

Time-Lapse Photography Data Protocols

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Project Overview

Katmai National Park has been using time-lapse photography to document temporal and spatial patterns of bear use at selected brown bear foraging areas since 2004. In general, cameras are installed overlooking areas with concentrated bear use and take photos at regular intervals over the course of the season (generally May through September). The photos are later processed to identify objects of interest (primarily bears, but also people, boats and planes) and gather XY location information for each object within the photo frame. This information, combined with date, time and tide information, is used to

describe bear use (and visitor use where applicable) in relation to day-of-year, time-of-day and tide stage. Comparisons between years can also be made. At sites with human visitation, bear use can be further investigated in relation to human presence.

Initially, time-lapse photos were collected and analyzed to evaluate bear use in the lower Brooks River. The primary goal of this project was to determine whether or not re-aligning the Brooks River Bridge would improve visitor movement across the river. Photos documented higher bear use on the upstream side of the bridge, resulting in bridge realignment downstream.

In 2007, this project was expanded to the backcountry, and cameras were installed at Geographic Harbor in Amalik Bay on the Katmai Coast. Cameras were set up each summer from 2007-2009 and documented bear and visitor use at the Geographic Creek outlet. Bear viewing and photography are the primary visitor activities reported by commercial operators for Geographic Harbor. Photo data found that bear use coincided with the late summer salmon run and visitation was highest during the peak bear season.

Differences in daily use patterns between bears and people were observed. Bears had two peaks in daily visitation, one early in the day and one late in the day, while visitor use was highest at mid-day. Average bear numbers decreased at increasing visitor levels, and spatial changes in bear use were also observed as visitor levels increased, indicating that visitation affects bear use. The data was further analyzed to compare bear and visitor use in relation to ranger presence at this minimally patrolled area. Findings suggested that rangers mitigate the impacts of visitation to bear use, resulting in a recent effort by the park to station park staff at this and other high use backcountry sites.

Since 2010, cameras have been set up at two other coastal locations: Katmai Bay and Swikshak Lagoon. These sites were chosen based on their levels of human visitation; Swikshak Lagoon attracts a small to moderate number of visitors for bear viewing in June, and Katmai Bay has little to no visitation and is not targeted by bear viewing groups. These sites contrast with Geographic Harbor's high visitation from mid-July through early September. Bear use within the photo frame at both sites is primarily within sedge meadows. When analyzed, Katmai Bay and Swikshak Lagoon photo data will be combined with Geographic Harbor data to compare bear use between sites with different levels of visitation. Time-lapse photography has proven to be a cost-effective way to document bear and visitor use at remote sites. Furthermore, data is collected throughout the season, during all daylight hours and without the potential influence that an on-site observer may have on bear use. Katmai has recently expanded this project to high use areas in the Preserve. It is expected that this project will continue to move to other backcountry bear foraging areas throughout the park and preserve.

Protocol Objectives

Time-lapse cameras at each study site take pictures every 30 minutes. A subset of photos (either all photos from one of two cameras, or a mix of photos to fill in gaps in data due to camera failures) will be selected for analysis. Each photo must be scored according to the number and location of bears and people present at the time of capture.

For each photo, digitize the locations of bears, humans, and human-related objects such as planes or boats. Import site photos into ArcMap and use a point feature class to identify the locations of these photo

subjects. Once digitized, the point features are saved to a database table. Data associated with each photo, such as date and time, are saved in another table and will be linked to the point features later.

Add XY coordinates to each digitized point feature using the AlaskaPak toolbar.

Categorize tide stage for each photo.

Record whether each photo was able to be scored, or unable to be scored due to weather, darkness, blurriness, or other factors.

Camera shifting occurs over the course of the season due to weather factors; however, photos must align to establish correct spatial data. Georeference misaligned photos to a base photo of the study site to ensure locational accuracy of photo objects.

Conduct QA/QC checks on digitized data.

Software

ArcGIS 10.1 - 10.2.x: ArcMap and ArcCatalog

Microsoft Access

Microsoft Excel

Microsoft Office Picture Manager

Adobe Bridge

Thumbs Plus

Project Notes

At the Swikshak site in 2012 and early 2013, tide stage was originally documented in each photo through digitizing the tide level by creating a point feature on a vertical line at the right of the camera view. XY coordinates were assigned to each tide point; this information was then analyzed spatially to determine tide stage based on the Y coordinate.

At the Katmai Bay site, documenting tide stage through digitization was deemed impossible based on the camera placement. Therefore, tide stage documentation at Katmai Bay occurs by assigning a categorical variable – low, medium, high, or very high – to each photo in a Tide column of the Photo Information tables for each year of the study.

At Swikshak, a significant camera shift occurred in photo 2013Swikshak_0704.JPG on 6/21/13 at 17:39:12. After georeferencing, the tide line was no longer contained within the extent of the camera view because of this shift. As a result, the tide line had to be moved to the left for all images following this one.

By photo 2013Swikshak_1596, it was again impossible to keep the relocated tide line within the extent of the camera view after georeferencing. After evaluating possible options, it was decided that tide line digitization should be eliminated at Swikshak, and that the Katmai Bay tide stage categorization method should be employed instead for consistency across study years and sites. This method was then applied from photo 2013Swikshak_1596 forward, and the 2012 and early 2013 Swikshak photos were revisited and given categorical tide variables as well.

Field Data Upload and Renaming Photos

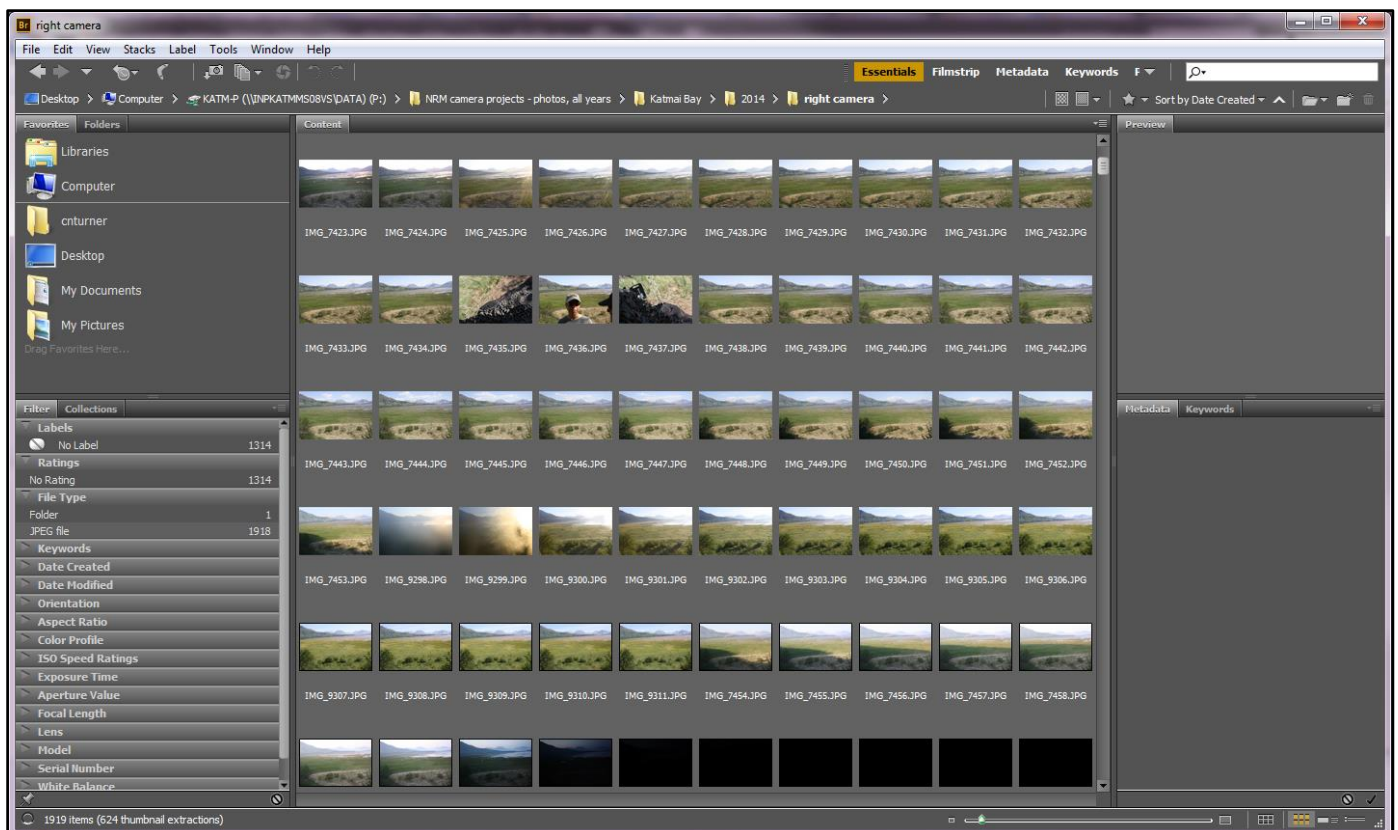
Field Data Upload

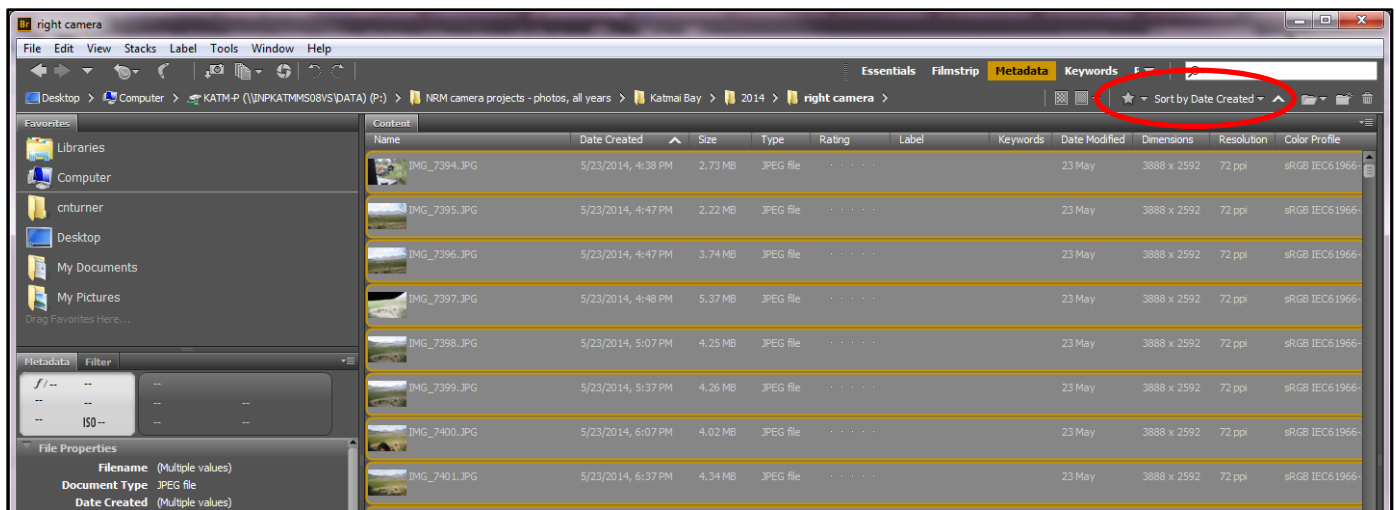
Cameras are visited multiple times throughout the season for maintenance and memory card change-outs. Each time memory cards are retrieved from the field, they must be uploaded to

At the end of the season, photos from each of the cameras are reviewed. One set of photos per site (either the photos from the left camera or the photos from the right camera) are selected for analysis based on the number and quality of photos collected. The chosen set of photos is copied into a new folder. The photos are renamed so that the year, site, and photo number are included in the file name.

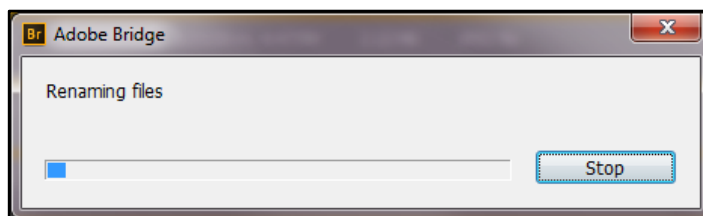
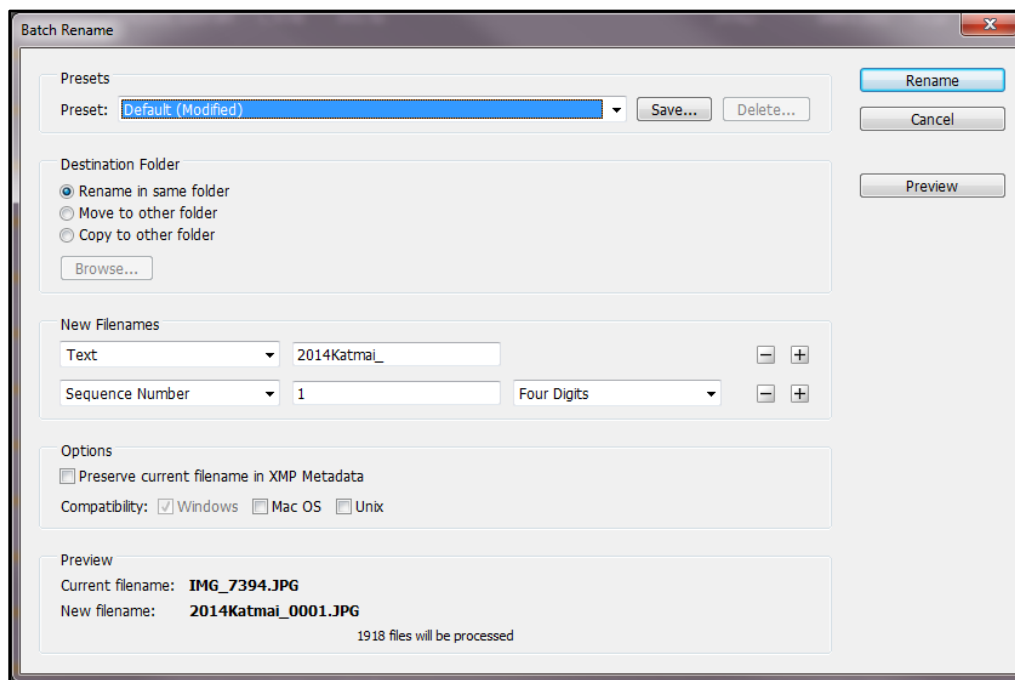
Renaming Photos

1. Open Adobe Bridge and navigate to the folder of photos to be renamed. Wait until all the photos are loaded to ensure that they all get renamed. Note: this can take a while. Sort the photos by date.





- Under **Tools**, select **Batch Rename** (or Ctrl+Shift+R). Under **New Filenames** in the Batch Rename input box, create the naming and numbering sequence in accordance with year and location. File numbers should start at 1 and have a 4 digit sequence. Confirm the renaming sequence by looking at the Preview section. Click **Rename**. It will take several minutes for the files to be renamed.

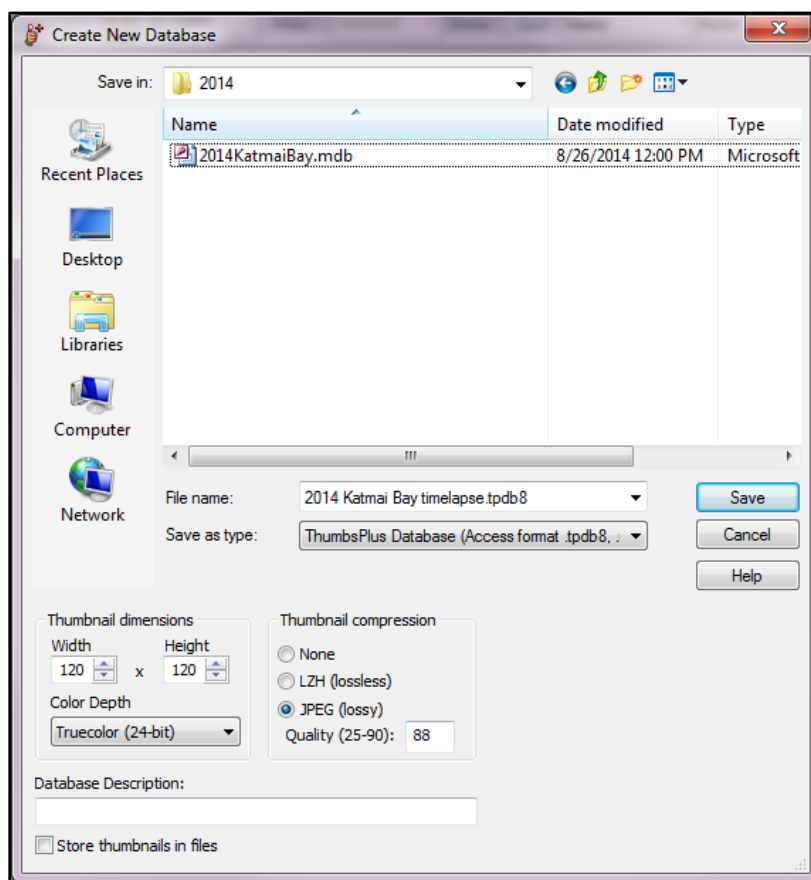


4. When Adobe Bridge has finished renaming the files, check to see that all files have been renamed by scrolling down the list of photos.

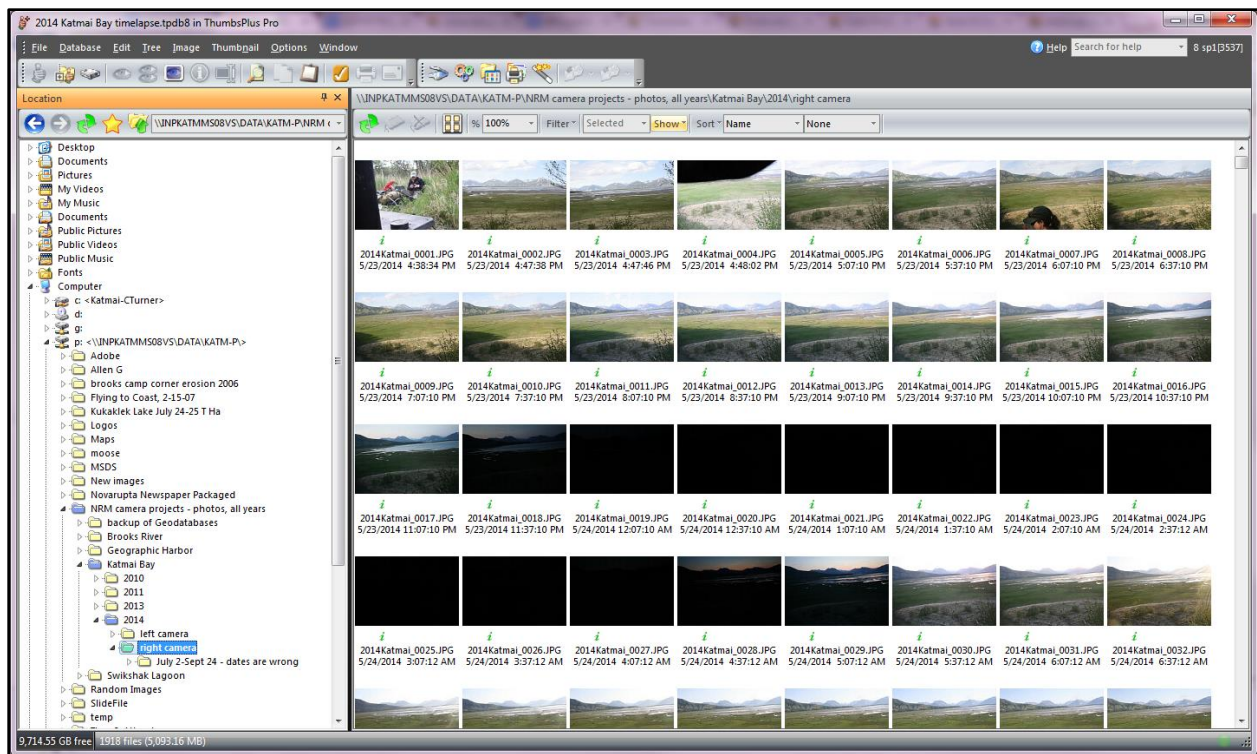
Creating a Photo Information Table

An excel table with photo name, date, time, categorical tide stage and scoring notes is created for each set of photos to supplement the object and spatial data collected through ArcGIS. The first step in this process is to separate the date and time information from the photos which is combined in the photo metadata.

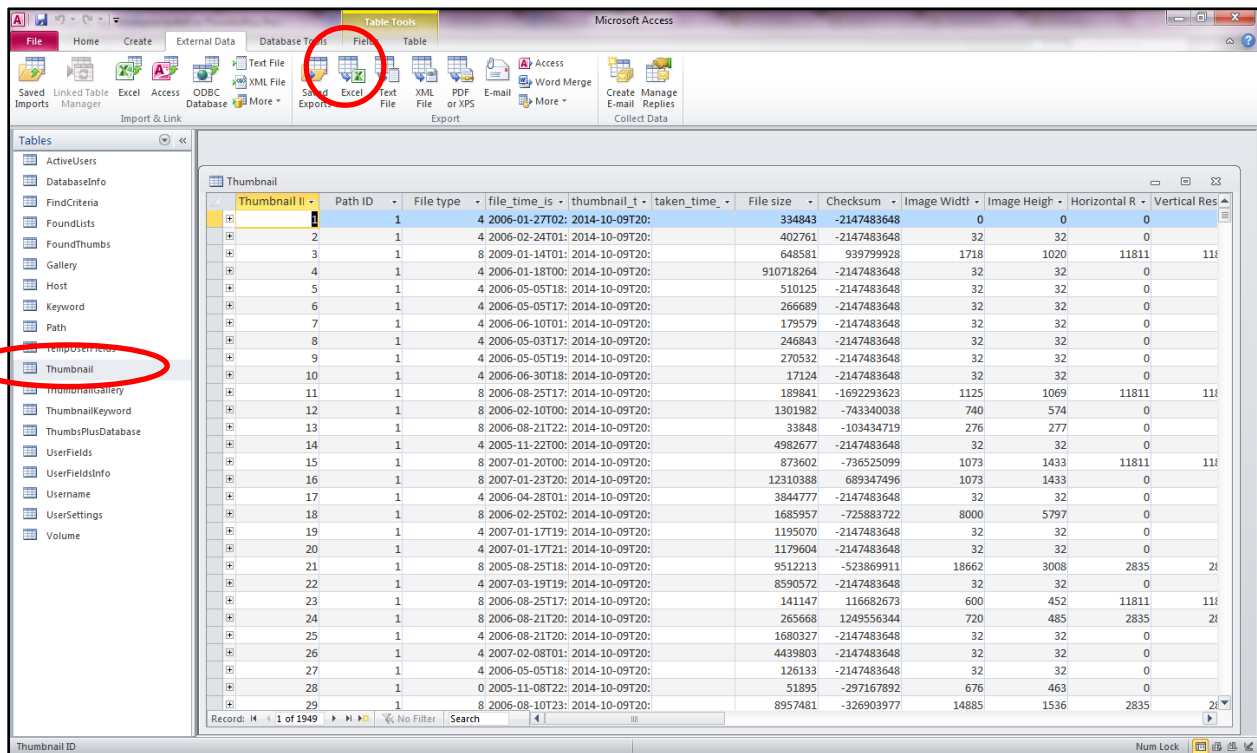
1. Open Thumbs Plus. Under the **Database** heading select **Create New**. Rename the database and save it in the appropriate location/year folder. Click **Save**.



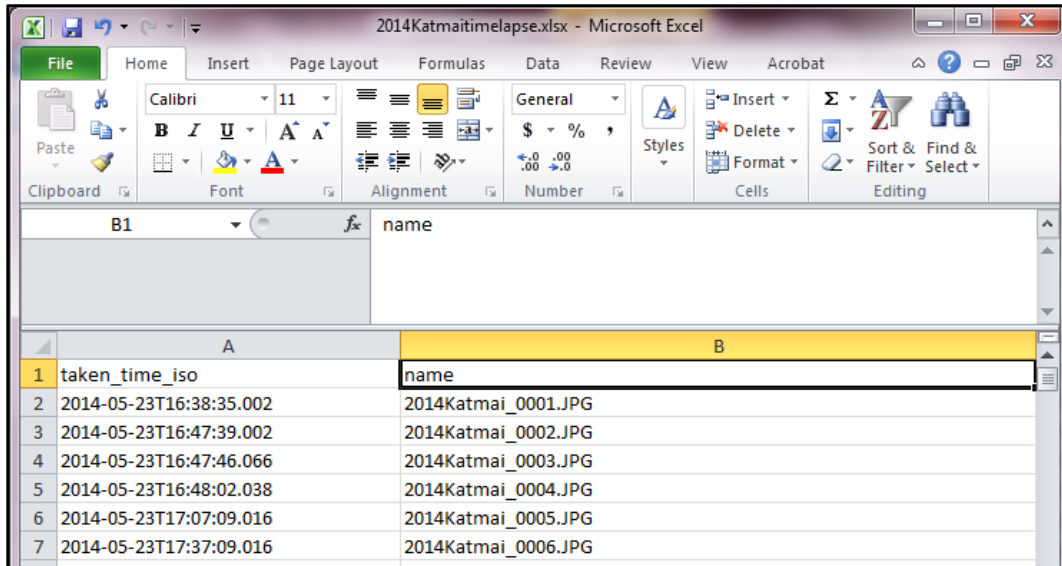
2. Navigate to the folder with the renamed photos. Give the program time to load all the photos (be patient – this can take a while). Once all the thumbnails have loaded go to: **Database > Advanced > Open in MS Access**.



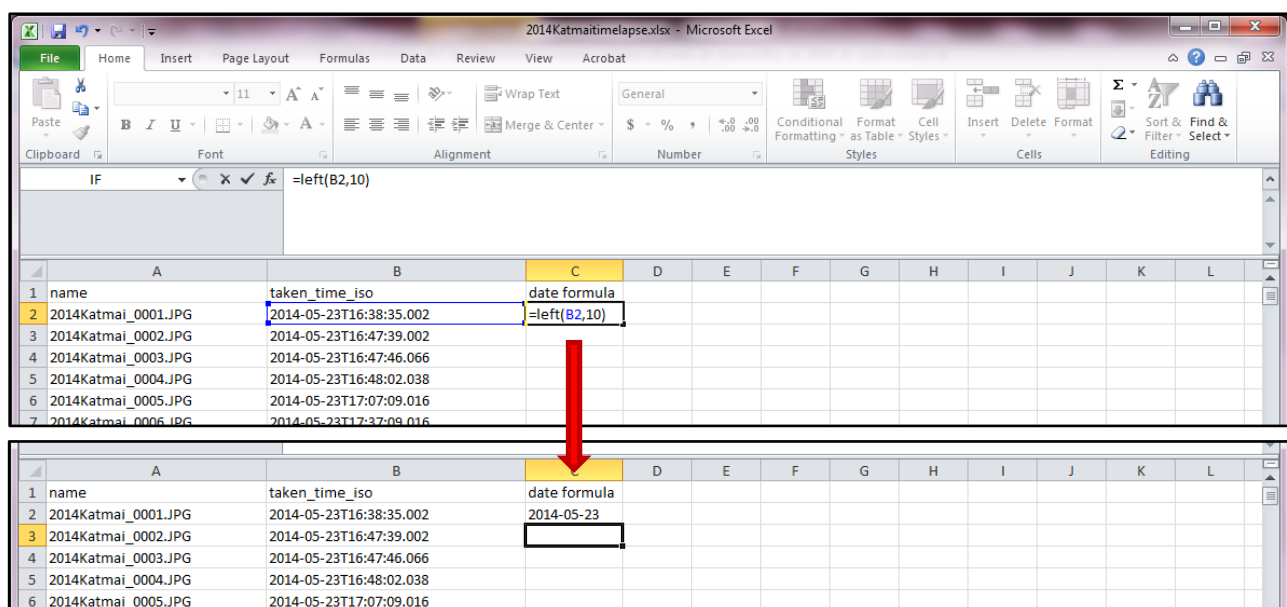
3. In Access, open the Thumbnail table. Select all the records (Ctrl+A) and Export to Excel.



- Open the Excel file and delete all columns except file name and the date/time information.
Note: there might be several columns with date/time information, eg. File_time_iso, thumbnail_time_iso, and taken_time_iso; the correct one will likely be taken_time_iso which you can confirm by looking at the photos.



- Move the date/time field to the right of the name to make it easier to break down into date and time.
- Begin separating the Date information from the Date/Time field. To separate out the date select the next cell in the column to the right and use the formula **=LEFT(cell, number)**. For example =LEFT(B2,10) works below:



6. Select the cell and drag the formula down to the last entry in the date formula column. Copy the entire column and **Paste Special > Values**, into the column to the right. You are now finished with the date section, and can delete the date formula column. Now you have a name column, date/time column, and date column.

Select the cell. Hover over the lower right corner of the cell until a black + appears. Click and drag the formula down to the last row.

	A	B	C	D	E
1	name	taken_time_iso	date formula	date	
2	2014Katmai_0001.JPG	2014-05-23T16:38:35.002	2014-05-23		
3	2014Katmai_0002.JPG	2014-05-23T16:47:39.002	2014-05-23		
4	2014Katmai_0003.JPG	2014-05-23T16:47:46.066	2014-05-23		
5	2014Katmai_0004.JPG	2014-05-23T16:48:02.038	2014-05-23		
6	2014Katmai_0005.JPG	2014-05-23T17:07:09.016	2014-05-23		
7	2014Katmai_0006.JPG	2014-05-23T17:37:09.016	2014-05-23		
8	2014Katmai_0007.JPG	2014-05-23T18:07:09.016	2014-05-23		
9	2014Katmai_0008.JPG	2014-05-23T18:37:09.016	2014-05-23		
10	2014Katmai_0009.JPG	2014-05-23T19:07:09.016	2014-05-23		
11	2014Katmai_0010.JPG	2014-05-23T19:37:09.016	2014-05-23		
12	2014Katmai_0011.JPG	2014-05-23T20:07:09.016	2014-05-23		
13	2014Katmai_0012.JPG	2014-05-23T20:37:09.016	2014-05-23		
14	2014Katmai_0013.JPG	2014-05-23T21:07:09.016	2014-05-23		
15	2014Katmai_0014.JPG	2014-05-23T21:37:10.016	2014-05-23		

7. Separate out the time in a separate column similar to the way that the date column was created but use a formula to get the text from the right side of the column **=RIGHT(cell, number)**. In the case below, **=RIGHT(B2,12)** was used.

	A	B	C	D	E	F	G	H	I	J	K	L
1	name	taken_time_iso	date	time formula								
2	2014Katmai_0001.JPG	2014-05-23T16:38:35.002	2014-05-23	16:38:35.002								
3	2014Katmai_0002.JPG	2014-05-23T16:47:39.002	2014-05-23									
4	2014Katmai_0003.JPG	2014-05-23T16:47:46.066	2014-05-23									
5	2014Katmai_0004.JPG	2014-05-23T16:48:02.038	2014-05-23									
6	2014Katmai_0005.JPG	2014-05-23T17:07:09.016	2014-05-23									
7	2014Katmai_0006.JPG	2014-05-23T17:37:09.016	2014-05-23									

8. Copy the formula in to the rest of the column by selecting the cell with the formula and dragging it down to the bottom of the column. Copy and paste the values (**Paste Special > Values**) into a new column called timex and delete the formula column.
9. Create a timex formula column to the right to extract the time without the milliseconds using the left formula (eg. **=LEFT(F2,8)**)

G2		fx =LEFT(F2,8)				
	A	B	D	F	G	H
1	name	taken_time_iso	date	timex	timex formula	time
2	2014Katmai_0001.JPG	2014-05-23T16:38:35.002	2014-05-23	16:38:35.002	16:38:35	16:38:35
3	2014Katmai_0002.JPG	2014-05-23T16:47:39.002	2014-05-23	16:47:39.002	16:47:39	16:47:39
4	2014Katmai_0003.JPG	2014-05-23T16:47:46.066	2014-05-23	16:47:46.066	16:47:46	16:47:46
5	2014Katmai_0004.JPG	2014-05-23T16:48:02.038	2014-05-23	16:48:02.038	16:48:02	16:48:02
6	2014Katmai_0005.JPG	2014-05-23T17:07:09.016	2014-05-23	17:07:09.016	17:07:09	17:07:09
7	2014Katmai_0006.JPG	2014-05-23T17:37:09.016	2014-05-23	17:37:09.016	17:37:09	17:37:09
8	2014Katmai_0007.JPG	2014-05-23T18:07:09.016	2014-05-23	18:07:09.016	18:07:09	18:07:09

10. Copy the formula through the whole column, then copy the values into a separate column. Name the column **time** and delete all unnecessary columns so that you are left with **name**, **date** and **time**:

	A	D	H
1	name	date	time
2	2014Katmai_0001.JPG	2014-05-23	16:38:35
3	2014Katmai_0002.JPG	2014-05-23	16:47:39
4	2014Katmai_0003.JPG	2014-05-23	16:47:46
5	2014Katmai_0004.JPG	2014-05-23	16:48:02
6	2014Katmai_0005.JPG	2014-05-23	17:07:09
7	2014Katmai_0006.JPG	2014-05-23	17:37:09
8	2014Katmai_0007.JPG	2014-05-23	18:07:09
9	2014Katmai_0008.JPG	2014-05-23	18:37:09
10	2014Katmai_0009.JPG	2014-05-23	19:07:09

11. Add new columns: **tide**, **scored**, **reason**. Save the spreadsheet in the appropriate year/location folder (eg. G:\Katmai Bay camera project\2014) and name it accordingly (eg. 2014KatmaiBay_photoinfo.xlsx). This spreadsheet will be used to connect the photo object and spatial information to the date and time information. It will also be used to record tide stage for analysis and document whether or not photos were processed, and if not, the reason why.

ArcCatalog Introduction and Geodatabase Set Up



The ArcCatalog component of the ArcGIS suite is the data management platform for this project. This section of the protocol provides an introduction to the program and familiarizes the user with the process of creating the geodatabases and feature classes that store project data.

About ArcCatalog

Excerpt from the ESRI ArcGIS Resource Center:

http://webhelp.esri.com/arcgisdesktop/9.2/index.cfm?TopicName=an_overview_of_arccatalog

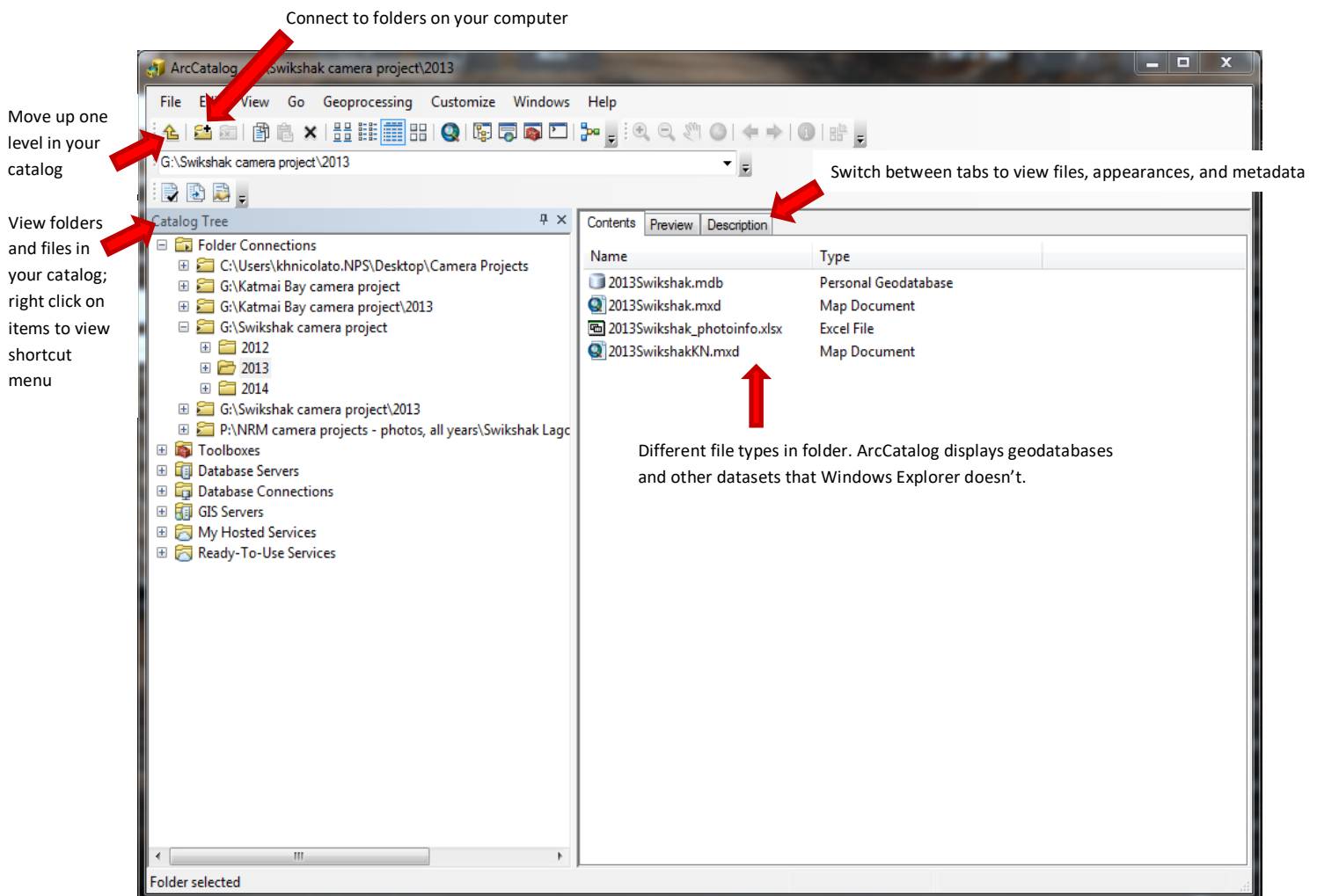
“Geographic information exists in many forms, including relational databases, files, ArcGIS documents, and remote GIS web services. ArcGIS applications work together to allow you to work with geographic

information and other ancillary data that exist in various data sources, including datasets, relational databases, and many file types and schemas.

ArcCatalog helps GIS users by providing an integrated and unified view of all the data files, databases, and ArcGIS documents available to ArcGIS users. Unlike other data (a photo or Word document), geographic datasets often consist of a set of files, rather than a single file. When listed in Windows Explorer, the datasets appear as a list of system folders and files, whereas ArcCatalog displays and manages the datasets as single entities. ArcCatalog is the program you use to organize and manage these various datasets and documents in both file-based workspaces and in geodatabases. This program allows you to connect to your data source locations, browse through your workspaces, examine or explore the data, manage data, tables and metadata, and search for data and maps.”

Layout of ArcCatalog

This is what your ArcCatalog window will look like. You’ll see that some toolbars and functions in ArcCatalog can be found in ArcMap as well.



Connecting to folders

To work with file contents stored on your computer in ArcCatalog, you have to connect to the folders they are stored in. Whenever you try to navigate to a new folder, you need to connect to it first. After you initially connect, the connection will be saved and you can navigate through that path any time.

To connect to a folder, click the Connect to Folder icon on the Standard toolbar, then navigate to your destination folder and hit OK. Connect to all the folders you frequently work in – ArcCatalog will save them all in your Catalog Tree. This applies to folders in ArcMap as well.

Introduction to the Geodatabase

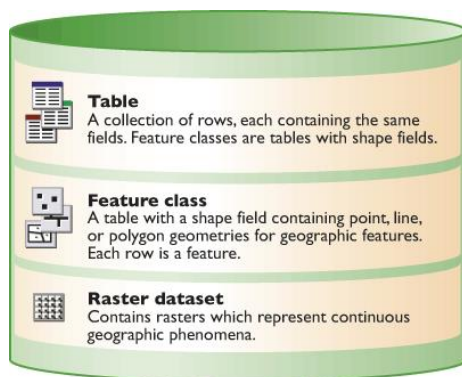
Excerpt from the ESRI ArcGIS Resource Center:

http://resources.arcgis.com/en/help/main/10.2/#!/What_is_a_geodatabase/003n00000001000000/

“At its most basic level, an ArcGIS geodatabase is a collection of geographic datasets of various types held in a common file system folder, a Microsoft Access database, or a multiuser relational DBMS (such as Oracle, Microsoft SQL Server, PostgreSQL, Informix, or IBM DB2). Geodatabases come in many sizes, have varying numbers of users and can scale from small, single-user databases built on files up to larger workgroup, department, and enterprise geodatabases accessed by many users.

The geodatabase is the native data structure for ArcGIS and is the primary data format used for editing and data management. While ArcGIS works with geographic information in numerous geographic information system (GIS) file formats, it is designed to work with and leverage the capabilities of the geodatabase.

All GIS users will work with three fundamental dataset types regardless of the system they use. They'll have a set of feature classes (much like a folder full of Esri shapefiles); they'll have a number of attribute tables (dBASE files, Microsoft Access tables, Excel spreadsheets, DBMSs, and so forth); and most of the time, they'll also have a large set of imagery and raster datasets to work with.



Fundamentally, all geodatabases will contain this same kind of content. This collection of datasets can be thought of as the universal starting point for your GIS database design.”

Types of Geodatabases

Excerpt from the ESRI ArcGIS Resource Center:

http://resources.arcgis.com/en/help/main/10.2/##/Types_of_geodatabases/003n00000007000000/

“The geodatabase is a “container” used to hold a collection of datasets. There are three types:

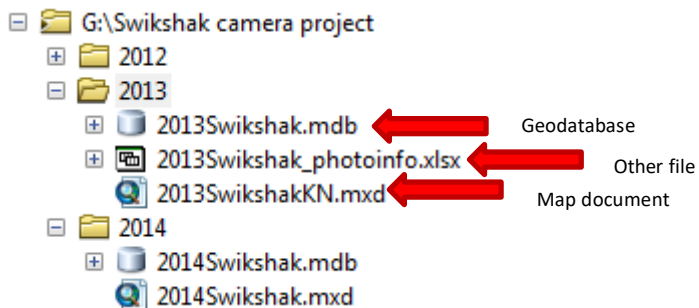
1. *File geodatabases—Stored as folders in a file system. Each dataset is held as a file that can scale up to 1 TB in size. The file geodatabase is recommended over personal geodatabases.*
2. *Personal geodatabases—All datasets are stored within a Microsoft Access data file, which is limited in size to 2 GB.*
3. *ArcSDE geodatabases—Also known as multiuser geodatabases. Stored in a relational database using Oracle, Microsoft SQL Server, IBM DB2, IBM Informix, or PostgreSQL. These geodatabases require the use of ArcSDE and can be unlimited in size and numbers of users.”*

Based on previous protocol, flexibility with MS Access, and suggestions from the AKRO GIS team, personal geodatabases are used to store data for this project. A separate geodatabase exists for each study site and year. Every geodatabase stores a point feature class for digitizing photo objects and a table containing information on each photo.

Creating a Geodatabase

Make sure your files are managed properly before creating a database. This is extremely important, because you will have to define the source of all your files in ArcMap, and a disorganized file management system will cause connection issues and generally give you a headache. In terms of file management, there should be folders created and set up like so:

Study site > study year > contains geodatabase, map document, and any other associated files



To create a new geodatabase for a study year in ArcCatalog:

1. In the Catalog Tree, navigate to the year where you want to store your geodatabase.
2. Right click in the Contents window and go to New > Personal Geodatabase. Name your database with the year and study site.

Creating a Point Feature Class

Excerpt from the ESRI ArcGIS Resource Center:

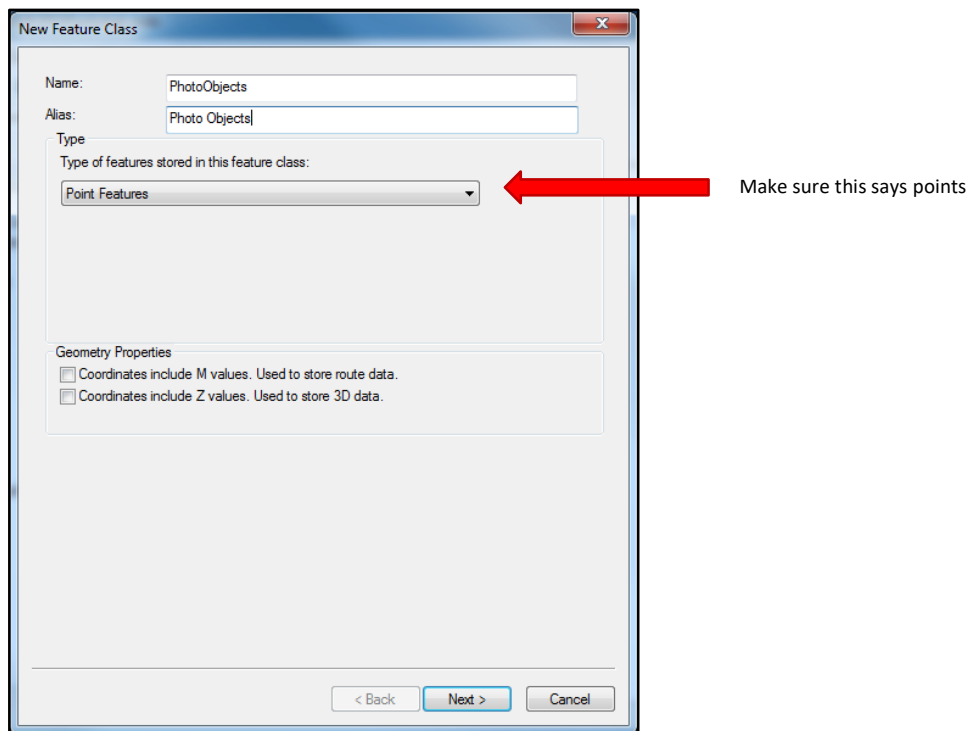
http://resources.arcgis.com/en/help/main/10.2/##/Feature_class_basics/003n00000005000000/

“A feature is an object that stores its geographic representation, which is typically a point, line, or polygon, as one of its properties (or fields) in the row [of an Attribute Table]. In ArcGIS, feature classes are homogeneous collections of features with a common spatial representation and set of attributes stored in a database table, for example, a line feature class for representing road centerlines.”

Digitizing and spatially referencing photo objects requires using a point feature class in ArcGIS. Each point in the feature class represents a bear, human, or human-related object that the user has observed and digitized.

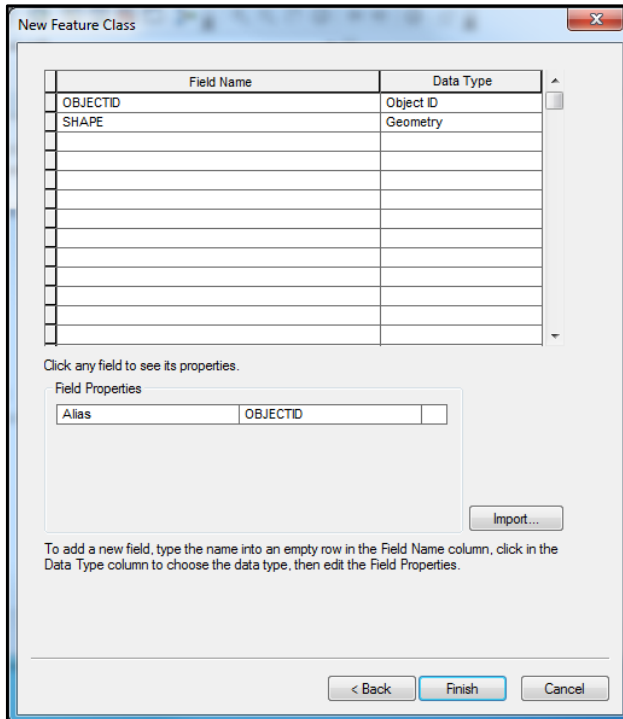
To create a point feature class within a geodatabase in ArcCatalog:

1. In the Catalog Tree, navigate to the geodatabase where you want to store your feature class.
2. Right click in the Contents window and go to New > Feature Class.
3. Change the information in the New Feature Class window to look like this:



4. Choose Alaska Albers Equal Area Conic as the coordinate system. Navigate to:
Projected Coordinate Systems > Continental > North America > Alaska Albers Equal Area Conic
5. Keep XY Tolerance at 0.001 and check Accept default resolution.

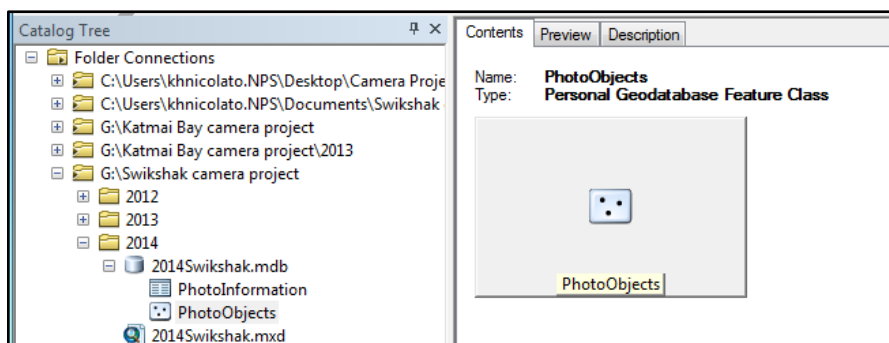
6. The final window should look like this:



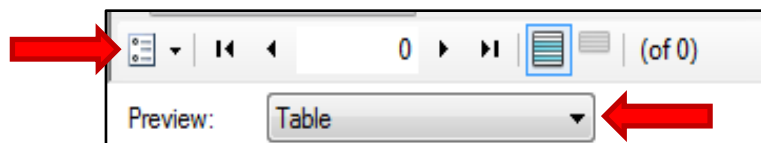
7. Click Finish to complete creating the point feature class.

Now it's time to create fields for storing tabular data about each point you digitize, including type of photo object, name of photo, and XY coordinates. In ArcMap, this data can be viewed and edited in an Attribute Table for the feature class layer.

1. In the Catalog Tree, select the feature class you just created. You will see it appear in the Contents window.



2. Click the Preview tab and switch from Geography to Table in the Preview pull down menu at the bottom of the window. Click the Table Options pull down menu and select Add Field.



3. Create three fields using the screen shots below. Be aware that this is the only time you will be able to edit the details without deleting the field and adding it back in, which you obviously don't want to do after you have data populating the field. There will also be two fields present for XY coordinates, but AlaskaPak will insert those later.

The 'Add Field' dialog box shows the following details:

- Name: PhotoObject
- Type: Text
- Field Properties:

Alias	Photo Object
Allow NULL Values	Yes
Default Value	
Domain	
Length	50

The 'Add Field' dialog box shows the following details:

- Name: PhotoID
- Type: Text
- Field Properties:

Alias	Photo ID
Allow NULL Values	Yes
Default Value	
Domain	
Length	50

The 'Add Field' dialog box shows the following details:

- Name: Comments
- Type: Text
- Field Properties:

Alias	Comments
Allow NULL Values	Yes
Default Value	
Domain	
Length	50

4. Right click on the Photo Objects feature class in the Catalog Tree and select Properties. Under the Fields tab, it should look like this:

The 'Feature Class Properties' dialog box, Fields tab, shows the following table:

Field Name	Data Type
OBJECTID	Object ID
SHAPE	Geometry
PhotoObject	Text
PhotoID	Text
Comments	Text

Below the table, the 'Field Properties' section shows:

Alias	OBJECTID
-------	----------

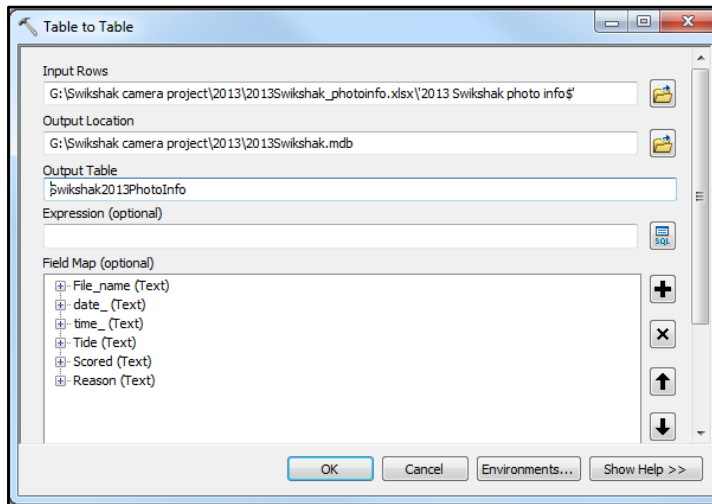
Buttons: OK, Cancel, Apply, Import...

Importing a Photo Information Table into a Geodatabase

To import your Excel table with the date and time information for each photo into your geodatabase:

1. Navigate to your geodatabase in the Catalog Tree. Right click and go to Import > Table (single).

2. For the Input Rows, browse to your Excel file and add the sheet containing your table. The Output Location should automatically read your geodatabase location. For Output Table, name the table with the study site, year, and something like “PhotoInfo” or “DateTime.” Note that you cannot begin the name with a number and you cannot have the table open in any other application, otherwise you will get an error. Use the geoprocessing window below as a guide. Click OK when you are finished.



3. The table should now appear in the Catalog Tree under your geodatabase.

Creating a Domain

In a database, it is important to have consistency. For a specific field, you don’t want a user typing “Person,” “People,” or “Human” when they all mean the same thing. This will make sorting, selecting, querying, and analyzing the dataset a nightmare. Even an accidental one-letter misspelling will cause the computer to recognize the data point as different.

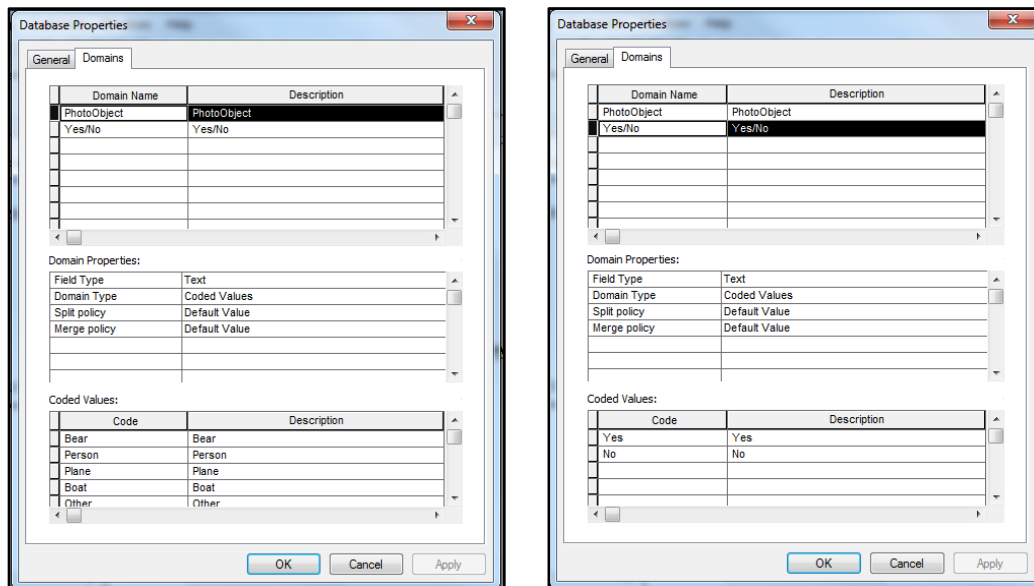
To avoid this issue and user error, a good way to standardize the data is by creating a pull down list, called a “domain” in ArcGIS. This forces the user to choose only among the selections provided when inputting text information for a data point. In the above example, this means that the Photo Object field would contain a domain with only one option for people called “Person” that the user would select from a pull down list in the Attribute Table.

For this project, there are two fields where a domain would be more useful than manually entering data -- the Photo Object field in the Photo Objects feature class, and the Scored field in the Photo Information Table. This is because there are only a small number of categorical values you can assign to these fields: Bear, Person, Boat, Plane, Other for Photo Objects, and Yes/No for Scored.

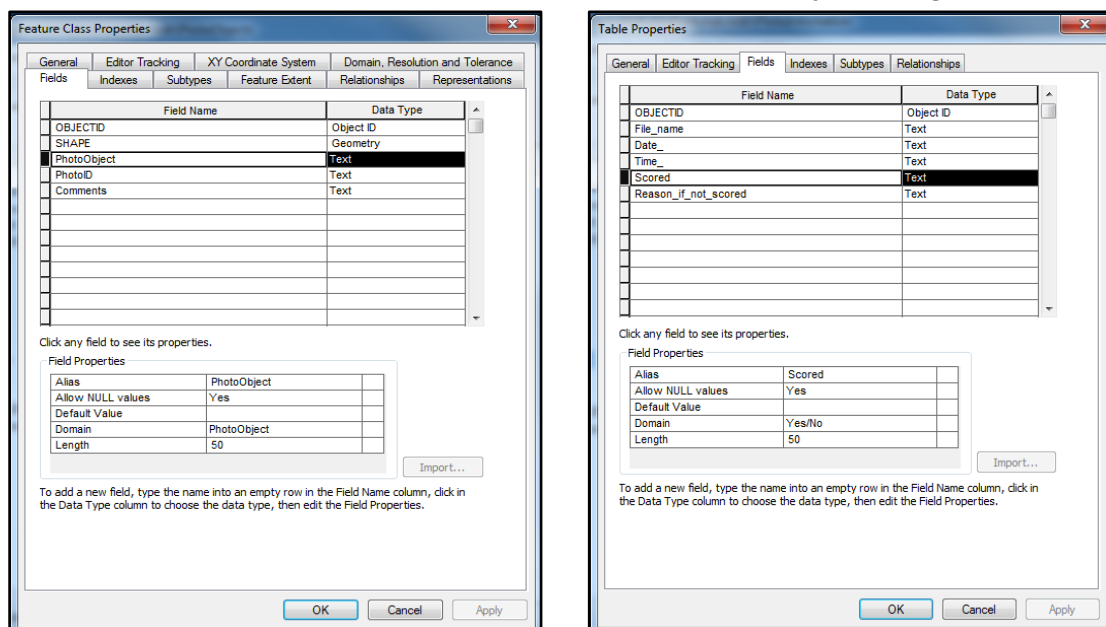
To create a domain in the Photo Object field or the Scored field:

1. In the ArcCatalog Catalog Tree, navigate to the geodatabase in which you want to create a domain. Right click the geodatabase and select Properties.

- Click on the Domains tab. This is where you will create pull down lists. Two were created here: one for the “Photo Object” field in the Photo Object feature class, and one for the Photo Information Table’s “Scored” field. Use these screenshots as a guide.



- Now that you’ve created domains, you need to tell ArcCatalog the geodatabase table and field that you want to use them in. In the Catalog Tree, navigate to the geodatabase in which you want to use the domain. Right click on the feature and select Properties. Go to the Fields tab.
- Here is the Field tab for the Photo Objects feature class on the left, and the Photo Information Table on the right. Clicking on either of these fields in the Field Name table brings up the Field Properties below it. Notice that there is a row called Domain. Click on the blank space in the column next to it and a pull down menu appears. Select PhotoObject for the Photo Objects feature class and Yes/No for the Photo Information Table. Click OK to save your changes.



5. Check to see that all your changes translate over in ArcMap.

- Open a new or existing map document in ArcMap. Right click Layers in the Table of Contents and select Add Data. Navigate to the geodatabase containing your Photo Objects feature class and select it. Hit Add. Right click the Photo Objects feature class and go to Edit Features > Start Editing. Right click again and select Open Attribute Table.
- Click the List By Source icon in the Table of Contents. Right click your geodatabase and select Add Table, then select your Photo Information Table and hit Add. Right click the table in the Table of Contents and select Open.
- The Photo Objects Attribute Table and the Photo Information Table should now both be open in the same window, with tabs to switch back and forth between the two.

OBJECTID	File_name	date_	time_	Tide	Scored	Reason
1899	2013Swikshak_1899.JPG	2013-07-16	16:10:27	<Null>	<Null>	<Null>
1900	2013Swikshak_1900.JPG	2013-07-16	16:40:27	<Null>	<Null>	<Null>
1901	2013Swikshak_1901.JPG	2013-07-16	17:10:27	<Null>	<Null>	<Null>
1902	2013Swikshak_1902.JPG	2013-07-16	17:40:27	<Null>	<Null>	<Null>
1903	2013Swikshak_1903.JPG	2013-07-16	18:10:27	<Null>	<Null>	<Null>
1904	2013Swikshak_1904.JPG	2013-07-16	18:40:27	<Null>	<Null>	<Null>
1905	2013Swikshak_1905.JPG	2013-07-16	19:10:28	<Null>	<Null>	<Null>
1906	2013Swikshak_1906.JPG	2013-07-16	19:40:28	<Null>	<Null>	<Null>
1907	2013Swikshak_1907.JPG	2013-07-16	20:10:28	<Null>	<Null>	<Null>
1908	2013Swikshak_1908.JPG	2013-07-16	20:40:28	<Null>	<Null>	<Null>
1909	2013Swikshak_1909.JPG	2013-07-16	21:10:28	<Null>	<Null>	<Null>
1910	2013Swikshak_1910.JPG	2013-07-16	21:40:28	<Null>	<Null>	<Null>
1911	2013Swikshak_1911.JPG	2013-07-16	22:10:28	<Null>	<Null>	<Null>
1912	2013Swikshak_1912.JPG	2013-07-16	22:40:28	<Null>	<Null>	<Null>
1913	2013Swikshak_1913.JPG	2013-07-16	23:10:28	<Null>	<Null>	<Null>
1914	2013Swikshak_1914.JPG	2013-07-16	23:40:28	<Null>	<Null>	<Null>
1915	2013Swikshak_1915.JPG	2013-07-17	00:10:28	<Null>	<Null>	<Null>
1916	2013Swikshak_1916.JPG	2013-07-17	00:40:28	<Null>	<Null>	<Null>
1917	2013Swikshak_1917.JPG	2013-07-17	01:10:28	<Null>	<Null>	<Null>
1918	2013Swikshak_1918.JPG	2013-07-17	01:40:28	<Null>	<Null>	<Null>
1919	2013Swikshak_1919.JPG	2013-07-17	02:10:28	<Null>	<Null>	<Null>
1920	2013Swikshak_1920.JPG	2013-07-17	02:40:28	<Null>	<Null>	<Null>
1921	2013Swikshak_1921.JPG	2013-07-17	03:10:29	<Null>	<Null>	<Null>
1922	2013Swikshak_1922.JPG	2013-07-17	03:40:29	<Null>	<Null>	<Null>
1923	2013Swikshak_1923.JPG	2013-07-17	04:10:29	<Null>	<Null>	<Null>

- Click a blank cell in the Photo Object field of the Photo Object Attribute Table, and you should get a pull down menu with the values you listed. Doing the same in the Scored field of the Photo Attribute Table should also give you a pull down menu.

PhotoObject	PhotoID
<Null>	<Null>

- If for any reason a domain needs to be removed, go back to Step 4. Instead of selecting PhotoObject or Yes/No, select in the blank area above it. This will remove the domain from the field and the user will need to go back to typing in values.

ArcMap Introduction and Map Document Set Up



The ArcMap component of the ArcGIS suite is the photo processing platform for this project. This section of the protocol provides an introduction to the program and familiarizes the user with useful layouts and common functions employed while working with the time-lapse photos and their associated databases.

About ArcMap

Excerpt from the ESRI ArcGIS Resource Center:

http://help.arcgis.com/en/arcgisdesktop/10.0/help/index.html#/What_is_ArcMap/006600000001000000/

“ArcMap is where you display and explore GIS datasets for your study area, where you assign symbols, and where you create map layouts for printing or publication. ArcMap is also the application you use to create and edit datasets.

ArcMap represents geographic information as a collection of layers and other elements in a map.”

Map Document (.mxd)

Excerpt from the ESRI ArcGIS Resource Center:

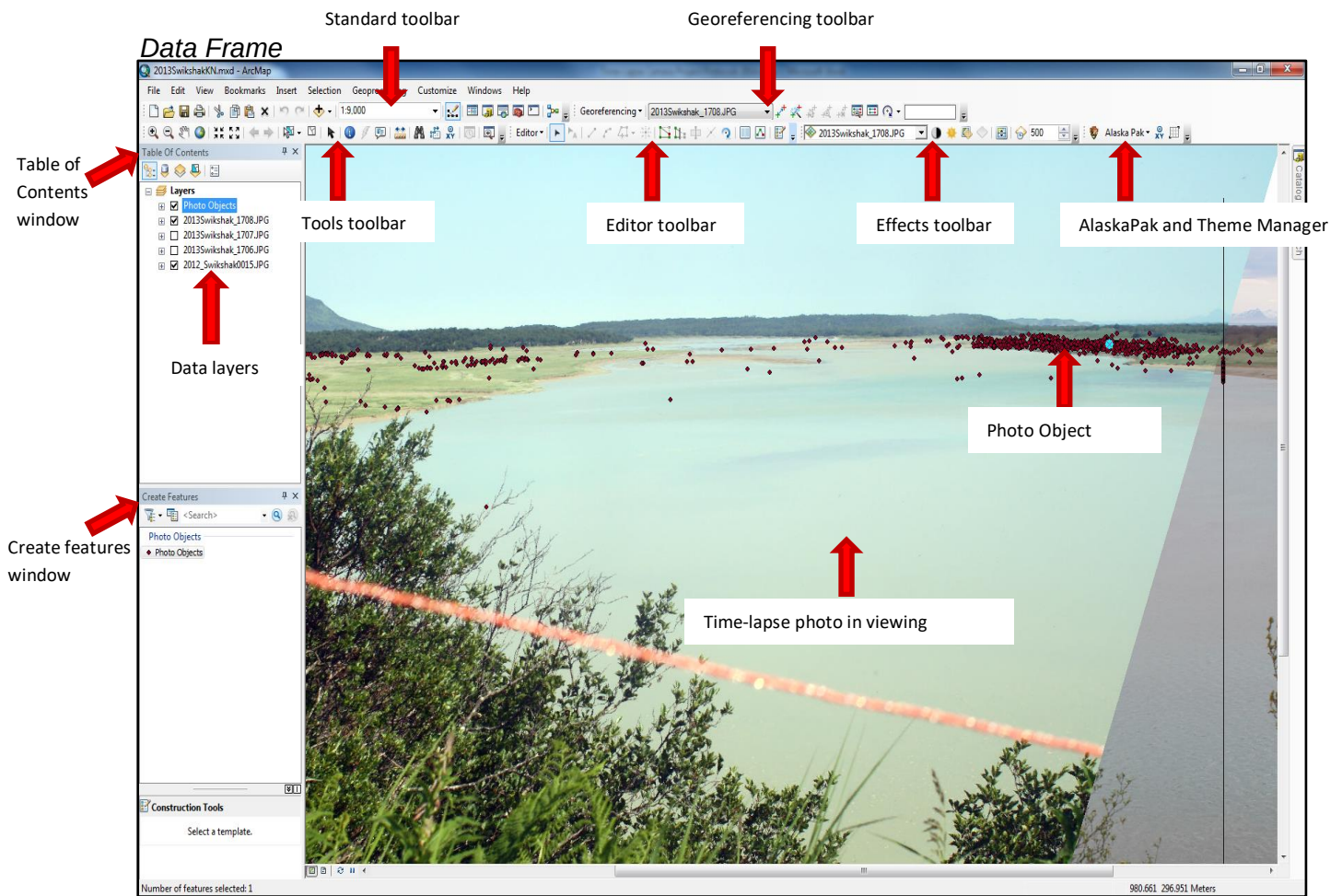
http://help.arcgis.com/en/arcgisdesktop/10.0/help/index.html#/Essential_ArcMap_vocabulary/006600000003000000/

“A map used in ArcMap that is stored as a file on disk. Each map document contains the specifications for the map layers, the page layout, and all other map properties. Map documents make it easy to save, reuse, and share your work in ArcMap. Double-clicking a map document opens it as a new ArcMap session.”

In other words, a map document is the GIS equivalent of a word document, where you can have images, words, data etc. saved as one complete file. For this project, you will work within different map documents established for each study site and year. Each .mxd should be created and stored at G: > (project site) > (year) > (file).

Layout of Map Document

ArcMap toolbars and layouts are completely customizable. All customized toolbars and layouts will be saved as part of the map document, so you won't have to set everything up each time you open the .mxd. You'll see that some toolbars and functions in ArcMap can be found in ArcCatalog as well. Below is an example showing a good way to set up your .mxd. For this project, the user's map documents should contain all the toolbars, tables, and windows pictured here, but they can be arranged however the user prefers. The layout pictured here is for a dual monitor set up, with the Data Frame in the first monitor and the Attribute Table, Attributes Window, and Link Table in the second monitor. Play around with arrangements and figure out what works well for your set up and your preferences.



Attribute Table, Attributes Window, and Link Table

Table

OBJECTID	SHAPE	PhotoObject	PhotoID	Comments	X_Coord	Y_Coord
1575	Point	Bear	2013Swikshak_1705	<Null>	2442.993007	-270.310614
1576	Point	Bear	2013Swikshak_1705	<Null>	2464.582579	-271.168363
1577	Point	Bear	2013Swikshak_1705	<Null>	2205.430434	-278.359457
1578	Point	Bear	2013Swikshak_1705	<Null>	1991.5214	-280.970021
1579	Point	Bear	2013Swikshak_1705	<Null>	427.266339	-282.342144
1580	Point	Bear	2013Swikshak_1706	<Null>	2749.968524	-275.782714
1581	Point	Bear	2013Swikshak_1706	<Null>	2675.690065	-281.951101
1582	Point	Bear	2013Swikshak_1706	<Null>	2550.007791	-277.83893
1583	Point	Bear	2013Swikshak_1706	<Null>	2486.604017	-277.324845
1584	Point	Bear	2013Swikshak_1706	<Null>	2486.78119	-282.979271
1585	Point	Bear	2013Swikshak_1706	<Null>	2451.589539	-284.007316
1586	Point	Bear	2013Swikshak_1706	<Null>	2342.822035	-283.296441
1587	Point	Bear	2013Swikshak_1707	<Null>	2799.840398	-296.663435
1588	Point	Bear	2013Swikshak_1707	<Null>	2724.16177	-303.409175
1589	Point	Bear	2013Swikshak_1707	<Null>	2707.928033	-288.652949
1590	Point	Bear	2013Swikshak_1707	<Null>	2671.03917	-306.992958
1591	Point	Bear	2013Swikshak_1707	<Null>	2596.733379	-283.382666
1592	Point	Bear	2013Swikshak_1707	<Null>	2562.712294	-285.280094
1593	Point	Bear	2013Swikshak_1707	<Null>	2532.11931	-282.539648
1594	Point	Bear	2013Swikshak_1707	<Null>	2351.846348	-289.519461
1595	Point	Bear	2013Swikshak_1707	<Null>	2323.092953	-280.247142
1596	Point	Bear	2013Swikshak_1707	<Null>	2122.249572	-280.311087
1597	Point	Bear	2013Swikshak_1707	<Null>	263.571775	-336.772808

Attributes Window

OBJECTID: 1582
PhotoObject: Bear
PhotoID: 2013Swikshak_1706
Comments: <Null>
X_Coord: 2550.007791
Y_Coord: -277.83893

Link Table

Link	X Source	Y Source	X Map	Y Map	Residual_x	Residual_y	Residual

Attribute Table displays information for all points in the Photo Objects

Link Table

Auto Adjust
Degrees Minutes Seconds

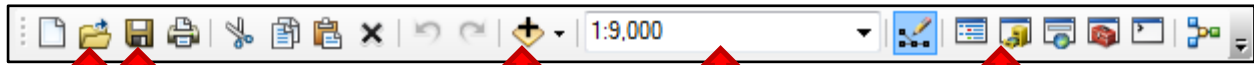
Transformation: 1st Order Polynomial (Affine)

OBJECTID
Object ID
Null values not allowed

Toolbars

Go to Customize > Toolbars to insert toolbars into your map document. The Standard and Tools toolbar are the primary toolbars in ArcMap, helping the user perform basic functions. Important highlights of the two toolbars used frequently for this project are described below -- scroll over icons in toolbars to discover other functions you might be interested in. The Georeferencing, Editing, and Effects toolbars, as well as the AlaskaPak toolkit, are addressed later in the protocol.

Standard toolbar



Open new document Save mapping document Add new data layers from files Map scale – can customize scale list ArcCatalog shortcut – will open in data frame

Full extent zooms out to extent of data in frame Clear selected features Identify geographic features



Zoom in/Zoom out Pan by dragging Select features Select, resize, and move text or graphics

Table of Contents

Excerpt from the ESRI ArcGIS Resource Center:

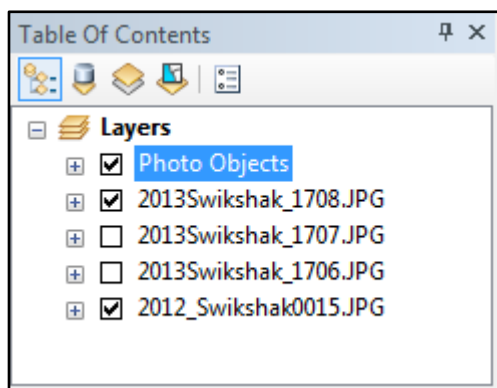
http://help.arcgis.com/en/arcgisdesktop/10.0/help/index.html#/Essential_ArcMap_vocabulary/0066000000003000000/

“The table of contents lists all the layers on the map and shows what the features in each layer represent. The check box next to each layer indicates whether its display is currently turned on or off. The order of layers within the table of contents specifies their drawing order in the data frame from bottom to top. The map's table of contents helps you manage the display order of map layers and symbol assignment, as well as to set the display and other properties of each map layer.”

Go to Windows > Table of Contents to insert this into your map document.

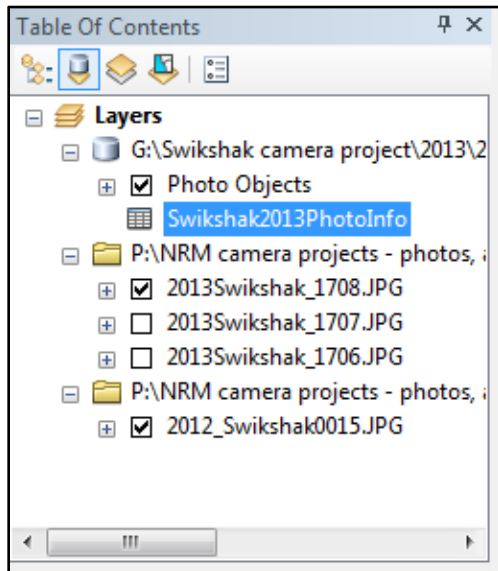
List By Drawing Order

Layers are listed by drawing order. Drag and drop to change drawing order. Right click layers for more commands.



List By Source

Layers are listed by the geodatabase or folder containing the data source they reference. Tables are also shown.



Inserting New Data

When you set up your .mxd for the first time, you will need to insert the Photo Objects point feature class, the study site base photo, and all future photos as data layers in ArcMap.

1. To insert a non-photo data layer, click the Add Data button on the Standard toolbar or right click Layers in the Table of Contents and select Add Data. Navigate to the folder your layer is in and hit Add.
2. To insert a photo data layer, navigate to the photo file in Windows Explorer and simply drag the file into your Table of Contents.

Setting Data Source

If a red exclamation point appears next to any of your layers, this means the database path has been corrupted. This occurs when a network goes down, or folders and files are moved around or renamed. When this happens, you need to set the data source again.

1. Right click the layer and go to Properties, or click the checkbox with the red exclamation point. Click the Source tab. Next to Database you will see where ArcMap says the data source is located, which is now incorrect. You need to set the correct source.
2. Click Set Data Source and navigate to the correct file. Hit Add. Your layer is not set to the correct data source.

Adding a Photo Information Table to a Map Document

1. Click the List By Source icon in the Table of Contents.

2. Navigate to your geodatabase. Right click and select Add Table, then select your Photo Information Table and hit Add.
3. Right click the table in the Table of Contents and select Open.

Installing AlaskaPak and Theme Manager

The AlaskaPak toolbar and Theme Manager are products developed by the Alaska Regional Office GIS team for NPS users working specifically with Alaskan spatial data. The AlaskaPak toolbar houses geoprocessing functions, while Theme Manager serves as a database for all Alaska NPS imagery and data layers. This project uses AlaskaPak for adding XY coordinates to data points.

To install the AlaskaPak toolbar and Theme Manager, follow the directions developed by the Alaska Regional Office included at the end of this protocol.

Beginning and Ending a Work Session

To begin work on the project each day:

1. Open the map document in ArcMap.

G: > (project site) > (year) > (.mxd file)

2. Open the folder containing the photos in Windows Explorer.

P: > NRM camera projects - photos, all years > (project site) > (year) > (“Left,” “Right,” or “All photos” depending on the project)

3. In Windows Explorer, right-click the photo (.JPG file) you are ready to process next and Open with > Microsoft Office.

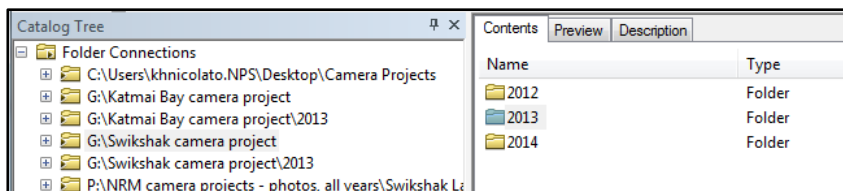
It is best to keep photos open in Microsoft Office Picture Manager while digitizing because it is easier to spot and analyze photo objects here than in ArcMap. Use the arrows at the bottom of the window to switch back and forth between images and quickly detect movement and change in bear and human numbers. Use the Zoom pull down menu and slider at the bottom of the window to establish a resolution that is personally comfortable for your viewing and processing.

To end work on the project each day:

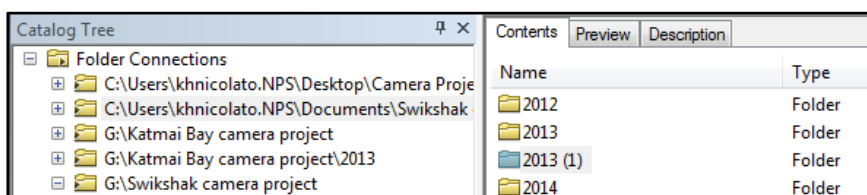
It is important to back up your work in a folder on your personal drive each day. This way, all your work won't be lost if something happens to the shared drive or network.

1. Save your edits and .mxd. Close out of ArcMap.

2. Open ArcCatalog and navigate to the study site folder you were working in on the G drive. Expand it and copy the entire year folder. For example, if you were working on Swikshak year 2013, copy the folder labeled “2013.”



3. Navigate to your User folder on the C drive where you will back up your work. Go to that same study site folder in the Catalog Tree so that the year folders are visible in the Contents window. Paste the year folder you copied from the G drive into the Contents window. This should have created a folder in the Contents window named “year (1).” Delete the old year folder and rename the new one to just the year, without the (1).



Digitizing Photo Objects

As stated in the Protocol Objectives, the locations of bears, humans, and human-related objects such as planes or boats must be digitized in each photo. To do this, site photos are imported into ArcMap and a point feature class is used to identify the locations of these photo subjects. Once digitized, the point features are saved to a database table, where the user can edit textual attributes about the data.

About Editing and Interactive Digitizing

Excerpt from the ESRI ArcGIS Resource Center:

http://resources.arcgis.com/en/help/main/10.1/index.html#/What_is_editing/01m500000003000000/

“ArcGIS allows you to create and edit several kinds of data. You can edit feature data stored in shapefiles and geodatabases, as well as various tabular formats. This includes points, lines, polygons, text (annotations and dimensions), multipatches, and multipoints.

Digitizing, the process of converting features into a digital format, is one way to create data. There are several ways to digitize new features. These include digitizing on-screen or heads up over an image, digitizing a hard copy of a map on a digitizing board, or using automated digitization.

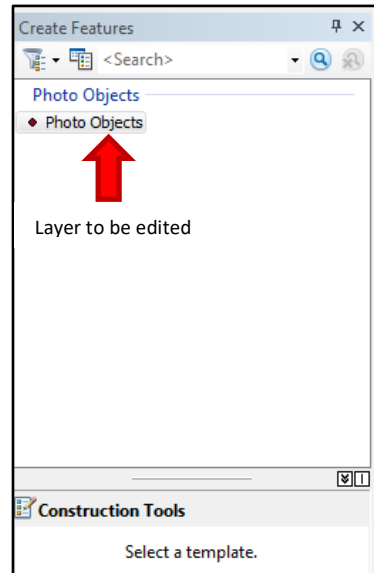
Interactive, or heads-up digitization, is one of the most common methods. In this method, you display an aerial photograph, satellite image, or orthophotograph on-screen as a basemap, then you draw features, such as roads, buildings, or parcels, on top of it.”

ArcMap Toolbars needed

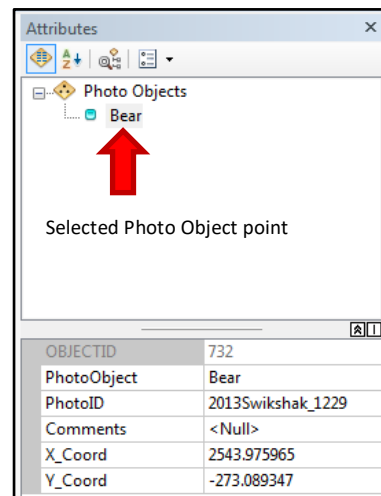


ArcMap Windows needed

Create Features



Attributes



Same information as seen in the Attribute Table

ArcMap Tables needed

Selection options buttons (see "Select By Attributes Function" for more information on that button)

Attribute Table

Table Options pull down menu

Right click field headings to sort columns ascending or descending

OBJECTID *	SHAPE *	PhotoObject	PhotoID	Comments	X_Coord	Y_Coord
760	Point	Bear	2013Swikshak_1233	<Null>	2840.160912	-296.179158
630	Point	Bear	2013Swikshak_1045	<Null>	2046.878379	-256.804781
752	Point	Bear	2013Swikshak_1232	<Null>	2558.792461	-288.181006
753	Point	Bear	2013Swikshak_1232	<Null>	2542.739616	-287.315695
754	Point	Bear	2013Swikshak_1232	<Null>	2458.632451	-270.841354
755	Point	Bear	2013Swikshak_1232	<Null>	2434.081715	-289.611919
756	Point	Bear	2013Swikshak_1232	<Null>	2402.082341	-269.589995
746	Point	Bear	2013Swikshak_1232	<Null>	2753.539969	-295.434977
758	Point	Bear	2013Swikshak_1232	<Null>	2397.911046	-271.496836
744	Point	Bear	2013Swikshak_1231	<Null>	2488.934744	-289.863773
761	Point	Bear	2013Swikshak_1233	<Null>	2668.799818	-291.942749
762	Point	Bear	2013Swikshak_1233	<Null>	2611.18524	-288.553691
763	Point	Bear	2013Swikshak_1233	<Null>	2553.78244	-285.376397
768	Point	Bear	2013Swikshak_1233	<Null>	2418.854133	-271.608145
769	Point	Bear	2013Swikshak_1233	<Null>	2357.850415	-270.125475
770	Point	Bear	2013Swikshak_1233	<Null>	2338.363176	-272.243665
757	Point	Bear	2013Swikshak_1232	<Null>	2406.670688	-270.900953
732	Point	Bear	2013Swikshak_1229	<Null>	2543.975965	-273.089347
723	Point	Bear	2013Swikshak_1228	<Null>	2742.925871	-295.567256
724	Point	Bear	2013Swikshak_1228	<Null>	2701.791458	-311.911311
725	Point	Bear	2013Swikshak_1228	<Null>	2494.582268	-273.165776
726	Point	Bear			2401.471738	-274.618178
727	Point	Bear			2281.306346	-290.451814
729	Point	Bear	2013Swikshak_1229	<Null>	2812.199881	-298.239875
747	Point	Bear	2013Swikshak_1232	<Null>	2670.226324	-286.451038

Same information as seen in the Attributes window

Photo Objects Swikshak2013PhotoInfo

Can switch between Photo Objects layer and Photo Information table

How to Digitize Photo Objects

1. In Windows Explorer, copy, paste, and rename the georeferencing file (.JGw) associated with the previous photo file (.JPG) to now correspond with the name of the new photo file, e.g.

 2013Swikshak_1708.JPG	7/12/2013 4:40 PM	JPEG image	3,806 KB
 2013Swikshak_1708.JGw	10/16/2014 9:44 AM	JGW File	1 KB

Previous photo's file name is 2012_Swikshak0017.JPG

New photo's file name is 2012_Swikshak0018.JPG

Copy and paste the georeferencing file named 2012_Swikshak0017.JGw

Rename copy to 2012_Swikshak0018.JGw

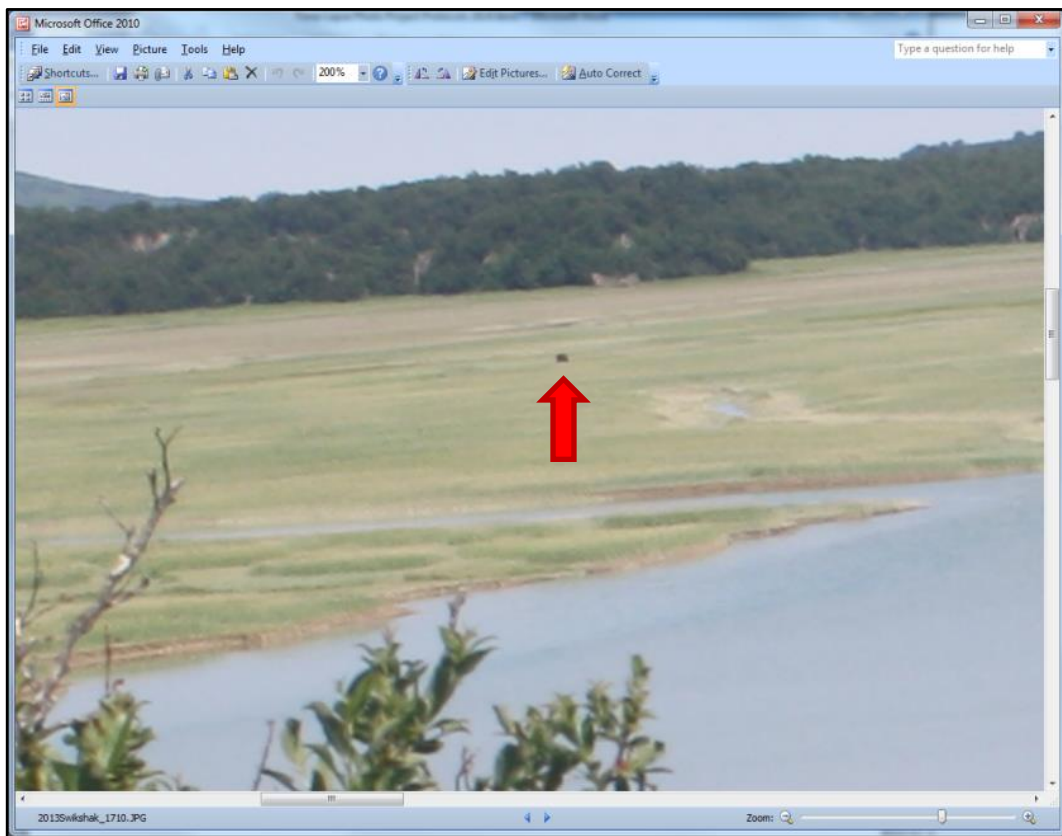
In doing this, you ensure that each time you insert a new photo into ArcMap, the new photo will place itself approximately where the last photo was georeferenced to. Simply inserting the new .JPG file into ArcMap without copying and renaming a new .JGw to match would cause the new photo to appear misaligned or out of the extent, since it has no proper spatial information associated with it.

2. With the new .JGw file selected, click the "Name" heading in the Windows Explorer window each time to reorder all files and place the new .JGw with its associated .JPG.
3. Drag the next photo to be analyzed (the actual .JPG file, not .JGw file) from the Windows Explorer window into the ArcMap Table of Contents window. Layer the new photo above the base photo, but below the Photo Objects layer.

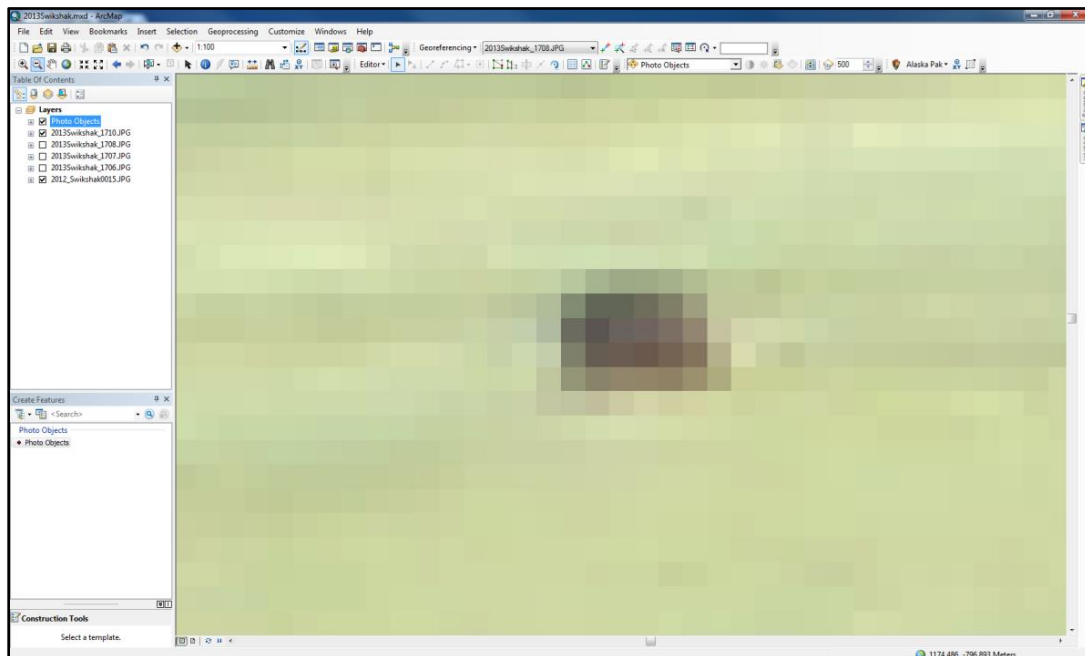


Check photo alignment every time and georeference if necessary prior to digitizing a photo (see Step 2 about the Swipe tool in the "Georeferencing Photos" section). Only proceed to digitization after taking these steps.

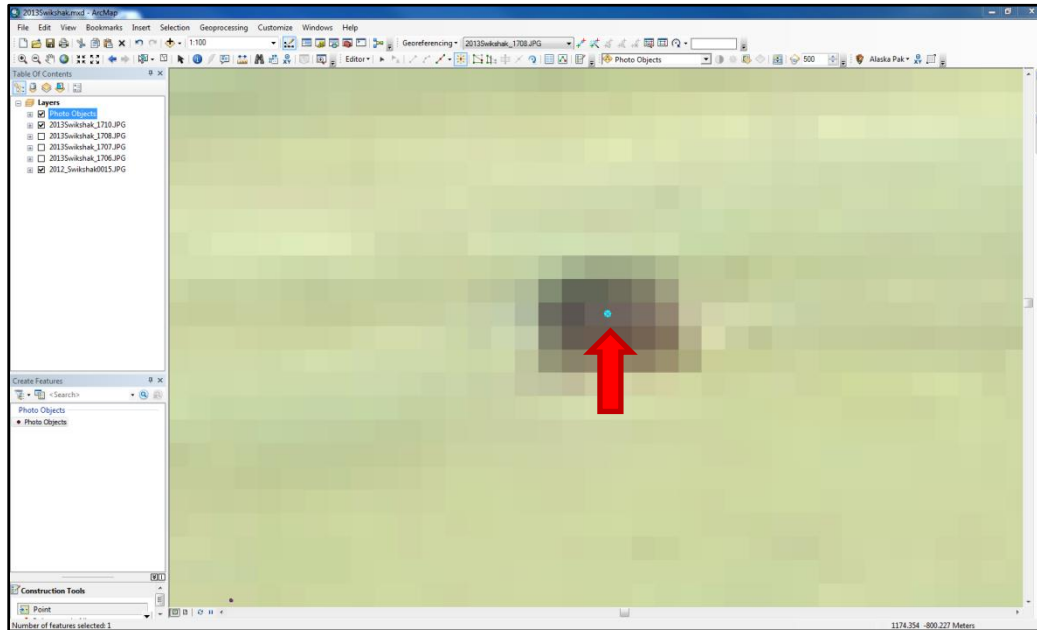
4. Begin editing by right clicking the Photo Objects layer in the Table of Contents and selecting Edit Features > Start Editing. You are now ready to start digitizing photo objects by creating point features in the Photo Objects layer. Ignore the "Spatial reference does not match data frame" warning you may encounter.
5. Pan through the photo open in Microsoft Office to get a general idea of the type, location, and number of photo objects.



6. Locate the corresponding objects in your ArcMap viewing window. For each object or group of objects, zoom in to almost pixel level. You will want to place your point feature as close to the center of each object as possible.



7. Make sure the Photo Objects layer is turned on in the Table of Contents. Click on Photo Objects in the Create Features window. Your cursor should turn into an arrow with a circular point at the tip. Place this circular point over the center of the photo object you want to digitize, and click to create. If you are dissatisfied with the placement and want to move a point, use the Edit tool in the Editor toolbar to select and move objects.



8. Each time you digitize an object, a new row will appear for that point feature in the Photo Objects Attribute Table. You need to fill out the correct information into this table to describe that point feature. In the Photo Object field, select the type of object from the pull down menu. In the Photo ID field, type in or copy, paste, and rename the name of the photo file you are viewing (minus the “.JPG”). If needed, there is a Comments field.

Photo Objects							
	OBJECTID *	SHAPE *	PhotoObject	PhotoID	Comments	X_Coord	Y_Coord
	1600	Point	<Null>	<Null>	<Null>	<Null>	<Null>

Photo Objects							
	OBJECTID *	SHAPE *	PhotoObject	PhotoID	Comments	X_Coord	Y_Coord
	1600	Point	Bear	2013Swikshak_1710	<Null>	<Null>	<Null>

The most efficient way to digitize is by creating all the point features for photo objects first, then batch entering the corresponding information into the Attribute Table.

- a. To batch enter, in the Attribute Table, select all the point features you want to fill out information for. If there are multiple types of photo objects like bears and humans, you will need to batch input each type separately, so only select one type at a time. You will see all these points appear in the Attributes window.

OBJECTID *	SHAPE *	PhotoObject	PhotoID	Comments	X_Coord	Y_Coord
1601	Point	<Null>	<Null>	<Null>	<Null>	<Null>
1602	Point	<Null>	<Null>	<Null>	<Null>	<Null>
1603	Point	<Null>	<Null>	<Null>	<Null>	<Null>
1604	Point	<Null>	<Null>	<Null>	<Null>	<Null>
1605	Point	<Null>	<Null>	<Null>	<Null>	<Null>
1606	Point	<Null>	<Null>	<Null>	<Null>	<Null>
1607	Point	<Null>	<Null>	<Null>	<Null>	<Null>
1608	Point	<Null>	<Null>	<Null>	<Null>	<Null>
1609	Point	<Null>	<Null>	<Null>	<Null>	<Null>
1610	Point	<Null>	<Null>	<Null>	<Null>	<Null>
1611	Point	<Null>	<Null>	<Null>	<Null>	<Null>
1612	Point	<Null>	<Null>	<Null>	<Null>	<Null>
1613	Point	<Null>	<Null>	<Null>	<Null>	<Null>

OBJECTID	1601
PhotoObject	<Null>
PhotoID	<Null>
Comments	<Null>
X_Coord	<Null>
Y_Coord	<Null>

- b. Select all these points in the Attributes window (using click + Shift). In the Attributes window table (not the Attributes Table), select the type of object from the Photo Object pull down menu. In the Photo ID field, type in or copy, paste, and rename the name of the photo file you are viewing (minus the “.JPG”). If needed, there is a Comments field.

OBJECTID	Bear
PhotoObject	Bear
PhotoID	2013Swikshak_1710
Comments	<Null>
X_Coord	<Null>
Y_Coord	<Null>

- c. Repeat the process if there are multiple types of photo objects present. All the photo objects you just digitized should now have the same information attributed to them.

OBJECTID *	SHAPE *	PhotoObject	PhotoID	Comments	X_Coord	Y_Coord
1601	Point	Bear	2013Swikshak_1710	<Null>	<Null>	<Null>
1602	Point	Bear	2013Swikshak_1710	<Null>	<Null>	<Null>
1603	Point	Bear	2013Swikshak_1710	<Null>	<Null>	<Null>
1604	Point	Bear	2013Swikshak_1710	<Null>	<Null>	<Null>
1605	Point	Bear	2013Swikshak_1710	<Null>	<Null>	<Null>
1606	Point	Bear	2013Swikshak_1710	<Null>	<Null>	<Null>
1607	Point	Bear	2013Swikshak_1710	<Null>	<Null>	<Null>
1608	Point	Bear	2013Swikshak_1710	<Null>	<Null>	<Null>
1609	Point	<Null>	<Null>	<Null>	<Null>	<Null>
1610	Point	<Null>	<Null>	<Null>	<Null>	<Null>
1611	Point	<Null>	<Null>	<Null>	<Null>	<Null>
1612	Point	<Null>	<Null>	<Null>	<Null>	<Null>
1613	Point	<Null>	<Null>	<Null>	<Null>	<Null>

Attributes










Photo Objects

- Person
- Person
- Person
- Person
- Person



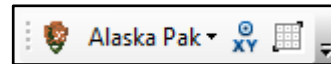

OBJECTID	
PhotoObject	Person
PhotoID	2013Swikshak_1710
Comments	
X_Coord	<Null>
Y_Coord	<Null>

OBJECTID *	SHAPE *	PhotoObject	PhotoID	Comments	X_Coord	Y_Coord
1601	Point	Bear	2013Swikshak_1710	<Null>	<Null>	<Null>
1602	Point	Bear	2013Swikshak_1710	<Null>	<Null>	<Null>
1603	Point	Bear	2013Swikshak_1710	<Null>	<Null>	<Null>
1604	Point	Bear	2013Swikshak_1710	<Null>	<Null>	<Null>
1605	Point	Bear	2013Swikshak_1710	<Null>	<Null>	<Null>
1606	Point	Bear	2013Swikshak_1710	<Null>	<Null>	<Null>
1607	Point	Bear	2013Swikshak_1710	<Null>	<Null>	<Null>
1608	Point	Bear	2013Swikshak_1710	<Null>	<Null>	<Null>
1609	Point	Person	2013Swikshak_1710	<Null>	<Null>	<Null>
1610	Point	Person	2013Swikshak_1710	<Null>	<Null>	<Null>
1611	Point	Person	2013Swikshak_1710	<Null>	<Null>	<Null>
1612	Point	Person	2013Swikshak_1710	<Null>	<Null>	<Null>
1613	Point	Person	2013Swikshak_1710	<Null>	<Null>	<Null>

9. Save both your edits and your MXD often. It is best to save at least your edits after every photo. To save edits, click on the Editor pull down menu in the Editor toolbar and select Save Edits. To save your MXD, click the Save icon in the Standard toolbar.
10. Each time you finish digitizing a photo, save and repeat back to Step 1.
11. If you need to stop editing for any reason, click on the Editor pull down menu in the Editor toolbar and select Stop Editing. It is not necessary to do this before closing out of ArcMap as long

as you remember to save your edits. It is necessary, however, to do this before adding XY coordinates, as discussed in “Adding XY Coordinates Using the AlaskaPak Toolbar.”

Adding XY Coordinates Using the AlaskaPak Toolbar



Coordinates can be added at any time as you see fit. Make sure each point feature has assigned coordinates when finished with photo processing for a study year.

1. You cannot be editing your Photo Objects layer while adding XY coordinates. Before using AlaskaPak, make sure to save your edits and stop editing. To save edits, click on the Editor pull down menu in the Editor toolbar and select Save Edits. To stop editing, click on the Editor pull down menu in the Editor toolbar and selecting Stop Editing.
2. Click on the AlaskaPak pull down menu in the AlaskaPak toolbar and select Add Attributes > Add XY Coordinates.
3. Change the information in the Add Coordinates window to look like this:

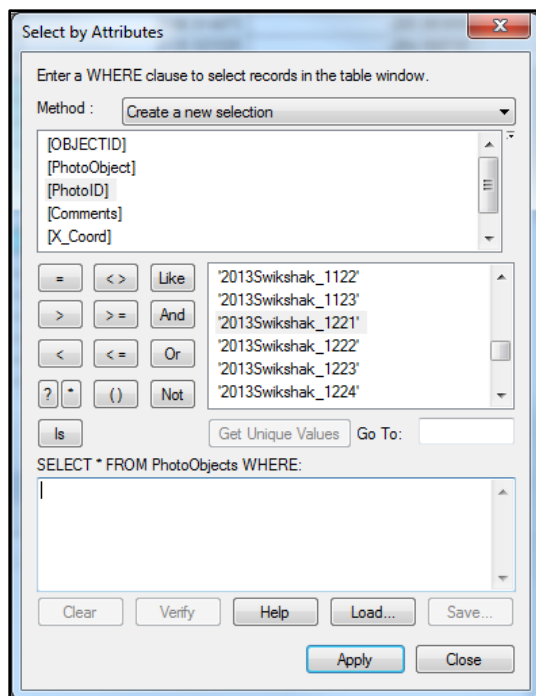
4. Select Ok. There should be X_Coord and Y_Coord fields present in the Photo Objects Attribute Table, with coordinate numbers present for each point feature. Scroll up and down in the Attribute Table if they do not appear immediately, and they should show up.

Photo Objects						
OBJECTID *	SHAPE *	PhotoObject	PhotoID	Comments	X_Coord	Y_Coord
1565	Point	Bear	2013Swikshak_1704	<Null>	2289.152271	-273.148802
1566	Point	Bear	2013Swikshak_1704	<Null>	1220.999985	-292.873322
1567	Point	Bear	2013Swikshak_1704	<Null>	1321.21373	-291.873986
1568	Point	Bear	2013Swikshak_1704	<Null>	2633.168664	-266.253735
1569	Point	Bear	2013Swikshak_1704	<Null>	2577.315972	-346.728418
1570	Point	Bear	2013Swikshak_1704	<Null>	2508.514109	-325.510595
1571	Point	Bear	2013Swikshak_1705	<Null>	2558.661722	-335.508221
1572	Point	Bear	2013Swikshak_1705	<Null>	2578.964557	-276.744555
1573	Point	Bear	2013Swikshak_1705	<Null>	2564.523828	-274.313887
1574	Point	Bear	2013Swikshak_1705	<Null>	2560.949383	-266.450155
1575	Point	Bear	2013Swikshak_1705	<Null>	2442.993007	-270.310614
1576	Point	Bear	2013Swikshak_1705	<Null>	2464.582579	-271.168363
1577	Point	Bear	2013Swikshak_1705	<Null>	2205.430434	-278.359457
1578	Point	Bear	2013Swikshak_1705	<Null>	1991.5214	-280.970021
1579	Point	Bear	2013Swikshak_1705	<Null>	427.256329	-282.342144
1580	Point	Bear	2013Swikshak_1706	<Null>	2749.968524	-275.782714
1581	Point	Bear	2013Swikshak_1706	<Null>	2675.690085	-281.951101
1582	Point	Bear	2013Swikshak_1706	<Null>	2550.007791	-277.83893
1583	Point	Bear	2013Swikshak_1706	<Null>	2498.604017	-277.324845
1584	Point	Bear	2013Swikshak_1706	<Null>	2486.78119	-282.979271
1585	Point	Bear	2013Swikshak_1706	<Null>	2451.569539	-284.007316
1586	Point	Bear	2013Swikshak_1706	<Null>	2342.822835	-283.290441
1587	Point	Bear	2013Swikshak_1707	<Null>	2799.840398	-296.663435
1588	Point	Bear	2013Swikshak_1707	<Null>	2724.16177	-303.409175

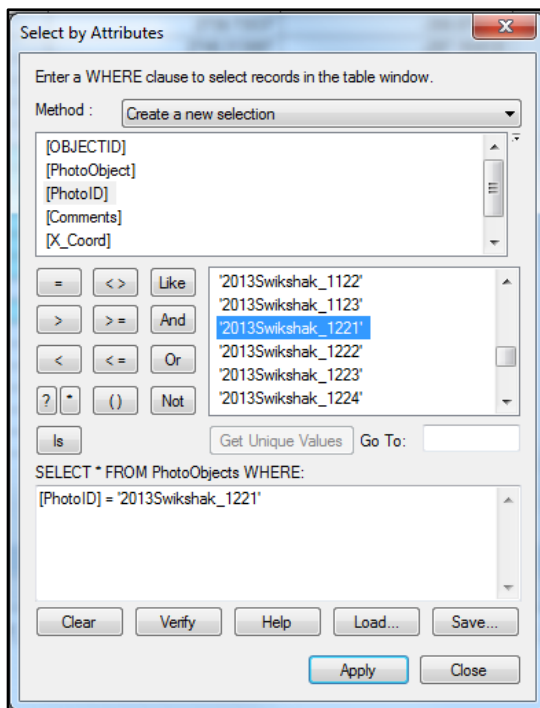
Select By Attributes Function

Select By Attributes proves extremely useful in large datasets when trying to seek out specific values in an Attribute Table. For example, you can use Select By Attributes to figure out how many humans you've digitized total, how many points were digitized in a specific photo, or to find errors when doing QA/QC. Select By Attributes works by running a user-created query that selects all rows containing the value(s) the user is searching for.

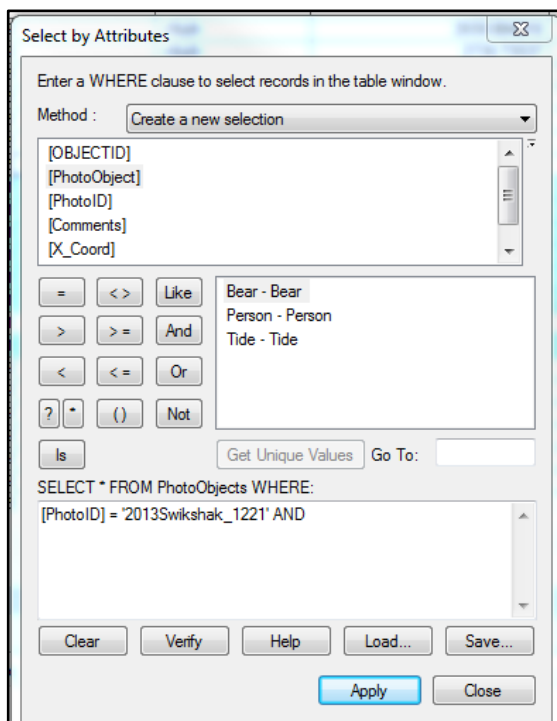
1. Click the Table Options pull down menu in the Attribute Table and choose Select By Attributes. For this example, the user will be trying to figure out how many bears he or she digitized in photo 2013Swikshak_1221. This means that the query will need to have two parts: one clause addressing the Photo ID field, and one clause addressing the Photo Object field.
2. Select the first field you want to enter into your query from the list, and click Get Unique Values. This will display the name of each value presently occupying this column in the Attribute Table. This is a good way to check for data entry errors, as misspelled values will show up as well. Since the user is trying to select points from a specific photo, select [PhotoID] from the first box, and Click Get Unique Values. This will bring up every photo name presently in the Attribute Table in the second box.



3. Begin to build a query in the SELECT*FROM box according to the user's needs. Double click [PhotoID] in the first box to bring it into the SELECT*FROM box. Insert a space, then click the equal sign. Insert another space. Finally, scroll through the second box to find the photo named 2013Swikshak_1221. Double click to bring it into the SELECT*FROM box. You now have the first half of your query, which states that for the values to be selected from the Photo Objects layer, the Photo ID field needs to read 2013Swikshak_1221.



4. To be selected, the points you're looking for not only need to have a Photo ID value of 2013Swikshak_1221 – they also need to have a Photo Object value of Bear. Because of this, the user must add an AND operator to their query. Insert a space after '2013Swikshak_1221' and double click the And button to add one into the SELECT*FROM box.
5. Repeat Step 2, but for the Photo Object field now. Select [PhotoObject] from the first box, and Click Get Unique Values. This will bring up every photo object presently in the Attribute Table in the second box. Only a few values should show up, as there are only so many photo objects to choose from in the domain.



- Now build the second half of your query. Double click [PhotoObject] in the first box to bring it into the SELECT*FROM box. Insert a space, then click the equal sign. Insert another space. Finally, double click Bear to bring it into the SELECT*FROM box. You now have the second half of your query, which states that for the values to be selected from the Photo Objects layer, the Photo Object field needs to read Bear. The final query should read:

```
SELECT * FROM PhotoObjects WHERE:
[PhotoID] = '2013Swikshak_1221' AND [PhotoObject] = 'Bear'
```

Select By Attributes will now highlight all bear points in photo 2013Swikshak_1221.

OBJECTID *	SHAPE *	PhotoObject	PhotoID	Comments	X_Coord	Y_Coord
659	Point	Bear	2013Swikshak_1121	<Null>	2418.986554	-270.430388
660	Point	Bear	2013Swikshak_1121	<Null>	2185.440704	-267.471431
661	Point	Bear	2013Swikshak_1121	<Null>	-156.212459	-309.917607
663	Point	Tide	2013Swikshak_1122	<Null>	2939.994919	-370.618907
664	Point	Bear	2013Swikshak_1122	<Null>	2739.73537	-309.870437
666	Point	Bear	2013Swikshak_1123	<Null>	2748.313087	-297.164038
667	Point	Bear	2013Swikshak_1123	<Null>	2217.174273	-266.188356
668	Point	Bear	2013Swikshak_1123	<Null>	2186.914073	-265.893856
669	Point	Bear	2013Swikshak_1123	<Null>	2135.523325	-264.568705
665	Point	Tide	2013Swikshak_1123	<Null>	2940.031373	-369.532623
674	Point	Bear	2013Swikshak_1221	<Null>	2403.971058	-270.440723
677	Point	Bear	2013Swikshak_1221	<Null>	2117.458671	-284.3832
676	Point	Bear	2013Swikshak_1221	<Null>	2384.121623	-273.156934
675	Point	Bear	2013Swikshak_1221	<Null>	2378.166817	-270.179544
672	Point	Bear	2013Swikshak_1221	<Null>	2566.664166	-276.966076
671	Point	Bear	2013Swikshak_1221	<Null>	2729.781473	-302.151881
670	Point	Tide	2013Swikshak_1221	<Null>	2939.997984	-367.184879
673	Point	Bear	2013Swikshak_1221	<Null>	2504.234131	-277.5842
679	Point	Bear	2013Swikshak_1222	<Null>	2768.574982	-295.592095
680	Point	Bear	2013Swikshak_1222	<Null>	2502.978363	-279.620889
681	Point	Bear	2013Swikshak_1222	<Null>	2372.979404	-272.066474
682	Point	Bear	2013Swikshak_1222	<Null>	2344.138855	-286.321024
683	Point	Bear	2013Swikshak_1222	<Null>	2320.270857	-280.409224
678	Point	Tide	2013Swikshak_1222	<Null>	2939.978173	-369.29239
686	Point	Bear	2013Swikshak_1223	<Null>	2586.610573	-280.254148

- Click the Show Selected Records icon to view only these highlighted values in the Attribute Table.



OBJECTID *	SHAPE *	PhotoObject	PhotoID	Comments	X_Coord	Y_Coord
671	Point	Bear	2013Swikshak_1221	<Null>	2729.781473	-302.151881
672	Point	Bear	2013Swikshak_1221	<Null>	2566.664166	-276.966076
673	Point	Bear	2013Swikshak_1221	<Null>	2504.234131	-277.5842
674	Point	Bear	2013Swikshak_1221	<Null>	2403.971058	-270.440723
675	Point	Bear	2013Swikshak_1221	<Null>	2378.166817	-270.179544
676	Point	Bear	2013Swikshak_1221	<Null>	2384.121623	-273.156934
677	Point	Bear	2013Swikshak_1221	<Null>	2117.458671	-284.3832

Entering Data in a Photo Information Table

As stated earlier in the protocol, for each site and study year a Photo Information table exists that contains the name, date, and time of each photo. The purpose of this table is to keep track of whether a photo can be scored or not, and to categorize the tide stage. You have two choices: edit the table in Excel, or edit it in ArcMap. Excel allows batch editing while ArcMap does not, and the Excel table can be imported later. ArcMap allows you to contain all your information in one program, but you cannot batch edit. The image below shows editing in ArcMap.

OBJECTID	File_name	date	time	Tide	Scored	Reason
1690	2013Swikshak_1690.JPG	2013-07-12	07:40:14	medium	yes	<Null>
1691	2013Swikshak_1691.JPG	2013-07-12	08:10:14	medium	yes	<Null>
1692	2013Swikshak_1692.JPG	2013-07-12	08:40:14	low	yes	<Null>
1693	2013Swikshak_1693.JPG	2013-07-12	09:10:14	low	yes	<Null>
1694	2013Swikshak_1694.JPG	2013-07-12	09:40:14	low	yes	<Null>
1695	2013Swikshak_1695.JPG	2013-07-12	10:10:14	low	yes	<Null>
1696	2013Swikshak_1696.JPG	2013-07-12	10:40:15	low	yes	<Null>
1697	2013Swikshak_1697.JPG	2013-07-12	11:10:15	low	yes	<Null>
1698	2013Swikshak_1698.JPG	2013-07-12	11:40:15	low	yes	<Null>
1699	2013Swikshak_1699.JPG	2013-07-12	12:10:15	low	yes	<Null>
1700	2013Swikshak_1700.JPG	2013-07-12	12:40:15	low	yes	<Null>
1701	2013Swikshak_1701.JPG	2013-07-12	13:10:15	low	yes	<Null>
1702	2013Swikshak_1702.JPG	2013-07-12	13:40:15	low	yes	<Null>
1703	2013Swikshak_1703.JPG	2013-07-12	14:10:15	low	yes	<Null>
1704	2013Swikshak_1704.JPG	2013-07-12	14:40:15	low	yes	<Null>
1705	2013Swikshak_1705.JPG	2013-07-12	15:10:15	low	yes	<Null>
1706	2013Swikshak_1706.JPG	2013-07-12	15:40:15	low	yes	<Null>
1707	2013Swikshak_1707.JPG	2013-07-12	16:10:15	low	yes	<Null>
1708	2013Swikshak_1708.JPG	2013-07-12	16:40:15	medium	<Null>	<Null>
1709	2013Swikshak_1709.JPG	2013-07-12	17:10:15	medium	<Null>	<Null>
1710	2013Swikshak_1710.JPG	2013-07-12	17:40:15	high	<Null>	<Null>
1711	2013Swikshak_1711.JPG	2013-07-12	18:10:15	very high	<Null>	<Null>
1712	2013Swikshak_1712.JPG	2013-07-12	18:40:15	very high	<Null>	<Null>
1713	2013Swikshak_1713.JPG	2013-07-12	19:10:16	very high	<Null>	<Null>
1714	2013Swikshak_1714.JPG	2013-07-12	19:40:16	high	<Null>	<Null>

1. You must be in Editing mode to enter data into this table. Click the Editor pull down menu in the Editor toolbar and select Start Editing. Ignore the “Spatial reference does not match data frame” warning you may encounter.
2. Each time a photo is processed, record “yes” or “no” in the Scored column. If no, state the reason why the photo cannot be scored. Common reasons include: “weather,” “dark,” “blurry,” “bad angle” (if someone was performing maintenance on the camera at the time), or depending on the year and study site, “skip” (e.g. for Swikshak, when skipping every other day of photos).
3. Enter tide stage categorizations for each photo in the Tide column – low, medium, high, or very high (See “Categorizing Tide Stage”).

Categorizing Tide Stages

Use these photos as a guide for categorizing tide stage at these sites or evaluating other study sites.

Katmai Bay

Low



Medium



High



Very High



Swikshak Lagoon

Low



Medium



High



Very High



Georeferencing Photos

As stated in the Protocol Objectives, camera shifting occurs over the course of the season due to weather factors, but the camera views in every photo must closely align to establish correct spatial data for photo objects. Images must be georeferenced to a base photo of the study site to ensure locational accuracy of digitized points.

About Georeferencing

Excerpt from the ESRI ArcGIS Resource Center:

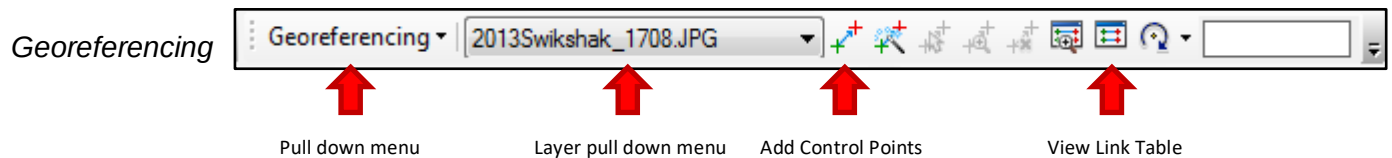
http://webhelp.esri.com/arcgisdesktop/9.2/index.cfm?TopicName=Georeferencing_a_raster_dataset

“Generally, you will georeference your raster dataset using existing spatial data (target data), such as a vector feature class, that resides in the desired map coordinate system. The process involves identifying a series of ground control points—known x,y coordinates—that link locations on the raster dataset with locations in the spatially referenced data (target data). Control points are locations that can be accurately identified on the raster dataset and in real-world coordinates. There are many different types of features that can be used as identifiable locations, such as road or stream intersections, the mouth of a stream, rock outcrops, the end of a jetty of land, the corner of an established field, street corners, or the intersection of two hedgerows.

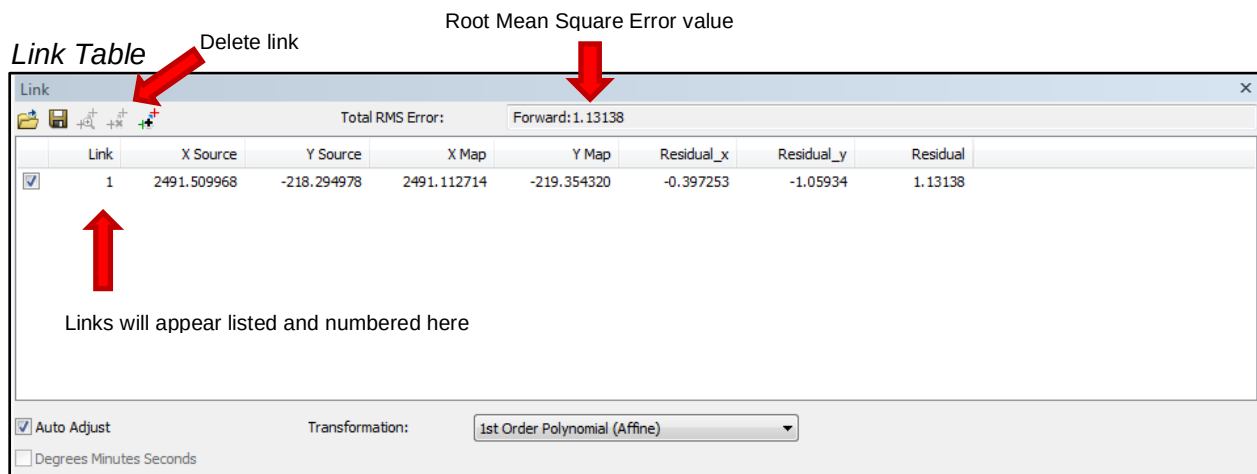
The control points are used to build a polynomial transformation that will convert the raster dataset from its existing location to the spatially correct location. The connection between one control point on the raster dataset (the from point) and the corresponding control point on the aligned target data (the to point) is a link.”

In this case, the “raster dataset” and “target data” are the current photo and the base image, respectively. Additionally, since they are both .JPG files, both are raster data. Even though the base photo is not vector data in a coordinate system, it has been spatially referenced, so it serves as the target.

ArcMap Toolbars needed

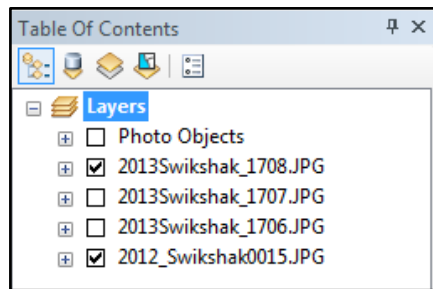


ArcMap Windows needed

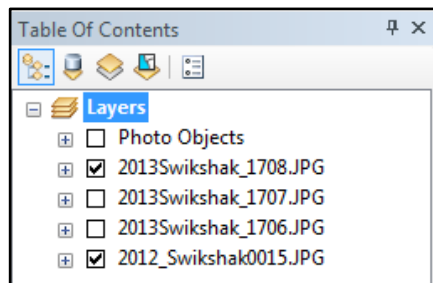


How to Georeference Photos

1. View the photos at a scale in ArcMap wherein you can visualize almost the entire extent.
2. Use the Swipe tool in the Effects toolbar to analyze how well the latest image and the base image align.
 - a. Select the current (new) photo name in the pull down menu on the Effects toolbar.
 - b. Make sure no layers are turned on in the Table of Contents between the current photo and the base photo. Make sure the Photo Objects layer is turned off.



- c. Click the Swipe button on the Effects toolbar. Notice that your cursor has turned into a triangle that changes direction depending on where it is in your window.
 - d. Swipe up and down or from side to side (up and down is best) to determine how much shifting has occurred between photos. If the latest photo overlays with the base photo with little to no movement, then you can start editing Photo Object points and digitizing the new photo. If the latest photo shifts slightly, see Step 3.
3. If the latest photo shifts slightly, you need to georeference it using the Georeferencing toolbar.
 - a. Select the current (new) photo name in the pull down menu on the Georeferencing toolbar.
 - b. Make sure both the base photo and the one to be georeferenced are turned on. Always order the base photo below any other layers in the Table of Contents, and make sure no layers are turned on in the Table of Contents between the current photo and the base photo. Make sure the Photo Objects layer is turned off.

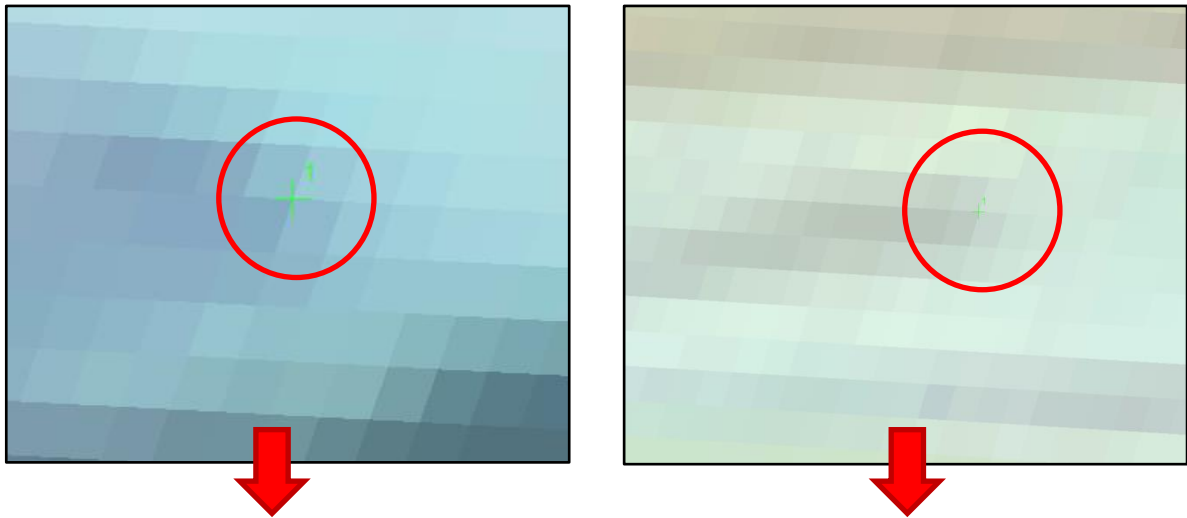


- c. Select the Point-to-Point button on the Georeferencing toolbar. Notice that your cursor has turned into crosshairs. To return to these crosshairs at any time, click the Point-to-Point button again.
- d. Click the View Link Table button on the Georeferencing toolbar. This allows you to view all the links you've created, test their accuracy by turning them on or off, or delete any you don't want.
- e. Find a feature that is consistent between the base image and the one to be georeferenced (e.g. a rock, a stump, places where land or forest comes to a point, where ridges meet the ground, crests or peaks of distant mountains, etc.)



In these tidally-influenced bays, it is important to pick features that are not affected by changes in water height across images. For example, if choosing to mark a shoreline feature, be aware of consistency.

- f. Zoom in to view the feature at a scale that allows you to see individual pixels. To decide which pixel you would like to use as a reference, you may flip back and forth between the new and base images by turning the photo off and on again using the checkbox in the Table of Contents, or by using the Swipe tool. Make sure the new image is turned on before you make your first control point.
- g. With the Point-to-Point button selected, align your crosshairs with a corner of your reference pixel. Click this corner to establish your first point.



- h. Turn off the current image and select the same (or as close as you can find to the same) corner of the pixel on the base image. You have now created a link that brings the two images closer to accurate spatial and visual alignment.



- i. Continue choosing other features and establishing control points in this manner until the images line up with little to no shifting. Create at least 3 links, but the more you have, the better the images will align and the smaller your “Total RMS Error” in the link table will be. 4-10 links typically align images well. Test your accuracy and alignment by turning any link(s) on and off in the Link Table that you feel might be causing distortion or a high RMSE. To delete any inaccurate links, select the link in the Link Table and click the Delete Link button.
- j. When you are finished, select the Update Georeferencing option in the Georeferencing pull down menu on the Georeferencing Toolbar. This will create a .JGwx file named after the new image in the Windows Explorer folder containing the photos.

	2013Swikshak_1708.JPG	7/12/2013 4:40 PM	JPEG image	3,806 KB
	2013Swikshak_1708.JGwx	10/28/2014 11:07 ...	JGWX File	1 KB
	2013Swikshak_1708.JGw	10/16/2014 9:44 AM	JGW File	1 KB

- k. Delete the original .JGw file and rename the newly created .JGwx as .JGw. You can now continue to copy, paste, and rename this file while analyzing photos until there is a noticeable shift in the camera, at which point you will have to georeference again.

	2013Swikshak_1708.JPG	7/12/2013 4:40 PM	JPEG image	3,806 KB
	2013Swikshak_1708.JGw	10/16/2014 9:44 AM	JGW File	1 KB

4. Save your MXD once you have finished. To save your MXD, click the Save icon in the Standard toolbar.

Quality Control in ArcMap

When finished with photo processing for a study year, complete these data checks in the Photo Objects Attribute Table to eliminate errors before analysis.

1. Check for points with “Null” values in the Photo Object or Photo ID fields – you may have forgotten to fill in their information, they may have been placed accidentally, or don’t actually exist. Right-click either of those field headings and select Sort Ascending to bring any points with null values in these fields to the top for investigation.
2. Check for any points missing XY coordinates. Right-click either of those field headings and select Sort Ascending to bring any points with null values in these fields to the top. Re-add coordinates with AlaskaPak if necessary.
3. Check for possible misspellings in the Photo ID field. Right-click the field heading and select Sort Ascending to bring any points with misspelling in this field to the top for correction.
4. If any more specific QA/QC problems arise, run a query with the Select By Attributes method to search for and correct errors.

AlaskaPak and Theme Manager Installation Instructions

Double click to open:

Accessing Theme Manager & the AlaskaPak Toolbar in ArcGIS 10.2.x for Desktop

Alaska Regional Office - GIS Team Cheat Sheet
Last Modified: July 9, 2014

Purpose

This document is intended to provide instructions on how to access Theme Manager and the AlaskaPak toolbar in ArcMap 10.2.x (i.e. versions 10.2, 10.2.1, and 10.2.2). In the Alaska Region we recommend using both of these products alongside ArcGIS Desktop.

Before You Begin

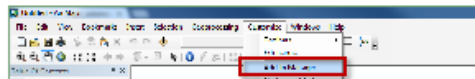
These instructions were written for ArcGIS 10.2.x for Desktop. Please make sure you have upgraded your software before using this cheat sheet. [Installation instructions](#) can be found on the [AKRO GIS Intranet Site](#) under GIS Help Desk → Cheat Sheets.

Adding the AlaskaPak Toolbar to ArcMap 10.2.x

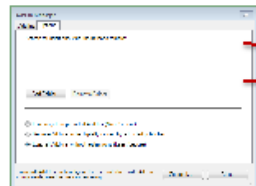
AlaskaPak is a collection of tools for use with ArcMap. These tools are designed to augment the functionality of ArcMap by providing easy to use tools for many common tasks performed by resource managers, GIS technicians, and other scientists. To access these tools from ArcMap, you will need to install the AlaskaPak add-in. The following instructions explain how to do so.

Installing the AlaskaPak Toolbar

1. Open ArcMap.
2. Click on the Customize menu and select Add-In Manager.



3. Within the Add-In Manager, click on the Options tab.
 - a) If you *do not* see any add-in folders already listed, *move on to Step 4*.
 - b) If you *do* see an add-in folder listed, *you will need to follow the steps found in Appendix A (pp. 4-5) to install the AlaskaPak toolbar*.



If an add-in folder was listed, it would be located in this list box. In this example, no add-in folders are listed.