Introduction: This exercise focuses on identifying tectonic landforms in a strike-slip faulting environment. Wallace Creek, California is along the San Andreas Fault System.

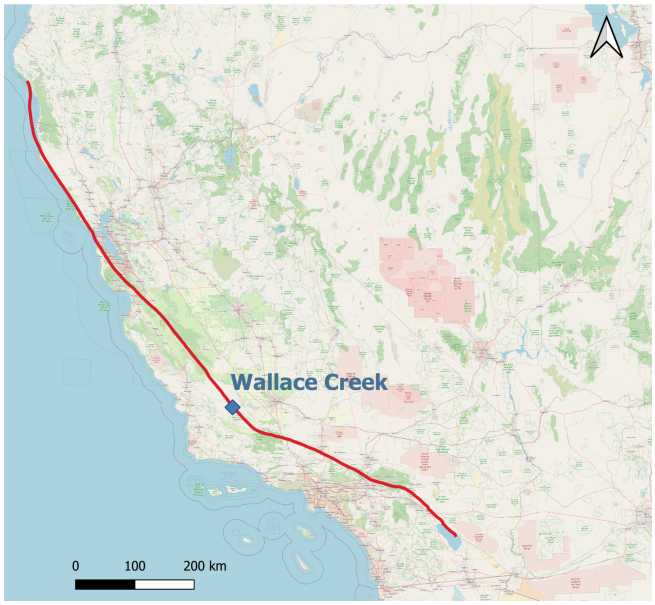


Figure 1: Location map showing Wallace Creek in along SAF south-central California. Los Angeles is at the southeast portion of the map area. Red line is a trace of San Andreas Fault.

Figure 2: Location of 1857 and 1906 rupture.

Instructions:

Mapping the San Andreas Fault (SAF) near Wallace Creek California

Rarely are tectonic landforms as well expressed and dated as they are at Wallace Creek along the San Andreas Fault in south-central California (Figure 1). In the area surrounding Wallace Creek are examples of most of the classic geomorphic features of strike-slip faults (Figures 2 and 3). These landforms were noted by numerous geologists through the early and mid 1900s as indicating horizontal motion along the SAF. The seminal work at the site was by Wallace, 1968; Sieh and Jahns, 1984; and Sieh and Wallace, 1987.

Learning Goals--After completing this exercise, you should have these skills:

- Create hillshades, slope shades, and contour maps for an area using QGIS. Please refer to the QGIS tutorial videos posted on the course website for help navigating the software. (http://activetectonics.asu.edu/mapping_active_faults/QGIS_videos/)
- Use aerial/satellite photography, topographic maps, and other topographic data to delineate landforms.
- Identify tectonic landforms along a strike-slip fault system

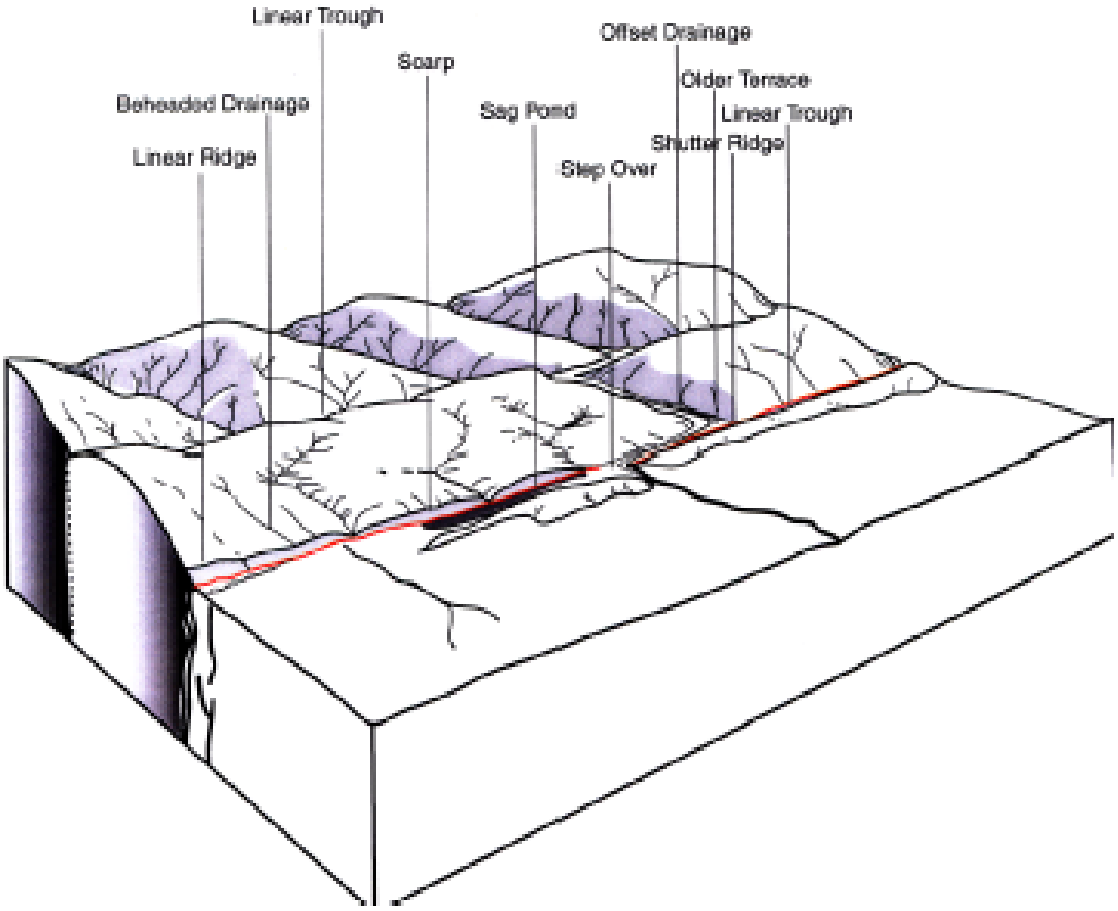


Figure 3: Block diagram showing landforms produced along recently active strike-slip faults (modified from Vedder and Wallace, 1970 by Jeri Young).

100 points total

1. Locate a base map over Wallace Creek using the WorldImagery in QGIS. Include a screenshot. (*5 points*)

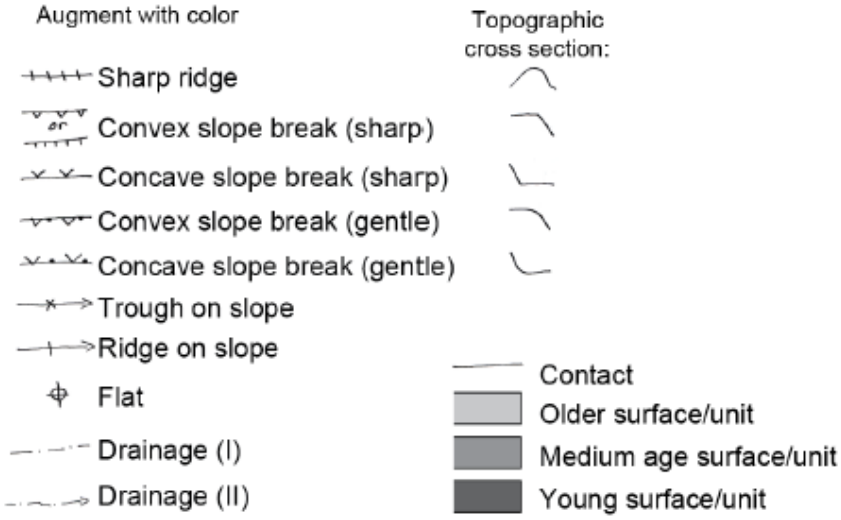
2. Load the wallace_creek_dtm.tif product into QGIS from the course website. This is derived from the "B4" lidar topography dataset available on OpenTopography (https://portal.opentopography.org/result?id=pc1642178564414) . The pre-computed file is in the shared Google Drive.

3. Produce a slope shade. Include a screenshot. Describe at least two landforms that you can see from the slope shade map. (*5 points*)

4. Produce a 1-meter contour interval map. Include a screenshot. (*5 points*)

5. Produce at least two hillshades. Include a screenshot of both. What angle(s) did you choose and why? Describe in one to two sentences the difference in the appearance of the landscape with different hillshade angles? (*5 points*)

6. Spend 30 minutes mapping the morphology of the area. Look for things like concave, convex, break in slope, etc. as shown in the below figure. Export the map as a PDF or take a screenshot to draw these features on the map and include an explanation if the symbology differs from below. (*20 points*).



7. From the locations of the morphologic elements, describe at least 3 landforms. What is the relationship between the landforms and faulting? (*5 points*)

8. Now, spend 30 minutes mapping the landforms associated with faulting. Some landforms you may see in this landscape are listed below and are shown in Figure 3. You may use whatever symbology you prefer for these features but make sure it is consistent and include an explanation (*25 points*).

    Beheaded drainages
    Offset drainages
    Sags
    Shutter ridges

Scarps
Different terrace levels (hint: look for terraces preserved near deeply incised channels).
Fault traces

9. Write a one page summary, use sketches as needed (*30 points*):
    a. The first paragraph: Description of the observed landforms; their sizes, shapes, orientations, and other characteristics.
    b. The second paragraph: An interpretation only based on your mapping, do not look anything up. What do you think the main processes were that formed the mapped features? What are the relative ages of the mapped features?
    c. The third paragraph should include a discussion of if some parts of the faults are better indicated in the surface geomorphology than others. Provide one or two points of evidence in your map to support your reasoning.