Introduction: This exercise focuses on utilizing air photos and Quaternary geologic mapping of alluvial fan units to map active faults in the area of the Landers Earthquake. The aerial imagery for this assignment was acquired in 1975, prior to the 1992 M7.3 Landers Earthquake. "Aerial Photo Mosaics were the aerial photo finding aids during the creation and photo revision of the U.S. Geological Survey (USGS) topographic map series. The film is referenced as a series of photo indexes (mosaics), each of which consists of a single-sheet composite of many individual photos. The photos date from the 1937 through 1980, and they were originally acquired by a variety of sources, such as the USGS, Bureau of Land Management, National Park Service, U.S. Air Force, U.S. Navy, and the Army Map Service." (USGS).

Learning Goals – After completing the exercise you should have these skills:

- *Acquiring airphotos (georeferenced or not) through the USGS Earth Explorer (anywhere, not just the Mojave Desert setting of the rest of the assignment)*
- *Make a Quaternary geologic map in QGIS (emphasizes the surficial geology of the piedmont environments)*
- *Find geomorphic indicators of active faulting in a strike-slip environment to accurately locate and map a fault*
- *Relate the observable evidence in the landscape to your confidence ranking of the fault trace*

100 points total

Instructions:

1. Go to https://earthexplorer.usgs.gov and make an account. Find a place that interests you. Search for imagery. For datasets, select aerial imagery. Then find (a) an aerial photo single frame and (b) high resolution orthoimagery in your area of interest. Download one aerial photo and one orthoimage. Display them in QGIS and turn in a screen shot. Write a paragraph describing your imagery- When were the images acquired? Are they georeferenced? (don't georeference if not already georeferenced) Are they in color? What

is the resolution? What else is noteworthy? (Hint: For aerial photo single frames, search for earlier times. There is more high resolution orthoimagery in the eastern US and in Western urban areas. Think about why this might be true.) (15 points)

2. Download the georeferenced images for the Lander's Earthquake from the course website and open them in QGIS. Display both georeferenced aerial photos (you only need to use the geo_1VDWF00010175.tiff file for the mapping however). **Do not look at the base imagery**.

3. Spend 1 hour mapping the Quaternary geologic units in the defined mapping boundary. Use the 'Lander_GeologicMapUnits.shp' shapefile and stylefile found on the course website. Refer to the class video on mapping polygons in QGIS for reference. Turn in a screenshot of your mapping as well as the shapefile(s) with a explanation. (25 points)

4. Spend 30 minutes – 1 hour mapping the geomorphic features in the landscape using the Geomorphic Indicator Ranking point shapefile. Remember this is a strike-slip system so the feature input for the GIR Feature Attribute should reflect that. From the geologic map and geomorphic features, draw a fault trace with a red line. Include a screenshot with annotated symbols for the GIR point features. (25 points)

5. Break the initial fault trace into 1-km segments (if trace is less than 1 km, do not segment). Using your own geologic intuition, look at the quantity and ranking of features within each segment along an entire trace and assign a final fault confidence ranking score to each segment. Include a screenshot with the updated fault trace. (15 points)

6. Export the mapped geologic unit shapefiles (with style file), the GIR_Feature shapefile (with style file) and the Fault Ranking Confidence shapefile (with stye file) to a known location on your computer. Zip them into one folder with 'LastName_FirstName_Landers' and email to rnadam@asu.edu and cpscott1@asu.edu

   For help saving and exporting shapefiles correctly, see Chelsea's video: https://www.youtube.com/watch?v=xuxXi9SCu-I
   (5 points)

7. Write a one-page summary: (15 points)
    a. The first paragraph should be a description of the observed landforms and Quaternary units; their sizes, shapes, orientations, and other characteristics. How are these features different than the previous mapping areas?
    b. The second paragraph should be an interpretation (only based on your mapping, no need to look anything up). What do you think the main processes were that formed the mapped features? Include a very brief geologic history.
    c. In the third paragraph, explain your reasoning for the assignment the fault confidence rankings (strong, distinct, weak, uncertain). Explain also in a few sentences the evidence that helped you determine primary versus secondary faulting.