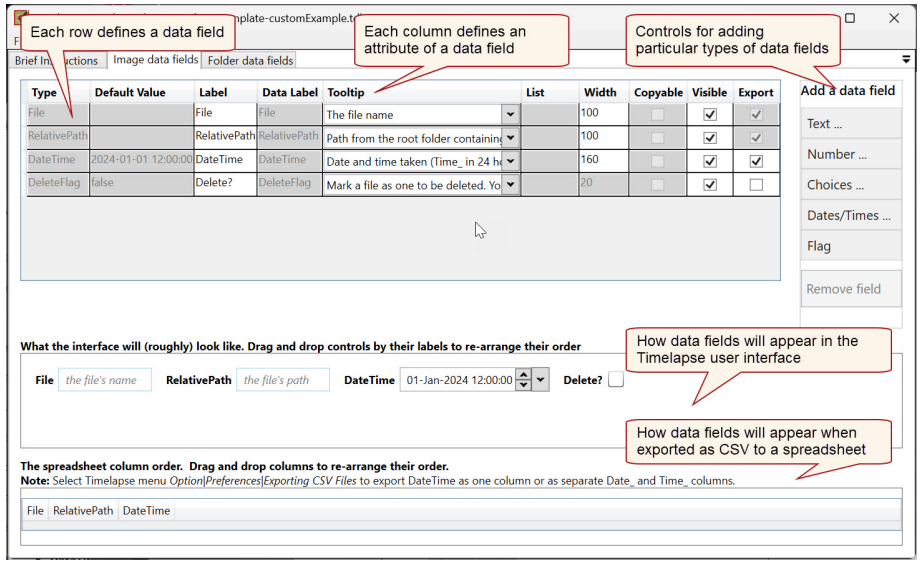
6. Create a new template. Select ***File | New template...,*** navigate to the folder you created, and click ***Save***. A new template will be created in that folder titled *TimelapseTemplate.tdb.*
7. The Template Editor window will appear as illustrated below. It contains four main areas.

   » ***Data field specification area*** (top). Each row in this area specifies a single data field item and its attributes. This area also displays several fields required by Timelapse. The white areas are editable, while the grayed out areas are not.

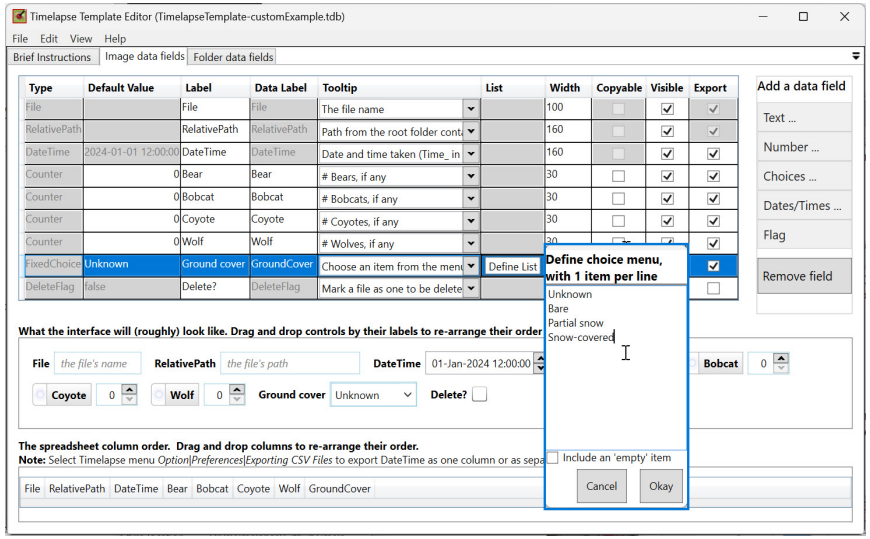
   » ***Data field appearance within Timelapse*** (lower middle) shows how the data will be displayed as fields in the Timelapse user interface. You can drag those fields around to re-arrange their order

   » ***Data columns in spreadsheet*** (bottom) roughly shows how the data will be displayed as columns in the exported CSV file/spreadsheet. You can also drag those columns around to re-arrange their order.

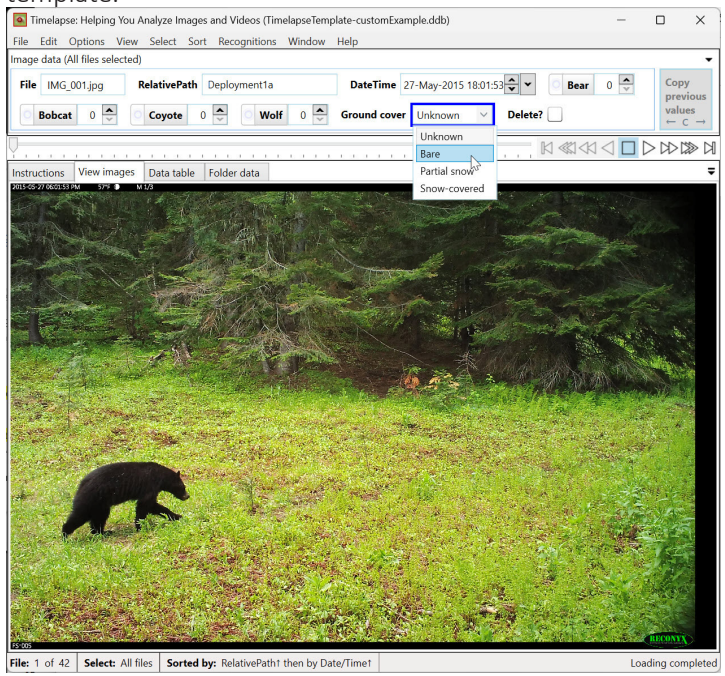
   » ***Data field row controls*** (right) are buttons that let you add particular types of rows into the table, or remove an existing row.



8. Two of the data tags you want, *File* and *DateTime*, are already provided as part of Timelapse's required fields, so you can just leave them as is.
9. Create 5 data rows for the other controls.
   a. Add 4 ***Count*** rows to define the *Bear*, *Bobcat*, *Coyote*, and *Wolf* fields.
   b. Add 1 ***Choice*** row to define the *Ground cover* field.
   c. Fill them in as shown below (don't forget the checkmarks!).
   d. For *Ground cover*, select the ***Define List*** button, and fill in the list items in the popup window that appears. These will appear when using Timelapse within that field's drop-down menu. Uncheck 'Include an empty item'. Then set that field's default value to unknown (default values for choices must match a list item).
10. Feel free to adjust the various other control attributes, and /or to change the control's order by dragging and dropping them around the two preview areas.



11. While the meaning of most things should be apparent, a few columns may need explaining.
   - ***Data label*** is the name of the database column that will hold the data. It is also used as the column name when data is exported to a CSV file.
   - ***Label*** is how that field will be labeled in the user interface.
   - ***Width*** is the width of the field.
   - ***Copyable*** defines whether that field is affected by the ***Copy previous values*** button.
   - ***Visible*** determines whether the control should be visible in the Timelapse interface.
   - ***Export*** determines whether the data field and its values should be included in exported CSV files. For example, because ***Delete flag*** 's Export is unchecked, it is excluded in the spreadsheet preview.
12. Quit the editor and start Timelapse. Using ***File | Load template, images and video files...***, load the template and images from your folder. The fields in the ***Data Entry*** panel, the columns in the ***Data Table*** tab, and the columns in the exported CSV file will now match the rows defined in the template.



That's it! You can now try creating your own template for processing and tagging your own images.

Note. The Timelapse Template Guide provides further details on creating templates.

An Image Recognition Teaser

Image recognizers for wildlife camera traps are becoming available. They work in two different but complimentary ways.

Detectors determine if an entity of interest is in the image, and locate that entity with a surrounding bounding box. Detectors can broadly classify what it detects (e.g., animal, person, vehicle) and provide a rough *confidence value* indicating its certainty. They perform well, albeit with occassional errors.

Classifiers further classify the detected entity into finer categories, e.g., deer, wolf, etc., where it also provides its own confidence value. Their performance can vary greatly as it depends, in part, on how their models are trained and how well that model matches what is in your images. Many classifiers are domain-specific, e.g., a classifier trained on African wildlife would not be appropriate to use on North American wildlife.

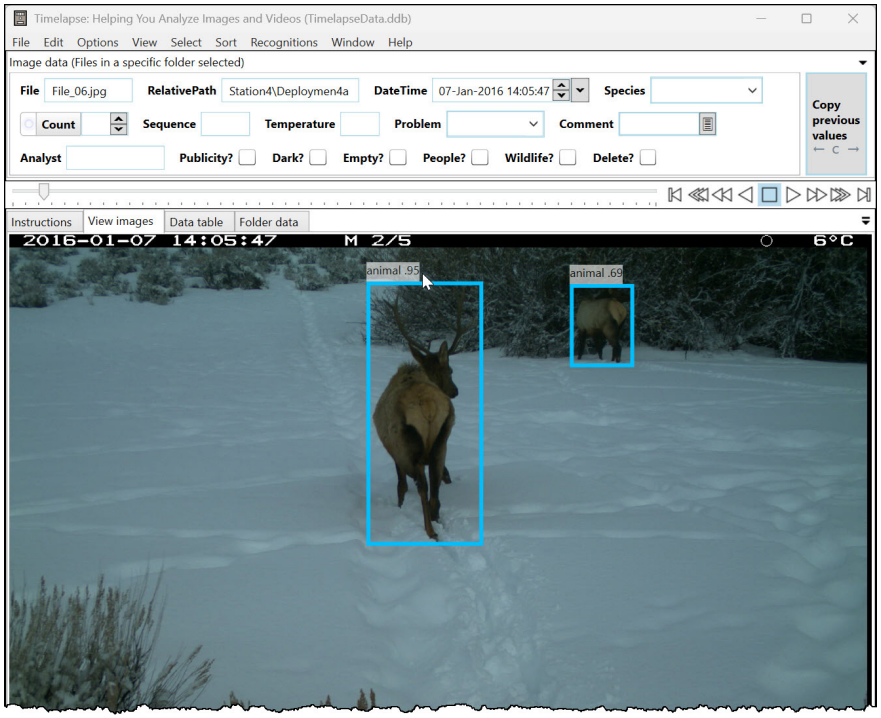
Timelapse primarily works with the 3rd party ***AddaxAI image recognizer***, which you can download and run via the Timelapse *recognition* menu. Using ***AddaxAI***, you can select your desired classifier (if any), and run it on a folder containing your images. This generates a recognition file in that folder. Using the same menu, you would then import that file into Timelapse. Timelapse uses information in that file to draw labelled bounding boxes atop the recognized entities, making them easier for you to spot and verify. You can then query for images matching particular detection and classification categories.

Note. Using image recognition is optional.

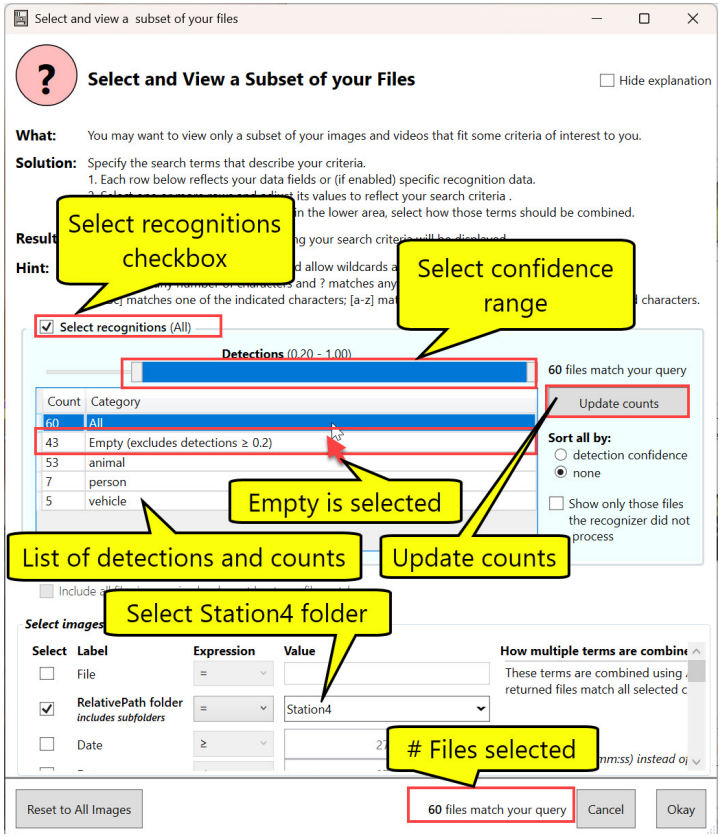
The Timelapse Image Recognition Guide offers a full description of image recognition, including how to download / run ***AddaxAI*** on your images and videos, and how to use image recognition in your workflow. Feel free to extend this exercise by downloading and running ***AddaxAI*** on other folders.

This section is a teaser revealing some of the powers and limitations of image recognition. For simplicity, your practice image set already includes recognition files (previously generated by ***AddaxAI***) in the *Station4* folder. For this example, consider image sets where many of the collected images do not capture wildlife. This often happens due to false triggers from wind effects, or cameras set in *timelapse* mode where images are taken every time interval. The following workflow uses detector results to find and quickly eliminate most of those empty images, including how to correct for recognition errors. Further details and more powerful workflows are found in the Timelapse Image Recognition Guide.

1. ***Load the recognition file.*** The *Station5* folder contains a recognition file previously generated by ***AddaxAI***. To import this file:
   - » Select ***Recognitions | Import image recognition data for this image set...***
   - » Navigate to *Station5*. Select *timelapse_recognition_detection_file.json*.
2. ***Display only the Station4 images***. From the Timelapse menu, choose ***Select | All files in a folder and its subfolders | Station4***.
3. ***Inspect images, focusing on bounding boxes.***
   - » Rapidly scan your images by using the slider. You should get a sense of how many are empty *vs.* those with bounding boxes drawn atop of what the detector thinks is wildlife.
   - » Scrutinize images. For example, *File_06.jpg* contains two bounding boxes. The left box is a high confidence detection (.95) and is clearly wildlife. The right one is a lower confidence detection (.69), likely becaise it is somewhat camoflaged by the background. You can inspect recognitions by zooming in or using the magnifying glass, and can temporarily hide the bounding box by pressing the **H** key.



4. ***Select high confidence Empty images.*** Use *Select | Custom Selections...* to open the custom selection dialog. Because recognition data is available, a *Select recognitions* checkbox is active and selectable.
   - » make sure that the *RelativePath folder* option is set to Station 4;
   - » click *Select recognitions* - the recognitions panel will appear;
   - » adjust the slider to a confidence range of 0.2- 1.0;
   - » click *Update counts* to generate counts of matching files;
   - » select *Empty* from the *Detections* menu, then Okay.



5. ***Assume that all returned images are Empty, and tag them as such***.
   - » Checkmark the *Empty?* field in the Data Entry Panel. Then right-click that field to raise its context menu. Select *Copy to all*. All 43 images will now be tagged as empty.
6. ***Check and correct recognition errors***.
   - » Visually- and quickly- scan these 43 images for detection errors i.e., to ensure that no wildlife is actually present. While bounding boxes will appear on some of the images, most are very low probability detections and are almost always false positives. Still, they are useful to consider, for its possible (although unlikely)that they did detect wildlife.
   - » Try hiding the bounding boxes by holding down the ***H*** key. Scan your images this way by simultaneously holding down the ***right-Arrow*** key.
   - » Regardless of the scanning method used, if you do spot any images that have wildlife in them (a small rodent is in File_72.jpg, File_73.jpg), just uncheck *Empty?* on that image, and check *Wildlife?*.
7. ***Review the remaining images for wildlif***e, as well as empty images that were missed.
   - » Raise the ***Select | Custom Selections...*** dialog again.
   - » Uncheck *Select recognition* box,
   - » Ensure that the *RelativePath folder* option is still set to Station4.
   - » Select the *Empty?* and *Wildlife?* term, set their operator to = and their values unchecked. This will return the all 60 images in the Station4 folder not currently tagged as Empty or Wildlife.

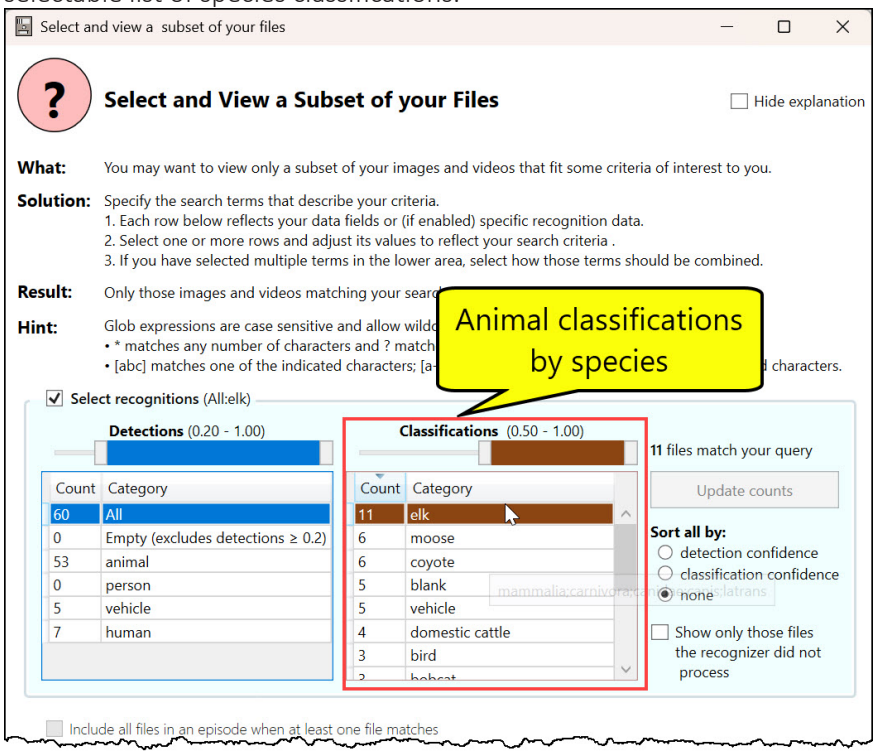
   - » Similar to what you did before, checkmark the *Wildlife?* field in the Data Entry Panel. Then right-click that field to raise its context menu and select *Copy to all* to tag those images as *Wildlife?*.
   - » Visually- and quickly- scan the 60 images for detection errors (e.g., Files 5, 7, 9,11,15,17,22). Correct the *Wildlife? / Empty?* checkboxes as needed. (False postives were intentionally included in this image set).

8. ***Delete empties.*** If you wanted to, you could delete all empty files. In the Custom Select dialog, select the Empty? field with a √ value and the RelativePath of Station4 to reveal all the images tagged as Empty. Then check the Delete? field and Copy to all to mark all images for deletion, and actually delete them via the functions available on the ***Edit | Delete...*** menu.

Congratulations! you have eliminated about 1//2 of the images in this folder from further consideration.

Image recognition has many more capabilities. For example:

- ***Try recogitions on videos.*** Load the recognition file in the *Station4* folder, then use *Select* to show images and videos in that folder. Navigate to a video and play it to see how bounding boxes are animated atop of it. Try the ***Best*** button (if present), to jump to the highest confidence frame in the video.
- Image recogniton can also include classifications, where it identifies particular species. For example, if we had asked the image recognizer image recognizer ***AddaxAI*** to generate classifications using the ***Google's SpeciesNet*** model, the custom selection dialog would then include a selectable list of species classifications.



Read the Timelapse Image Recognition Guide to see what image recognition can do for you, and how you can use image recognition effectively as part of your work flow.

A Folder Data Teaser *aka* Metadata

All the data you have been working with so far is at the 'image' level, where it mostly describes (or is related to) image features. But consider other information that are common to all images in a particular subset. This is called metadata, which is often structured as an ***information hierarchy.*** For example (and this is just an example) consider this hierarchy.

- ***Level 0: Project metadata*** describes details about the project, e.g., who is in charge, the project's purpose, and contact information. It applies to all images in the project.
- ***Level 1: Station metadata*** about each camera station placement, such as the latitude/longtitude coordinates specifying the exact camera location, why that location was chosen, and information about the camera used. It applies only to images at that station.
- ***Level 2: deployment metadata*** such as the start and end date of the deployment period, the ID of the camera used and how it was configured, and issues that may have occured. It applies only to images retrieved from that station's camera during a particular deployment period.

Note. Other information hierarchies may be simpler (fewer levels) or more complex (more levels) than this example, where they have their own particular data needs.

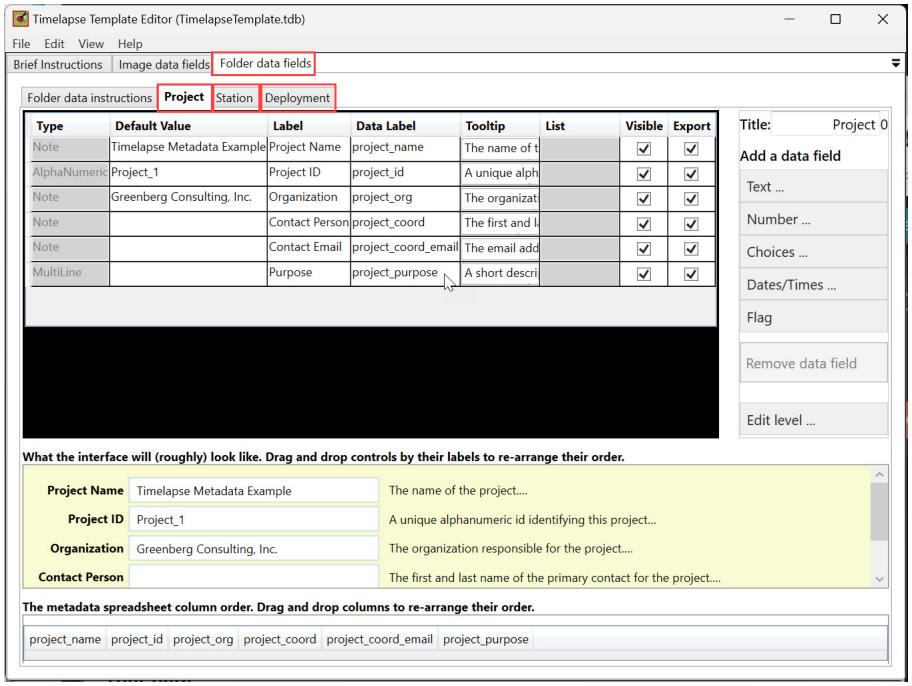
Timelapse can structure and store hierarchical metadata, where that hierarchy and its data fields are defined in the template. Importantly, Timelapse expects your image set's sub-folders to mirror that hierarchy. It then associates each hierarchical level with a given sub-folder and the images that are ultimately contained within that sub-folder or its children. This is better explained by example.

The Template can define folder-level data

1. Using the TemplateEditor, navigate to the *PracticeImageSet* folder and open the *TimelapseTemplate.tdb* file.
2. Click the Folder data fields tab at the top. You should see something like the following.
3. You will see several tabs: *Project*, *Station* and *Deployment*. Each tab represents a different hierarchical level, with *Project* at the top level.
4. Select the *Project* tab to see the data fields, defined by the project manager, that will eventually be filled in with project metadata of interest

(e.g., project name, an ID, the organization, etc).

5. Click on the Station and Deployment tab to see their data fields.
6. Close the template editor.



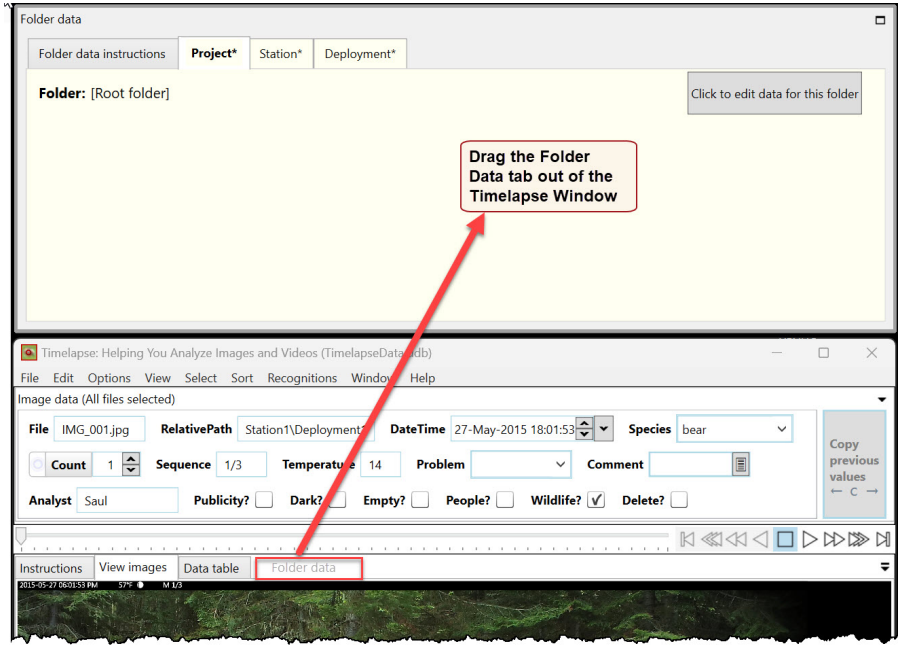
Note. The definition and inclusion of metadata is completly optional. While using metadata can add considerable richness to the amount of data captured within your project, it also places certain constraints on the project. For example, your image set must conform to a folder structure that mirrors the information hierarchy. This is explained in greater detail in the Timelapse Metadata Guide, which should be considered essential reading before using metada.

Filling in folder-level data in Timelapse

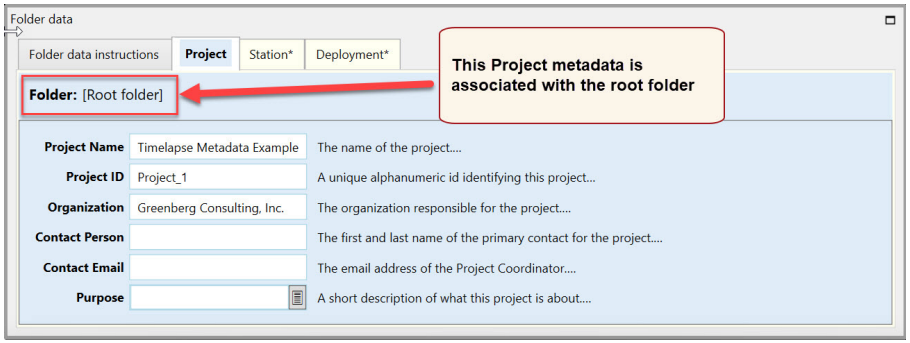
Open Timelapse. You will see that it also includes a Folder data tab. When you select that tab, the three tabs representing the Project, Station, and Deployment metadata will appear. Each tab knows what sub-folders your current image is in, and shows what data (if any has yet been entered) has been entered and linked to each sub-folder.

Lets enter some metadata.

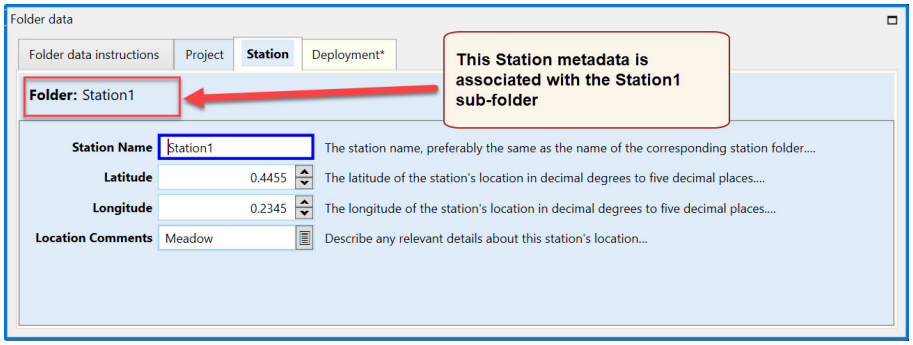
1. Choose *Select | All files*. Go to the first image. This should be *IMG_001* located in *Station1\Deployment1a* folder.
2. Pull the *Folder data* tab out of the Timelapse window and place it alongside it to make its contents easier to see. Do this by drag and drop: click and hold on the *Folder data* tab's title to begin dragging it out. You can reverse this by dragging it (by its title bar) back into the main window, or by right-clicking the title bar and selecting *Dock as tabbed Document*.



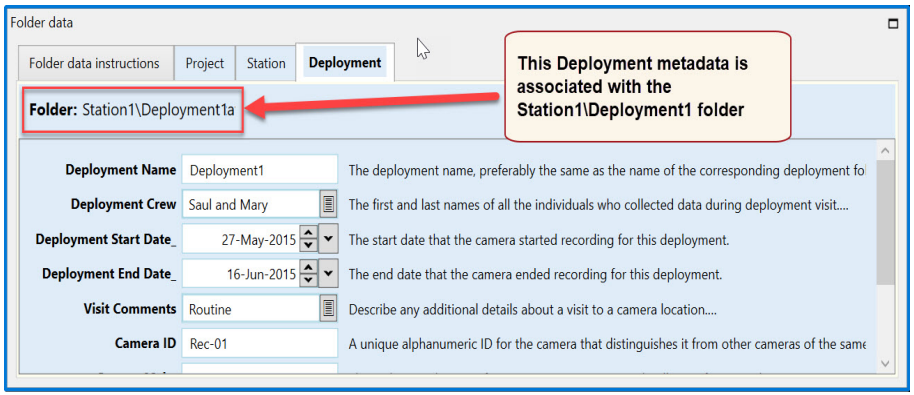
3. Timelapse signals that no metadata has yet been entered for the project by its yellow color, the * after the *Project* name, and by the *Click to edit data for this folder* button.
4. Click that button. The *Project* metadata fields will appear, filled in with default values as defined in the template. Its color also changes to signal that the metadata for has been initialize. Fill it in with pretend data.
   - » The *Project* metadata is associated with the root folder, of which there is only one. Because all subfolders and their images are within the root folder, they all share the same *Project* metadata. This also means you only have to fill in the *Project* data once.
   - » For example, if you scroll through your images, the *Project* data will remain the same.



5. Do the same with the Station tab, again on the first image.
   - » Because you are viewing an image in the *Station1* folder, this metadata is only associated with the *Station1* folder and its contents i.e., its *Deployment1a* and *Deployment1b* sub-folders and their images. Only those subfolders and images will share the *Station1* metadata. This also means you will have to fill in *Station* data for *Station2*, *Station3*, etc .
   - » For example, if you scroll through your images, the *Station* tab will turn yellow as soon as you move to an image in the Station2 folder (signalling that you have not yet filled in its metadata).



6. Do the same with the Deployment tab, again on the first image.
   - » Because you are viewing an image in the *Station1/Deployment1a* folder, this metadata is only associated with the *Station1/ Deployment1a* folder and its contents i.e., the images in that folder. Only those images will share the *Deployment1a* metadata. This also means you will have to fill in *Deployment* data for the *Deployment1b* folder found under *Station1,* and for the other Deployment folders in *Station2*, etc.



7. Try navigating to images in other folders. What how the color of the tab changes (signalling that no data has yet been entered).Add data to those folders. Alternately, you can ***Select | All files in a folder and its subfolders*** to narrow your view to a particular subfolder and then examine and/or fill in its metadata.
8. When you are done, you can export the metadata to a *CSV* (Excel) file by ***File | Export or import data to/from a csv file | Export all folder data to .csv files...***
   - » Three files will be generated: *Project.csv*, *Station.csv*, and *Deployment. csv.* Each collects the just-entered data. Image data is exported as a separate operation as previously detailed. Each file (including the image csv file) also contains links to their parent metadata (by way of columns containing the parent folder names). This allows you to cross-reference all the collected data to one another.

As Folder metadata is more involved than what is explained here, you should read the Timelapse Metadata Guide. While you don't need to know that much if you are just entering data, there are critical nuances involved if you are the one defining metadata in the template, or use Timelapse's merge facilities, or if you think you may have to modfiy the template (or your folder structure) in the future.

Note. *Metadata standards* are now being developed by various agencies. Each standard defines an information hierarchy, its required and optional data fields, and their attributes. Their purpose is to promote data sharing between projects and organizations. The Timelapse Template Editor includes a few of these standards. You can view existing standards (more will be added as they arise) or create a template based on that standard by selecting *File | New template based on a standard...*

Beyond the Basics

This QuickStart guide illustrated only a few of the basic features of Timelapse, along with a cursory explanation. While it is enough to give you a sense of how the software works, Timelapse has many other important features that can help you create an effective and efficient tagging workflow. These are described in subsequent manuals and various video tutorials available on the Timelapse website, which can also be accessed through the Timelapse ***Help*** menu. The partial list below hints at what else is available.

- ***File management*** tools for adding, deleting and copying files to or from your image set on the fly.
- ***Folder Editor*** to let you rename and move your folders around.
- ***Data manipulation*** such as deleting or duplicating records.
- ***Metadata standards and folder-level data*** as fully described in the Timelapse Metadata Guide.
- ***Automatic image recognition and classification*** for both images and videos, as fully described in the Timelapse Image Recognition Guide.
- ***Template creation*** as fully described in the Timelapse Template Guide.
- ***Database management*** including how to create a master database for large projects via *merging* by *checking out / checking in* database subsets.
- ***Navigation tools*** to cruise through your files by various means.
- ***Examining image details*** through zoom and magnification tools, image adjustment tools (e.g., brightness, contrast), and image differencing to make changes between image sequences pop out.
- ***Rapid data entry*** through various shortcuts and tools.
- ***Automatically populating fields*** for populating fields with file metadata (including date/time), recognition data, globally unique ids, and others.
- ***Video player*** with various controls to let you view videos efficiently.
- ***Query facilities*** where you can select a subset of files based on the values in your data fields.
- ***Sorting*** where you can sort your files by various criteria.
- ***Date correction tools*** for repairing various common date and time errors.
- ***Automatic episode detection*** where images are grouped together in ***episodes***, i.e., images separated by a short time duration defined by you.
- ***Automatic dark image detection*** for identifying night-time images.
- ***Window management***, where you can arrange Timelapse windows and panels in different layouts to best fit your workflow and screen size.
- ***Feature details and example workflows*** where videos and manuals illustrate different ways of using Timelapse effectively.