

Georeferencing Workflow

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Workflow for Georeferencing: Bring in TIF file, Make control points, Choose transformation, export to raster

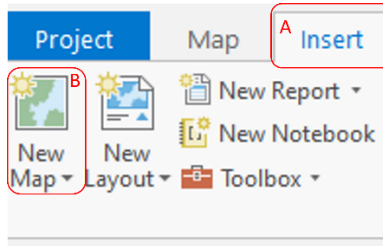
We began by setting the map projection so that it display a map to be able to reference the full extent of the image. The TIFF file was added to the map, and repositioned so that control points could be added. The coastline shapefile that the image was being georeferenced to was added to the map and checked for correct projection.

Using the Georeference tab, control points were selected across the map for minimize distortion and focus on georeferencing accuracy in specific sections. When an appropriate number of control points were added, the transformation tool under the Georeference tab was used to fit the image to the coastline shapefile.

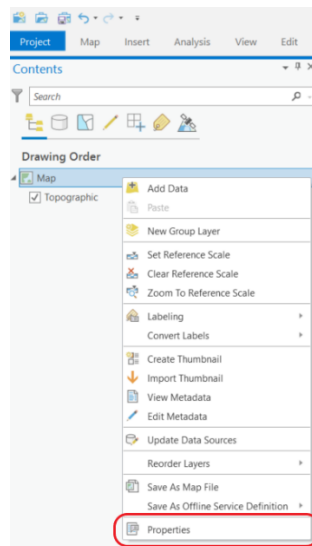
The control points were exported as a separate file, and the image was exported as a new TIFF file that is georeferenced.

Getting started

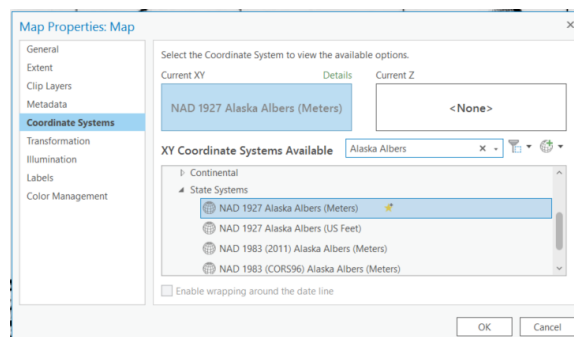
1. Open ArcGIS Pro
2. Insert map
 - a. Click on **Insert** Tab
 - b. Click **New Map**



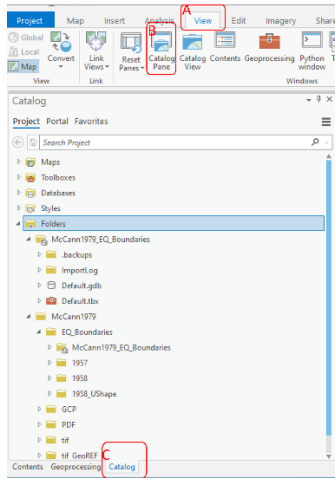
3. Change Map Projection
 - a. Right click on Map under the Contents Pane
 - b. Click on Properties



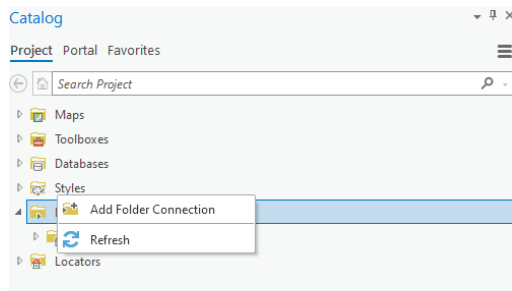
- c. Select Coordinate Systems from the left side of the menu
- d. Type Alaska Albers into the search bar, then select the option for NAD 1927 Alaska Albers (Meters) under the State System drop down

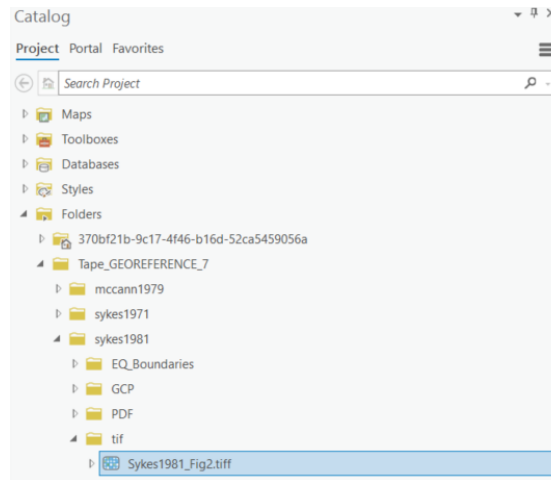


- e. This will ensure that the background image covers the extent of the Aleutian Islands
4. Bring in TIF file
- a. Click **Catalog Pane**
 - b. Click **Catalog** tab at the bottom of the page

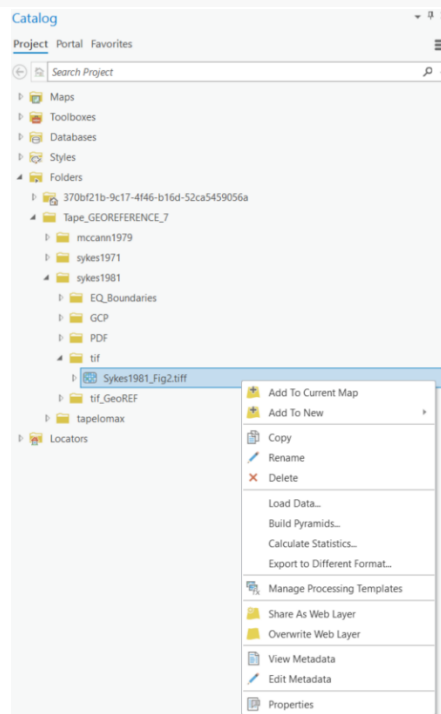


- c. Right click on **Folders** and **Add folder**
- d. Select desired folder
- e. Expand folder to view the .tiff file





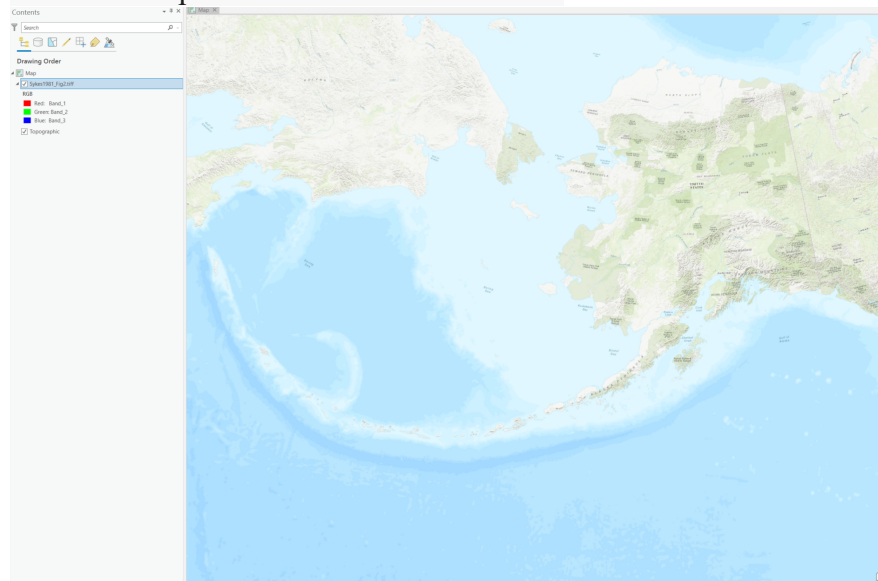
f. Right click on file and select “Add to Current Map”



- g. If a box pops up with the option to calculate statistics, click **No**
- h. Right click the .tiff file that has been imported and select **Zoom to Layer**. This will show up in the center of the ocean somewhere in the world since it is not georeferenced. We will change this in the next step.

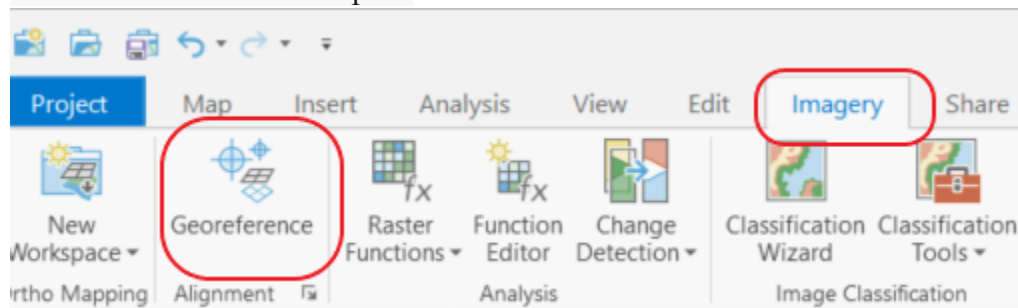


i. Move the map so that Alaska is in the view



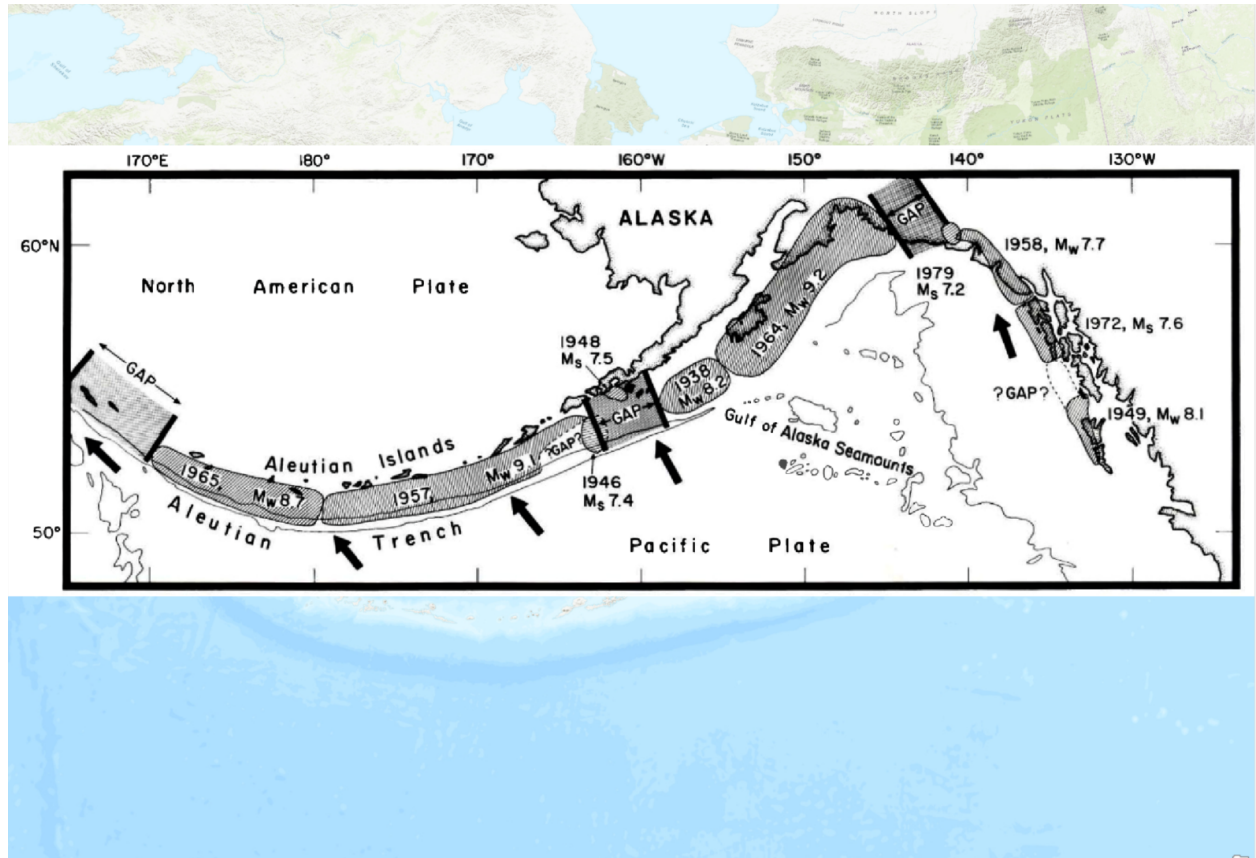
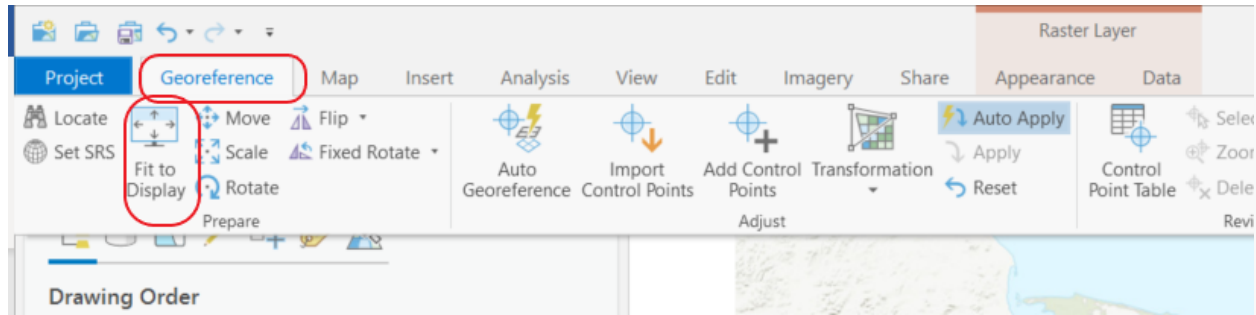
j. At the top of the page, select the **Imagery** tab

k. Choose the **Georeference** pane

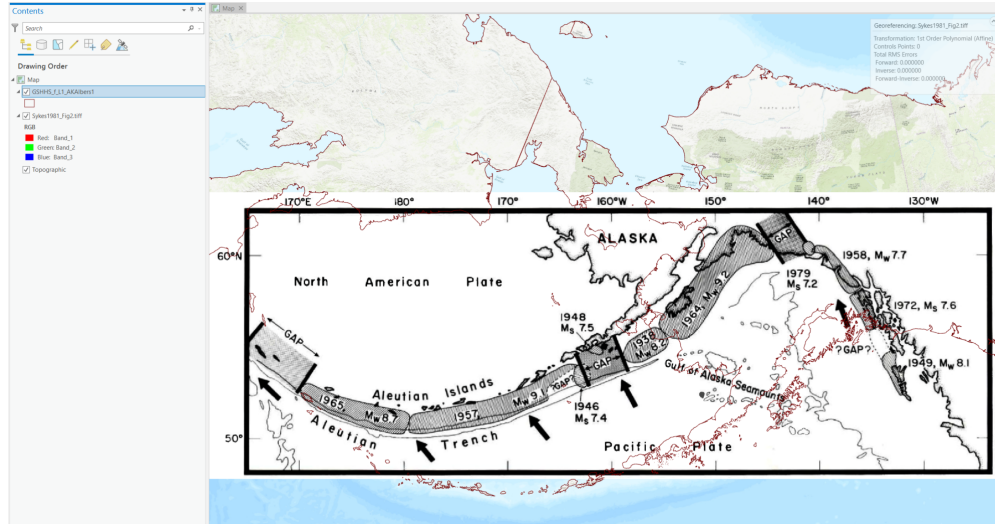


l. Select the opened **Georeference** pane

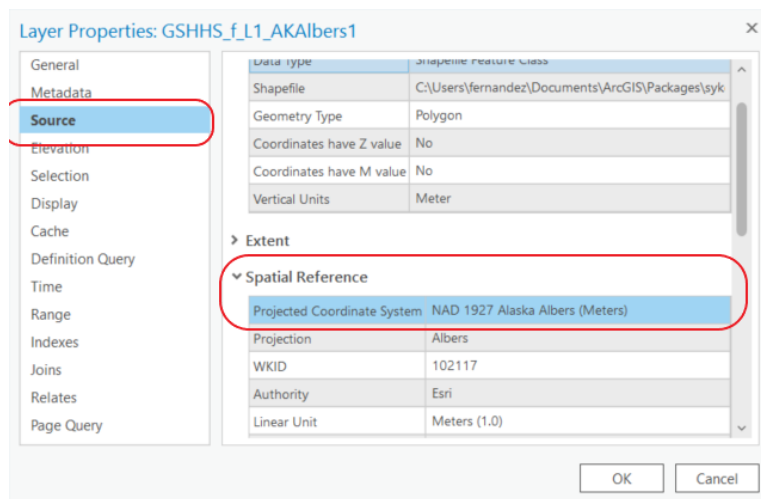
m. Select **Fit to Display** to place the image over Alaska



5. Bring in Coastline layer
 - a. In the Catalog pane, open the folder that contains the shapefile that you will georeference against
 - b. Right click on the shapefile and **Add to Current Map**
 - c. Ensure that coastline layer is overlaid on top of the tif image

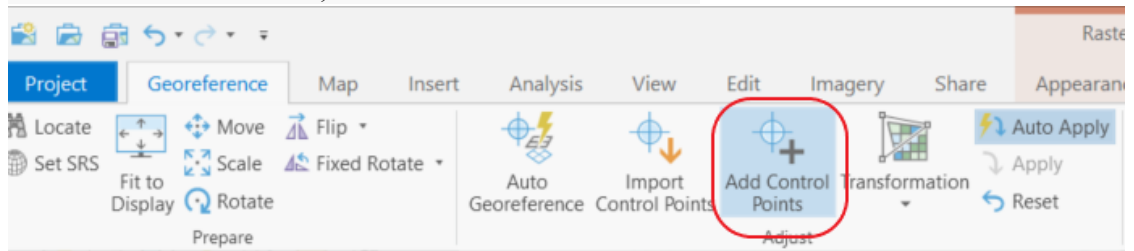


- d. Make sure that the coastline layer brought in matches the projection of the map by right clicking on the layer, selecting **Properties**, then selecting the **Source** option in the left side
- e. Click the drop down for **Spatial Reference** and confirm that it matches the map projection of **NAD 1927 Alaska Albers (Meters)**

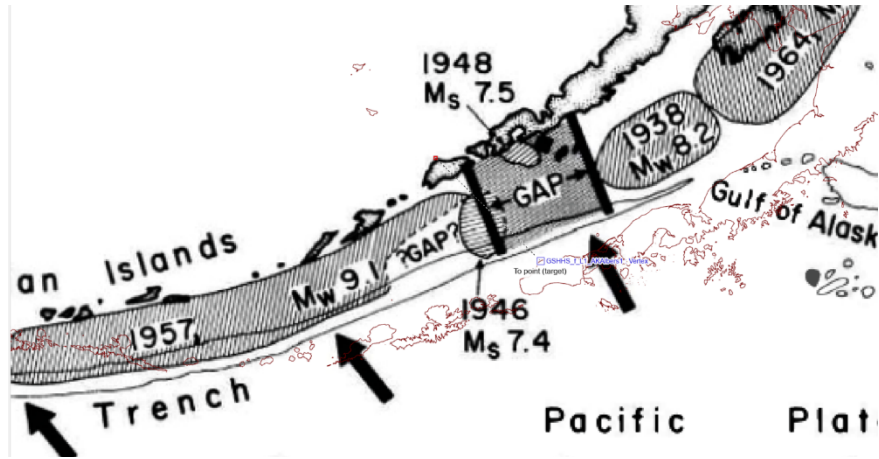


6. Creating Control Points

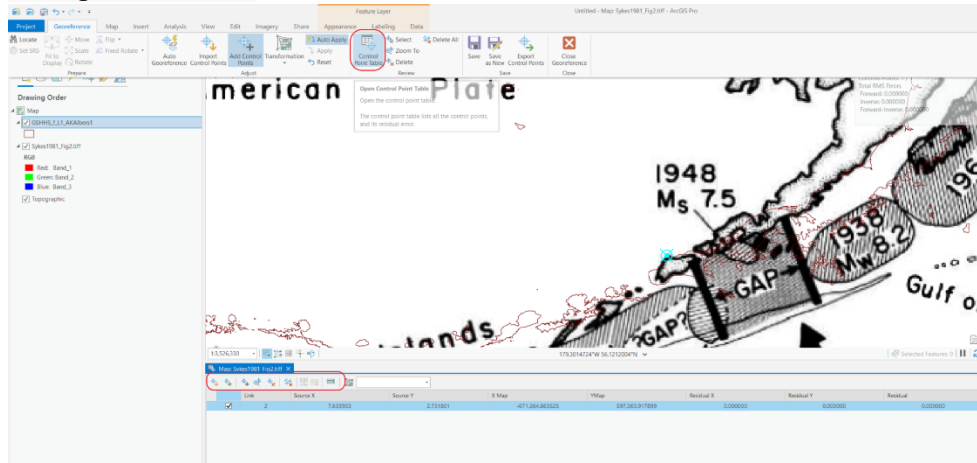
- a. In the **Georeference** tab, choose **Add Control Points**



- b. Select a point of the image that matches to a point on the layer you are georeferencing to. Make sure that the image point is selected before selecting the point on the coastline layer.



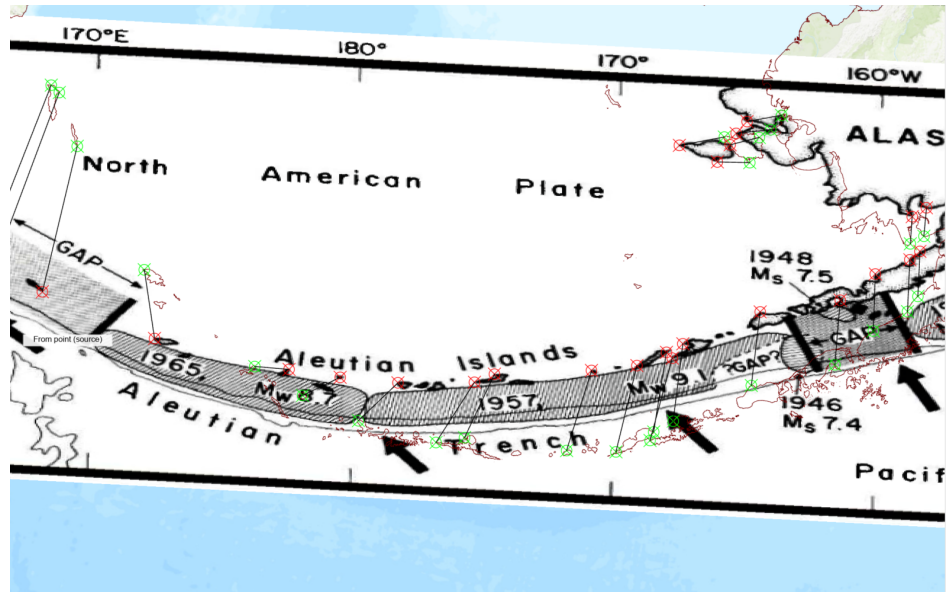
- c. In the **Georeference** tab, click **Control Points Table** to view the control points. Points can be selected, deleted, turned off or on from this table in the options at the top of the table.



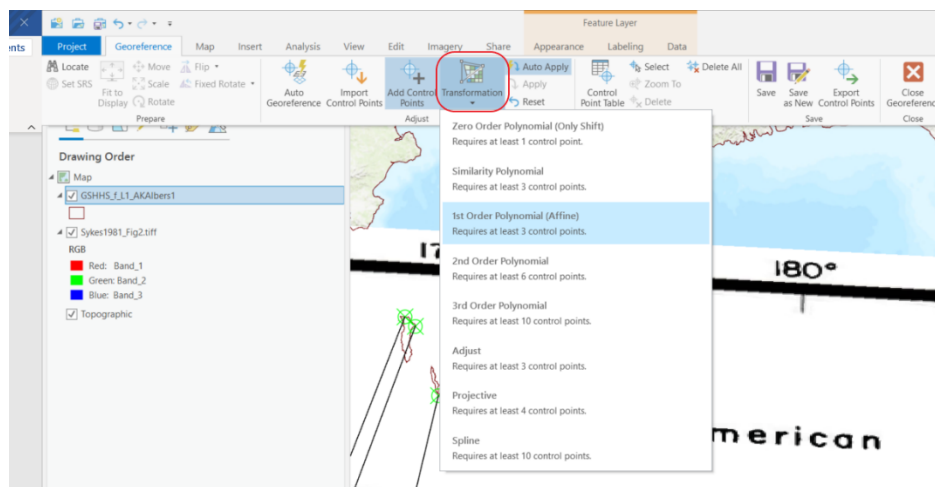
- d. As you add points, create a spread throughout the image so that it does not fold in on itself. For example, create one point in the upper left corner, then the next point in the lower right corner. More points can be created for specific areas of the image for which high accuracy is important.

7. Changing Transformations

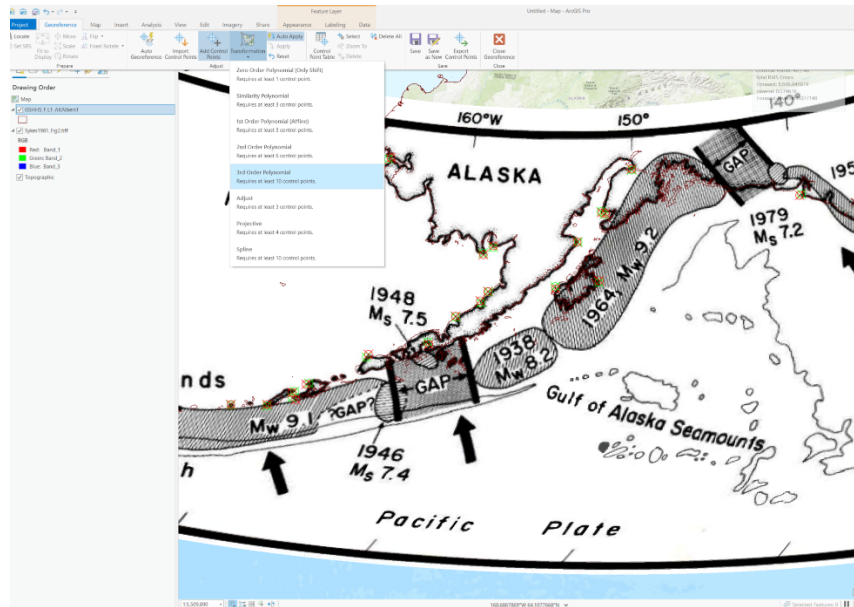
- a. More control points may lead to a more accurate georeferenced map. The control points will show the offset they have from the point selected on the tif image, and the point selected on the shapefile it is being referenced to.



- b. This can be fixed by changing the **Transformation** option found in the **Georeference** tab



- c. It is automatically set to 1st order Polynomial, but for this image we had 48 control points and the 3rd order polynomial transformation appeared to work best.



- d. For more information on transformations, see links below:

[Overview of georeferencing—ArcGIS Pro | Documentation](#)

[Understanding Raster Georeferencing \(esri.com\)](#)

[Test Georeferencing Transformations \(esri.com\)](#)

- e. Listed below are the number of control points and transformations we used for each image for this project:

File name: SYKES 1981

Transformation: 3rd Order Polynomial

Number of Control Points: 46

File name: McCANN 1979

Transformation: 3rd Order Polynomial

Number of Control Points: 69

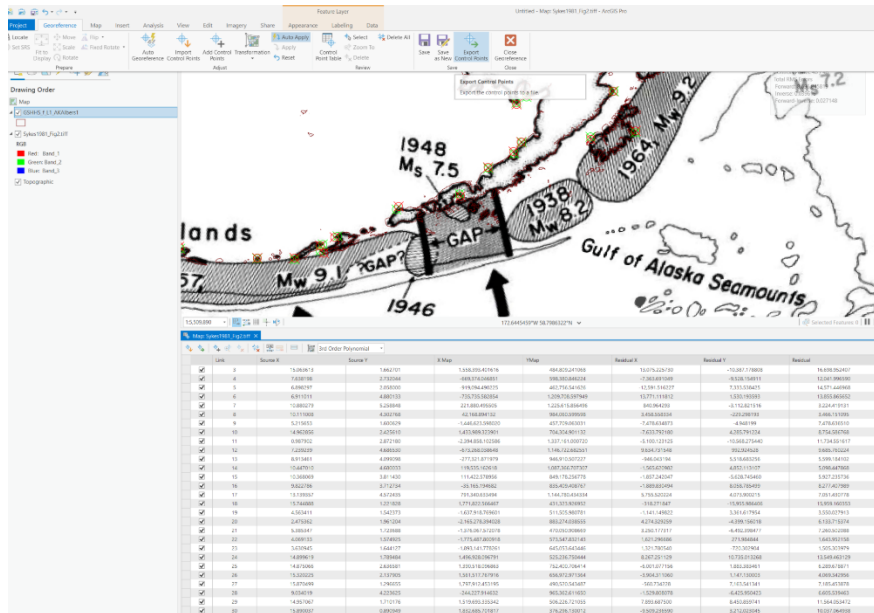
File name: SYKES 1972

Transformation: 3rd Order Polynomial

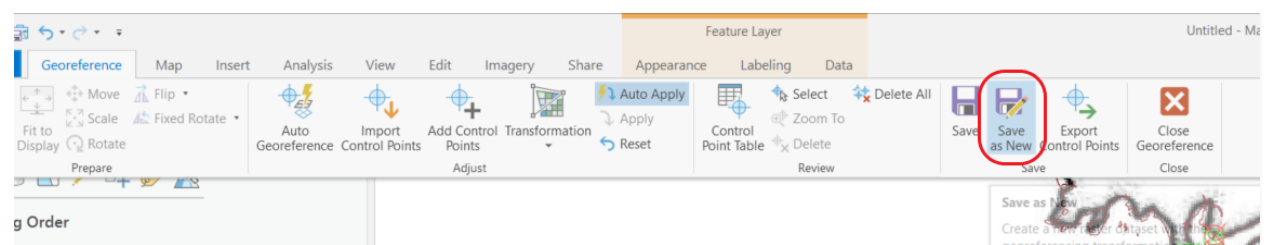
Number of Control Points: 70

8. Saving a new file

- a. Under the **Georeference** tab, select **Export Control Points**
- b. Save as a file. This will allow you to import the control points in automatically if you ever needed them again instead of manually remaking them.



c. Under the Georeference tab, select Save As New





- d. An **Export Raster** pane will appear on the right side of the screen
- e. Rename the **Output Raster Dataset** in the preferred location
- f. Confirm that **Output Format** is **TIFF**
- g. Click **Export** to create your new GeoTiff


Export Raster 7 - 9 x



Sykes1981_Fig2.RIFF


General Settings

Output Raster Dataset
 

Coordinate System
NAD_1983_Alaska_Albers_Meters 

Geographic Transformations
None 




Clipping Geometry 
Default 


Maintain Clipping Extent 

Cell Size
X Y


Raster Size
Columns Rows


Pixel Type
 8 Bit Unsigned
NoData value

Render Settings
 Force RGB 
 Use Columns 
 Use Renderer 

Output Format
TIFF 

Compression type

None 

Compression Quality 

Catalog Export Raster