Alexa Melcon
Geography 360 Fall 2013
Michelle Goman
Lab 3

Stream Reach Characterization of Copeland Creek, Rohnert Park, California

Introduction

The following report describes a stream reach characterization of Copeland Creek, a small stream that flows from the west side of Sonoma Mountain down toward Sonoma State University. The portion of Copeland Creek examined is located within Fairfield Osborn Preserve, a 400 acre nature reserve owned by the university on the northwest flank of Sonoma Mountain (Figure 1). The preserve (1300-2000 feet in elevation) has a Mediterranean climate, with mild precipitation in winter and hot, dry summers interrupted by coastal fog. The dominant vegetation within the preserve includes chaparral grasslands and oak woodland.

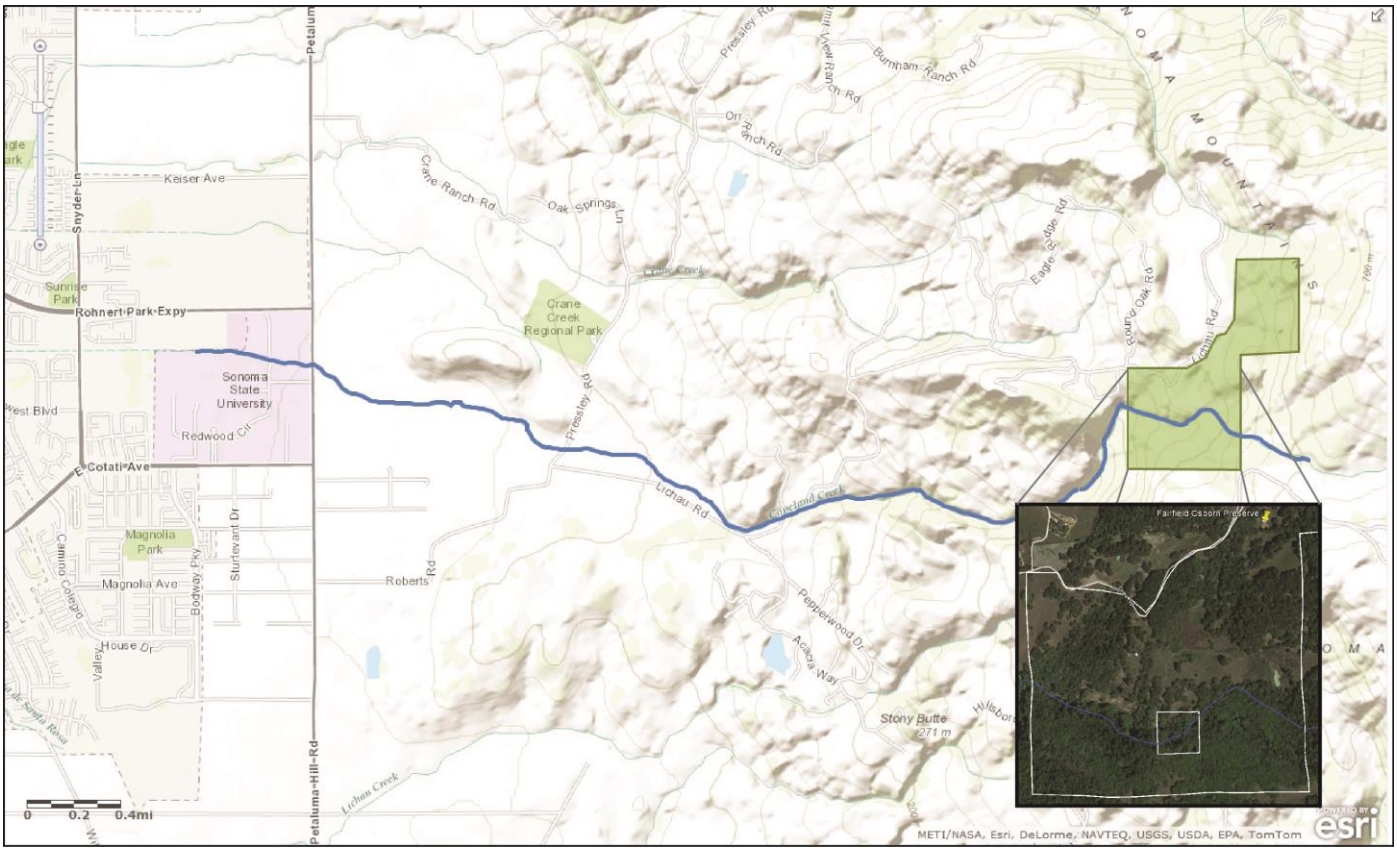


Figure 1. Index map showing location of Copeland Creek and Fairfield Osborn Preserve. The white box in the inset shows the fieldwork location

Methods

The methods used to characterize the stream include creating channel cross-sections and a longitudinal profile, a field sketch of the area, placement of erosion pins, and a Wolman pebble count. An arbitrary benchmark of 100 meters was used in all auto-level surveys. Measurements were recorded every 0.5 meters or at sudden slope changes for both the longitudinal profile and the cross-sections. Two half-field days were spent characterizing the stream as part of a geomorphology class at Sonoma State University, and the results are described below.

Results

A detailed field sketch of the area shows major features within our portion of Copeland Creek (Plate 1). Pacing was used to measure distances between features on the map, however compass directions were only approximated. The right side of the sketch shows simplistic cross-section profiles of the creek bed at regularly spaced intervals of approximately six meters. Both sides of the stream were extensively armored, and the level of the stream during high flow was indicated by exposed roots on the northwest bank where erosion cut into the hillsides as well as by small terraces on the southeast bank.

The longitudinal profile is shown in Figure 2. Elevation and water depth were recorded along the thalweg. The gradient of the stream at this location was calculated to be 6.3%. A portion of the profile with negative slope was determined to be inaccurate, and efforts were made to correct the shape of the profile. The negative slope in the profile may have been caused by the stadia rod not being held perfectly vertical, which would create error when calculating elevation, or may be attributed to inaccurate measurement recording. Backsight measurements

were taken for the longitudinal profile and the following cross sections, and all were within centimeters of the original reading.

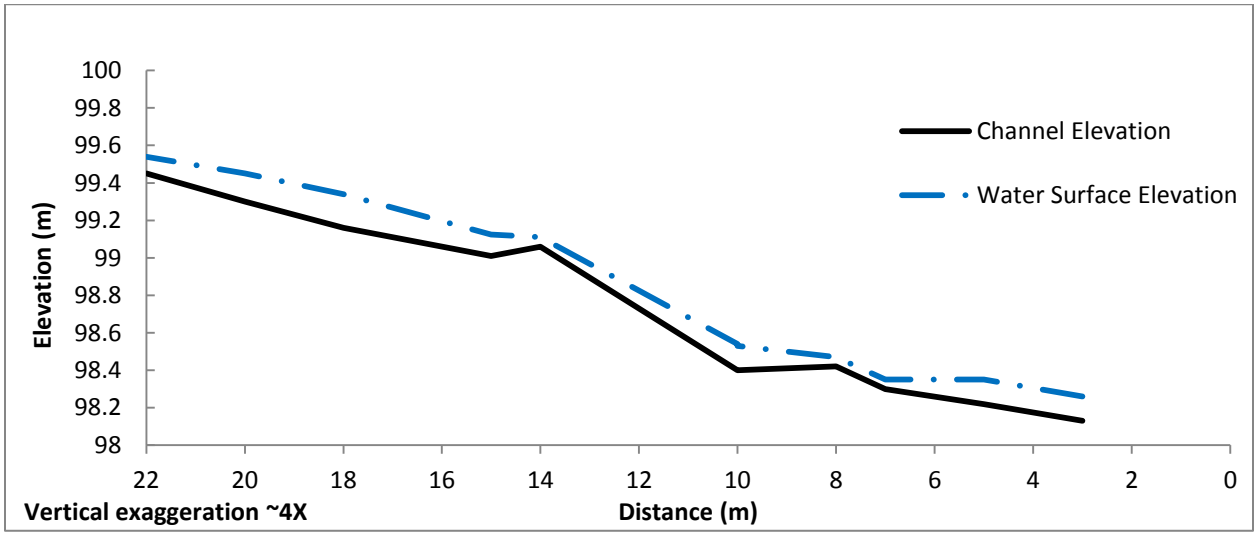


Figure 2. Longitudinal profile of Copeland Creek Reach.

Two cross sections are shown in Figure 3. Both cross sections are facing northwards and upstream. Sudden changes in the channel shape can be attributed to large clasts present within the bed of the stream. Both profiles clearly show the steepness of the northwest bank and the small terrace on the southeast bank. Error in the shapes of these profiles may have been due to similar issues with the stadia rod and recording measurements. Large boulders within the stream bed may also affect the shape of both profiles.

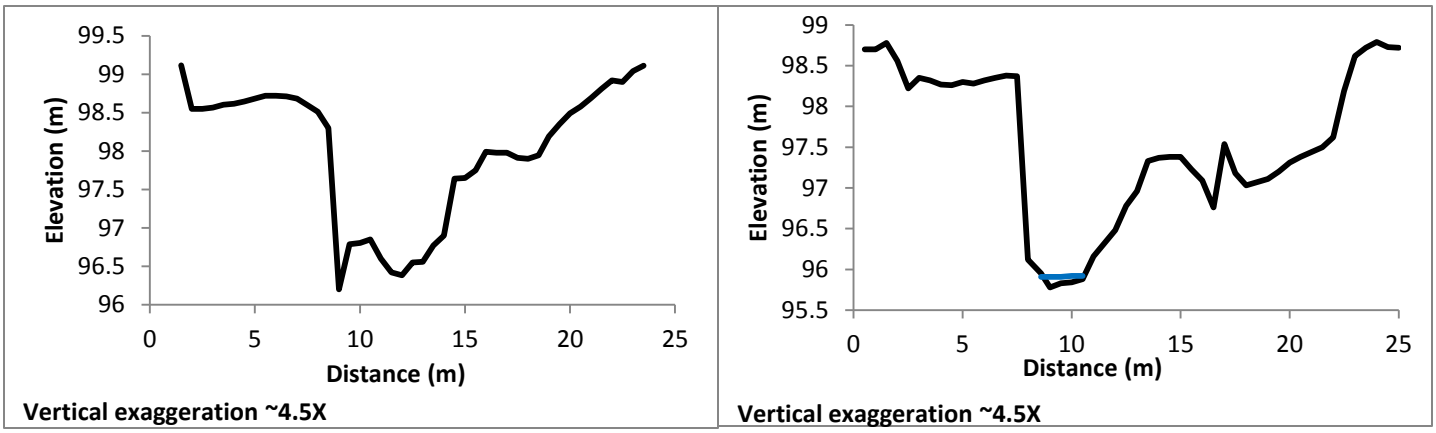


Figure 3. Channel cross sections. The right is the downstream cross section in Plate 1, while the left is the upstream cross section.

A Wolman pebble count was performed along the full length of the stream to characterize the bedload sediment. The intermediate axis of each clast was measured in centimeters using a ruler. The results of the pebble count are shown in Figure 4, which plots cumulative percent against clast size. The average clast size was 6.6 centimeters, with most falling between four and eight centimeters. Rocks at the stream were derived from the native volcanic of Sonoma Mountain (porphyritic andesite, basalt, and rhyolite), and also included sandstone. Small point bars consisting of well rounded, cobble to boulder size clasts are present in the southern part of the stream (Plate 1).

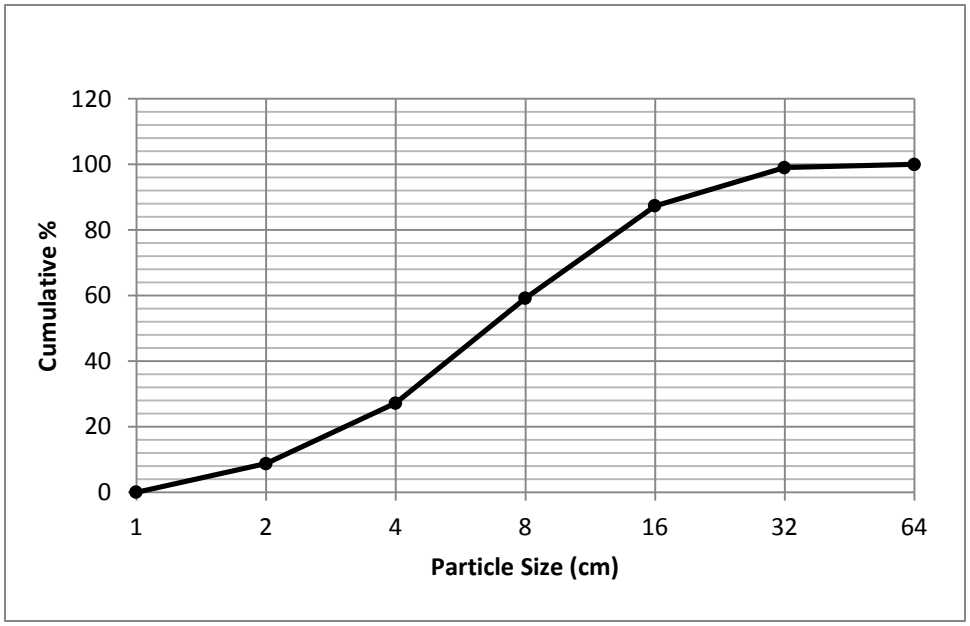


Figure 4. Plot of Wolman Pebble count, with mean clast size of 6.6 cm

A series of erosion pins were placed on the banks of the stream along each cross section. Table 1 summarizes the location and exposure of each erosion pin, and the locations are also shown in Plate 1. Extensive armoring on each bank made it difficult to insert the erosion pins, and a few were placed upstream of the cross section line as a result. The erosion pins will be used for future studies that examine changes in channel shape.

Table 1. Erosion pin location and exposure

Cross section	Erosion pin location (looking downstream)	Elevation (m)	Exposure (mm)
Downstream	Right bank, lower pin	99.7	60
	Right bank, upper pin	99.72	61
	Left bank, lower pin	99.64	60
	Left bank, middle pin*	99.66	61
	Left bank, upper pin	99.73	59
Upstream	Right bank, lower pin	99.65	153
	Right bank, upper pin	99.76	185
	Left bank, lower pin*	99.66	--
	Left bank, upper pin*	99.7	--

*Erosion pins are offset upstream from cross section line by 0.5-1.0 m

Summary

A stream reach characterization was completed on a portion of Copeland Creek located within Fairfield Osborn Preserve. A field sketch shows major features within the stream and the gently meandering shape. The gradient was calculated to be 6.3% from a longitudinal profile along the creek bed. Channel cross sections show steep banks created by erosional processes and small terraces created during overflow of the stream. A Wolman pebble count shows the dominant clast size to be between four and eight centimeters. Erosion pins were placed at strategic locations on either side of the stream and will be used to study changes in channel shape over time.

Plate 1.

Stream Assessment Field Sketch Form

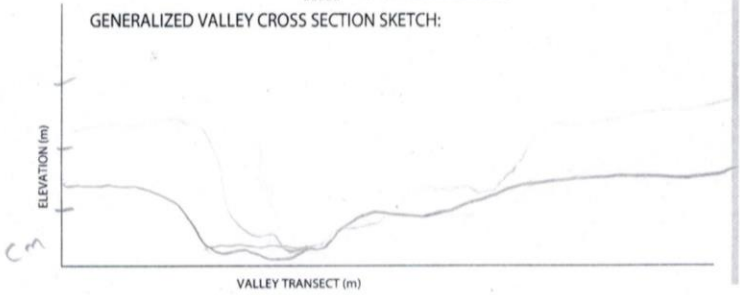
River/Stream: Copeland Creek Reach ID:

Date/Time: 10-25-13 ~10:35 AM Location: Fairfield Osbun Preserve, Rohnert Park Map by: Alexa

2 cm = 6 m

Map Scale (if applicable): 1 cm = 3 m

GENERALIZED VALLEY CROSS SECTION SKETCH:



SYMBOL LEGEND:

- Geomorphic Unit Boundary
- Flow Direction
- UTM Coordinate Location: RS-1
- Fish Sampling Location & ID: F1
- Invertebrate Sampling Location & ID: I1
- Cross-section Location: x - - - - - x
- = tree
- Qc = cobbles/boulders
- - - = dry river
- ← = thalweg
- ? = erosion pin
- = slope change
- = < 5 ft bank
- = > 5 ft bank

HYDRAULIC UNIT KEY:

Flow Types:

- ☐ H9 Free Fall
- ☐ H8 Chute
- ☐ H7 Broken standing waves
- ☐ H6 Unbroken standing waves
- ☐ H5 Rippled
- ☐ H4 Upwelling
- ☐ H3 Smooth surface flow
- ☐ H2 Scarcely perceptible flow
- ☐ H1 Standing water

Substrate Categories:

- ☐ S1 Silt
- ☐ S2 Sand
- ☐ S3 Gravel
- ☐ S4 Cobble Sm.
- ☐ S5 Cobble Lg.
- ☐ S6 Boulder Sm.
- ☐ S7 Boulder Lg.
- ☐ S8 Bimodal

Form # C - _____